Federal Ministry
of Transport and
Digital Infrastructure

Report by the “Volkswagen” Commission of Inquiry

Investigations and administrative measures with regard to Volkswagen, results of the field investigation of the Federal Motor Transport Authority into unlawful defeat devices in diesel vehicles, and conclusions

Content

A. Introduction

With a Notice of Violation dated 18 September 2015, addressed to companies in the Volkswagen group (VW), the US American Environmental Protection Agency (US EPA) alleged that the engine control of certain diesel vehicles was deliberately manipulated and that US environmental standards were thereby circumvented. In the vehicles concerned, a specific engine control software recognises whether the vehicle follows a test cycle on the basis of certain parameters. In real-life road operation, the vehicles switch to a different emission strategy. The allegations of the use of such an unlawful defeat device referred to type EA 189 VW 2.0-litre diesel engines. In the US, this affects approximately 482,000 vehicles. The global figure of Group vehicles concerned, which also comprise 1.6- and 1.2-litre VW diesel engines, amounts to up to 11 million vehicles, of which approximately 8.5 million vehicles are located in the European Union and approximately 2.5 million in Germany.

Federal Transport Minister Alexander Dobrindt launched a Commission of Inquiry on 22 September 2015, directly after the allegations against VW in the US became known. Headed by State Secretary Michael Odenwald, this commission consists of experts of the Federal Ministry of Transport and Digital Infrastructure (BMVI), the Federal Motor Transport Authority (KBA), and is scientifically supported by Prof. Dr.-Ing. Georg Wachtmeister, full professor, TU Munich, Chair of Internal Combustion Engines. The Commission of Inquiry started informative talks with VW on 23 September 2015. At the date of this report, 53 meetings have been held; besides VW, other vehicle manufacturers, suppliers, associations and organisations were also summoned, and talks with the US EPA and Member States were conducted.

The tasks of the Commission of Inquiry relate to the allegations made against VW:

- Analysis of the facts,
- Support of the administrative procedures with regard to type approvals,
- Assessment of the corrective actions offered by VW, including their lawfulness, expediency, technical and time-related feasibility while considering the interests of customers and vehicle owners,
- Specification and control of the implementation of VW's corrective measures.

Additionally, the commission had received the mandate to investigate whether comparable unlawful test cycle recognitions, as in the VW case, were used for other types of diesel vehicles.

Right after the allegations of the US authorities against VW became known, the KBA was instructed on 21 September 2015 to initiate specific re-examinations and, in particular, to clarify whether the vehicle type approvals of the manufacturer VW which are valid throughout Europe are also affected by the allegations of the use of unlawful defeat devices according to the stipulations of the European type approval regulations. The corrective actions derived from this up to now are summarised in section C.I. ("Investigations – Volkswagen") of this report. The basis of the legal requirements of the European type approval regulations is explained in section B. ("Basis") of the report.

On 24 September 2015, Alexander Dobrindt, the Federal Transport Minister, called upon the KBA to widen the investigations to include current diesel vehicle types of other marketable German and foreign manufacturers. In this context the KBA conducted a total of 56 measurements on 53 models of "Euro5" and "Euro6" diesel vehicles. The Commission of Inquiry supports these field investigations of the KBA. The results of these investigations and their assessments by the Commission of Inquiry are laid out in section C.II. ("Investigations – KBA – Field Examination of Diesel Vehicles").

After the clarification of the facts had been concluded and all findings resulting from the investigations of the KBA were made available, it was the task of the Commission of Inquiry to review in a comprehensive and conclusive way which actions are required to adjust international, European and national regulations. The proposed measures are summarised in section D. ("Conclusions").

B. Basis

I. Development and Reduction of Nitrogen Oxides (NOx)

1. NOx Formation Mechanisms

The source of the nitrogen oxides found in exhaust emissions is almost exclusively the nitrogen in the ambient air. There is the possibility that fuel contains nitrogen, yet this share is negligible for the formation of nitrogen oxide. In principle, there are three development pathways for NOx: "thermic nitrogen monoxide (NO)", "prompt NO" and "fuel NO". Since the development path of "thermic NO" is the most important one for diesel engine combustion (90 to 95 % of NOx), the following provides a brief explanation to create an understanding of how exhaust gas recirculation works.

The nitrogen molecule, e.g. in the intake air, consists of an N-N triple bond. This triple bond needs to be split first, which requires high activation energy in the form of a high temperature (1,800 to 2,000 Kelvin). Once this temperature is reached or exceeded, N_2 splits into two N radicals and forms a bond with an active oxygen atom to become NO. If lower temperatures are reached again, NO can form NO_2 with O_2. The formation pathways are highly simplified in this report. Indeed, there are multiple chemical formation reactions, but they are not relevant for this case. What is important is the fact that the combustion temperature is the decisive factor for the formation of NOx. Therefore, the objective of the combustion process development is to achieve maximum temperatures that are as low as possible during combustion to avoid the formation of NOx.

2. Measures to Reduce NOx Emissions

As far as measures to reduce NOx emissions are concerned, one distinguishes between measures within the engine and exhaust after treatment.
Combustion management and exhaust gas recirculation (EGR) are part of the measures within the engine. Combustion management means the arrangement of the chronological sequence of the reaction rate (burning rate). If it is very high, it will lead to a very high energy conversion per unit of time and thus to high temperatures. In principle, the combustion process is influenced by the characteristics of the injection and by the air movement in the combustion chamber (turbulence, swirl, tumble). These mechanisms of action will not be discussed in further detail as they were not subject of the discussions in the present case.

Water vapour (H_2O) and carbon dioxide (CO_2) are triatomic gases used for combustion as part of the EGR. Given their higher heat capacity, they absorb more heat during combustion. Thus, the combustion temperature can be lowered with EGR, which in turn leads to a reduction in the formation of NOx. The exhaust is taken as a so-called high pressure EGR directly after the outlet valves and supplied to the combustion via an EGR cooler before the inlet valves. The amount of EGR is regulated via a valve (EGR valve). This process is currently predominantly found in mass production. Alternatively, or in addition, the exhaust can be taken after the turbine of the exhaust turbocharger and particulate filter and be supplied to the engine air intake before the compressor (low pressure EGR). This configuration is a more recent development and is used occasionally in mass production.

Currently, there are two procedures in place for the NOx exhaust after treatment which can also be used in combination:

Lean NOx Trap (LNT)

Exhaust after treatment with an LNT is a discontinuous procedure. The nitrogen oxides found in the exhaust tract are stored on the catalytic layer, e.g. by barium oxide, by converting it to barium nitrate. If the barium oxide in the LNT is used up due to the NO_2 storage process (before that, NO is oxidised to become NO_2), a regeneration process needs to be launched. The back reaction from barium nitrate to barium oxide during which the trapped NO_2 is released again as NO, requires a high temperature. It is generated by a late combustion and a reduction of the air-fuel-ratio to approximately 1.0 and below (rich mixture). Since CO is now also present in the exhaust due to the rich mixture, the NO released reacts in the presence of rhodium (catalyst material) to form N_2 and CO_2. Depending on the NOx formation during combustion and the size of the LNT, the regeneration intervals are between 3 km and 10 km. During the regeneration period, combustion takes place under air starvation which leads to a high level of particle formation. Thus, the particulate filter is subject to a heavy load during the regeneration phase of the LNT.

SCR catalyst (Selective Catalytic Reaction)

Emission control with an SCR catalyst is a continuous process, which means that no regeneration is required. The chemical conversion of NOx into gases that are harmless for people takes place via an ammonia reaction. As ammonia is highly toxic, it cannot be used as a pure substance in a vehicle. Therefore, an aqueous urea solution (AdBlue) is used which is injected as an ammonia precursor before the SCR catalyst. In the first section the catalyst is coated in such a way that urea is converted to ammonia. In

the middle section the composition of the catalyst material ensures a preferential reaction of ammonia with NOx. The challenge consists in the adequate feeding of AdBlue which corresponds to the current amount of NOx in the exhaust. Striking a balance between both reactants is hardly possible, especially under dynamic operating conditions. Thus, a small excess of AdBlue is always injected. The excess ammonia is then converted once again into harmless components in the last section of the SCR catalyst. This process is increasingly replacing the LNT.

II. Legal Requirements

1. European Type Approval Process

Vehicles are only allowed to be registered in the Member States of the European Union (EU) if they conform to an official approval. The European Directive 2007/46/EC is relevant for the passenger vehicles (cars, vehicle category M1) and light-duty vehicles (vehicle category N1) reviewed here. This directive in turn contains a number of individual regulations for the different technical systems and components of these cars. The requirements to be applied to the exhaust gas emissions of these vehicles are set out in Regulation (EC) No. 715/2007 and the implementing regulation (EC) No. 692/2008. Regulation (EC) No. 692/2008 considers a number of different facts. With regard to the field investigation of diesel vehicles conducted here as well as the effect of defeat devices, the Type 1 test, the examination of the exhaust gas emissions in the New European Driving Cycle (NEDC) on a chassis dynamometer, is the most important element of Regulation (EC) No. 692/2008 (Annex III). The test method itself, required as per Annex III, is described in the UN Regulation No. 83.

The technical tests are to be conducted by a Technical Service appointed by the approval authority. The Technical Service may carry out the tests at its own test facilities or at the manufacturer's test facilities. If the tests are conducted at the manufacturer's facilities, the Technical Service has to ensure that the facilities fulfil the same requirements as those of an appointed Technical Service. The manufacturer provides the vehicle.

The manufacturer describes its vehicle to the extent required by the regulation. The Technical Service examines the vehicle according to the requirements of the regulation and draws up a technical report on the findings. It examines whether the tested vehicle corresponds with the manufacturer's description. While the regulation declares

Vehicle on an all-wheel chassis dynamometer

the prohibition of unlawful defeat devices, it does not prescribe a test method to be used by the Technical Service with which the presence of unlawful defeat devices could be detected. The Technical Service then sends the technical report and the description to the approval authority. The approval authority reviews the documents and issues the type approval as soon as the legally required tests have been successfully verified.

With the type approval issued, the manufacturer may manufacture an unlimited number of vehicles that correspond exactly with the type approval. The manufacturer is required to monitor the production for approval conformity, known as conformity of production (CoP).

The approval authority in turn checks the conformity of the vehicles in production. The authority is required to first check the records of the manufacturer's conformity of production tests. If these records are insufficient, the manufacturer's quality management and, if need be, the approved vehicle is examined. The regulation limits the investigations into the vehicles to the test methods set out in the regulation. Differing methods, as carried out in this field examination to detect unlawful defeat devices, are not part of the approval authority's instrument provided for by law. There are no specifications for administrative reviews in terms of the frequency or vehicle numbers.

Apart from testing brand new vehicles straight out of production, vehicle manufacturers must conduct tests on vehicles in the field and document the results regularly and under specific conditions; this is known as the review of in-service conformity (ISC). Anomalies found during the ISC tests need to have consequences for production. Usually, the KBA reviews these manufacturer documentations annually and randomly witnesses the measurements.

Furthermore, ISC rules facilitate the carrying out of national monitoring programmes of the Member States. Currently, Germany is one of four Member States which have implemented such programmes on a voluntary basis, most recently within the research endeavour of the Federal Highway Research Institute.

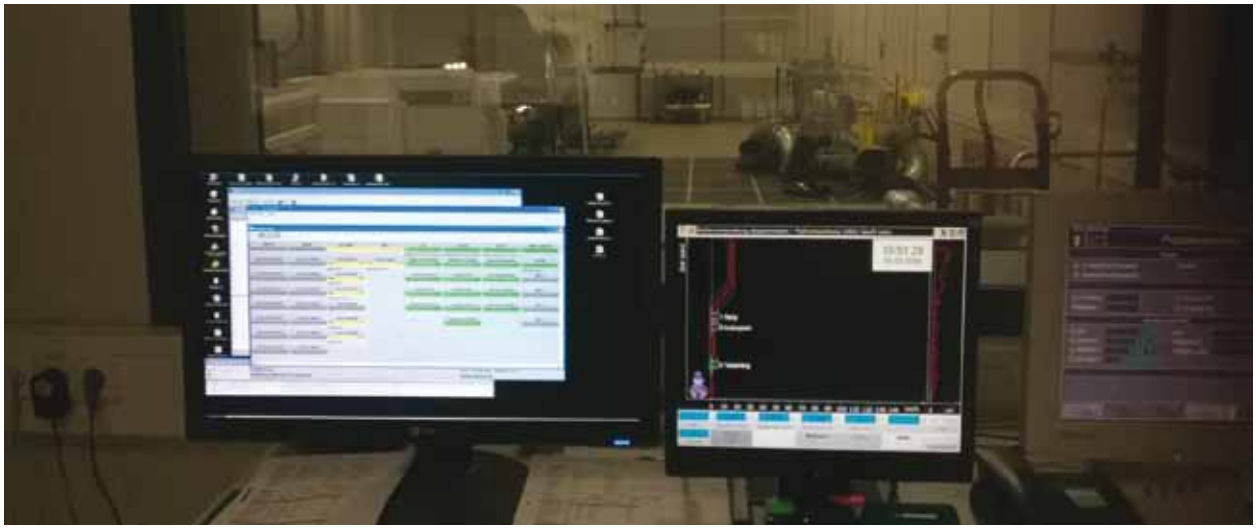
According to applicable regulations, the Type 1 test in the NEDC is conducted on the chassis dynamometer for CoP and ISC.

2. New European Driving Cycle (NEDC) and Type 1 Test Procedure

The Type 1 test is conducted on a chassis dynamometer in a laboratory under reproducible boundary conditions (e. g. vehicle pre-conditioning, temperature, air pressure, humidity and operational profile).

The NEDC constitutes a clearly defined speed-time-profile which the driver operating the test vehicle on the dynamometer needs to follow within a defined tolerance range. The speed-time-profile of the NEDC to be applied in the European type approval process is illustrated below.

The NEDC has a total duration of approximately 20 minutes (1180 s) and consists of two different parts. Part 1 is within the speed range of max. 50 km/h and includes frequent stops (urban areas); part 2 is to cover the extra-urban speed range with a short distance driven on a motorway. The NEDC on the chassis dynamometer simulates driving straight ahead approximately 11 km



Control station of a chassis dynamometer

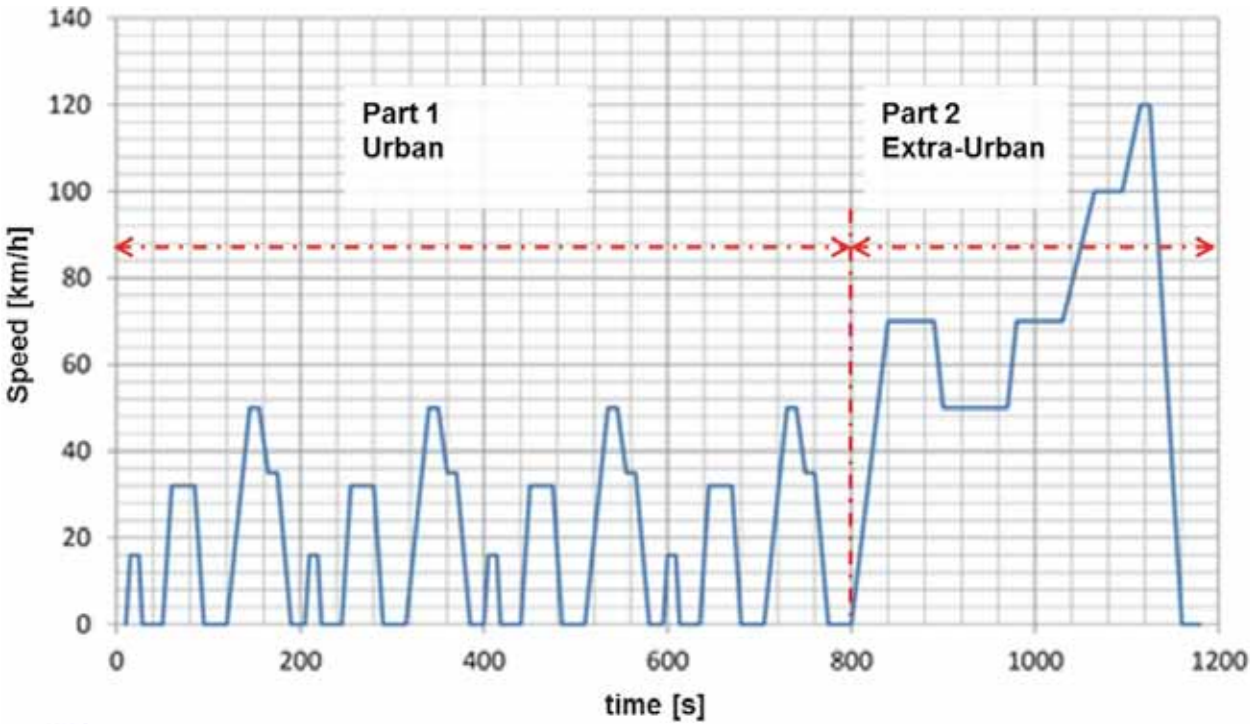


Illustration of the NEDC

on a flat road with moderate acceleration (amax = 0.8 - 1 m/s²), an average speed of Vø = 33.6 km/h and a short-term maximum speed of vmax = 120 km/h.

The test bench is calibrated with the help of the results stemming from the determination of the road load curve, so that the total road load of the test vehicle on the chassis dynamometer is almost identical with that on the street. The road load is determined by applying a fixed road load curve as required by the regulation (table values) or by processes that include coast down tests on the road. The road load is the descriptive quantity for the load resistance the vehicle experiences during operation. In a first approximation it can be described by a quadratic function with the force parameters F0, F1 and F2.

The chassis dynamometer also simulates the inertia of the vehicle. The equivalent inertia allocated to the vehicle mass is used as the inertia. Example: A vehicle with a weight of 1530 kg is designated the inertia class 1470 kg according to the table, and in its inertia behaviour it is therefore assessed as a vehicle which is 60 kg lighter.

The test vehicle is pre-conditioned by NEDC Part 2, the extra-urban cycle, being run three times on the chassis dynamometer. Subsequently, the vehicle is parked for at least 6 hours (max. 36 hours) at an ambient temperature of 20 to 30 °C in order to achieve temperature equalisation. The exhaust test is conducted on the dynamometer with such a pre-conditioned vehicle at an ambient temperature between 20 and 30 °C under defined conditions for humidity and air pressure.

During the test run, a complete NEDC is run, and the entire exhaust gas flow is recorded with the help of the measurement technique for sampling and the chemical analysis described in the rules and procedures. The content of the components CO_2, CO, hydrocarbons (HC), NOx and particle emissions (mass PM, number PN) is determined. The results are recorded for each component as mass emission per kilometre (mg/km) or as a numerical value (number/km).

Threshold values apply for pollutants (CO, NOx, particles: PM, PN); these may not be exceeded. The following chart illustrates the development of the pollutant threshold values of the emission classes from Euro 4 to Euro 6 for diesel vehicles. Compliance with these threshold values is to be solely proven in the NEDC during Type 1 tests.

Table: Pollutants and threshold values

Pollutant (Type test)		Euro 4 since 2005	Euro 5 a since 2009	Euro 5 b since 2011	Euro 6 since 2014
CO	mg/km	500	500	500	500
NOx	mg/km	250	180	180	80
HC + NOx	mg/km	300	230	230	170
PM	mg/km	25	5	4,5	4,5
PN	number/km	-	-	$6x10^{11}$	$6x10^{11}$

3. Rules Governing the Defeat Device

The defeat device is defined in Article 3(10) of the Regulation (EC) No. 715/2007 as follows:

"10. "Defeat device" means any element of design which senses temperature, vehicle speed, engine speed (RPM), transmission gear, manifold vacuum or any other parameter for the purpose of activating, modulating, delaying or deactivating the operation of any part of the emission control system that reduces the effectiveness of the emission control system under conditions which may reasonably be expected to be encountered in normal vehicle operation and use."

The use of defeat devices is governed in Article 5 (1) and (2) of this Regulation:

"(1) The manufacturer shall equip vehicles so that the components likely to affect emissions are designed, constructed and assembled so as to enable the vehicle, in normal use, to comply with this Regulation and implementing measures.

(2) The use of defeat devices that reduce the effectiveness of emission control systems shall be prohibited. The prohibition shall not apply where

a) the need for the device is justified in terms of protecting the engine against damage or accident and for safe operation of the vehicle;

b) the device does not function beyond the requirements of engine starting;

c) the conditions are substantially included in the test procedures for verifying evaporative emissions and average tailpipe emissions."

C. Investigations

I. Volkswagen

1. Objects of the Investigation

In order to clarify whether vehicles of the VW Group are affected by the allegations of unlawful defeat devices being used in Europe too, different questions were addressed.

Right after the allegations made by the US authorities against VW became known, the KBA was instructed to initiate specific re-examinations by independent experts. The vehicles were tested under varying test requirements on the chassis dynamometer in the laboratory and under real driving conditions on the street. The execution and methodology of the measurements as well as the results and the assessment of the results are described in detail in section C.II ("Investigations – KBA Field Examination of Diesel Vehicles").

In the session of 23 September 2015, VW admitted to the Commission of Inquiry of the BMVI that there are also unlawful defeat devices in certain diesel vehicles that are type approved in the EU. This predominantly affects "Euro 5" vehicles with engines of the series EA 189, the production of which has already been discontinued with the exception of light-duty vehicles. Diesel engines with a 2.0-, 1.6- and 1.2-litre capacity are affected. VW complied with the request of the Commission of Inquiry right away and submitted a list of the Group vehicles concerned, listed by brands and models. According to this list, approximately 2.5 million diesel vehicles are affected in Germany and 8.5 million diesel vehicles throughout the EU.

The KBA started its field examination with vehicles of the VW group which were affected by the unlawful defeat device. These comprised marketable VW diesel vehicles with a 2.0-, 1.6- and 1.2-litre capacity, which constitutes a global market volume of 11 million vehicles. Vehicles of the Audi brand with corresponding motorisation were chosen for the exemplary validation of the VW vehicle results. The examinations were able to illustrate the modified emission behaviour of VW vehicles due to the unlawful defeat device.

Apart from the engine concepts, for which VW had admitted the use of unlawful defeat devices, the KBA also included other vehicles of the VW Group in the investigations in order to review regularity or to look into specific suspicious facts/allegations.
The examinations showed that warnings about the current production of vehicles with series EA 288 engines (Euro 6) also being affected by exhaust gas manipulations were unsubstantiated.

Because of, inter alia, the suspicion of another unlawful defeat device being used in vehicles of the VW, Audi and Porsche brand with a 3.0-litre diesel engine, respective vehicles were included in the KBA field investigations. With a Notice of Violation, dated 2 November 2015, the US EPA informed Volkswagen AG, Audi AG, Porsche AG, Volkswagen Group of America Inc., and Porsche Cars North America Inc. of the installation of unlawful defeat devices in vehicles with 3.0-litre engines. Complaints were made about the model years 2014 (VW Touareg), 2015 (Porsche Cayenne) and 2016 (Audi A6 Quattro, A7 Quattro, A8, A8L and Q5) with a warm-up mode, the use of which is considered unlawful according to US law. Details on the investigations into the models Audi A6 and VW Touareg with the respective engine are given in section C.II on the KBA field investigations.

2. Measures in the Administrative Procedure

VW has to establish as quickly as possible the conformity of the vehicles concerned with the emission regulations and the type approval. To this end, the KBA called upon VW to submit a binding plan of action and schedule by 7 October 2015, and to inform about the technical details on the installed software programmes. VW fulfilled this request on time. On the basis of the exhaust after treatment strategy described by VW and the manipulations of the exhaust-relevant software of vehicles with series EA 189 engines which were reconstructed by independent re-examinations, the KBA came to the conclusion that the software manipulation is to be considered an unlawful defeat device in the sense of Regulation (EC) No. 715/2007.

Then, on 14 October 2015, the KBA issued a notice based on § 25(2) of the EC Vehicle Approval Regulation, on the basis of which retroactive collateral clauses regarding type approvals can be mandated for vehicles already in use to guarantee their regularity. This notice prompted VW to recall vehicles with engines of the series EA 189 in order to remove the unlawful defeat device and to establish regularity.

Another consequence of the notice is that the new vehicles concerned which have not yet been registered for the first time are to be denied registration in line with the EC Type Approval Directive 2007/46/EC. The BMVI informed the highest federal state authorities responsible for registration in writing. Such vehicles may only be registered for the first time if the unlawful defeat device has been removed within VW's recall measure. The same holds true for new vehicles of the Audi, Seat and Skoda brands in Germany after the competent British and Spanish type approval authorities have notified the KBA of the non-conformity of such defeat devices. In contrast, there are no restrictions to registration

for vehicles that were registered before– be it in Germany or in the EU - especially so in the case of a resale. No legal basis is seen to impose a ban on the sale of such vehicles.

As part of its plan of action, the VW Group suggested corrective measures. These measures provide for a software adjustment of the engine control unit for all vehicles concerned, with a flow transformer to stabilise the flow in the air mass path being required for vehicles with 1.6-litre engines. In principle, these remedies were regarded as suitable after their mechanisms had been explained. However, in each individual case a final review and authorisation for retrofitting granted by the KBA is required, which takes place successively after the completion of the specific application for each individual vehicle concept and review by the Technical Services. Additionally, the KBA conducts independent reviews of other Technical Services prior to issuing the authorisation. The vehicles need to fulfil all the emission requirements of the Regulation (EC) No. 715/2007 after the defeat device has been removed, including a review of the compliance of the engine performance and the CO2 emission value of the original type approval as well as the noise regulations according to the Directive 70/157/EEC or Regulation (EU) No. 540/2014.

On 27 January 2016, the KBA issued a final authorisation for retrofitting the first model, the VW Amarok 2.0 litre. With this, VW was able to start the recall and to retrofit this model. The authorisation to retrofit other vehicle models with 2.0-litre engines has now also been issued (certain variants of the Audi A4, A5, A6, Q5, and Seat Exeo). Also, certain types of the VW Golf are about to be authorised for retrofitting by the KBA.

The authorisations to retrofit other models affected are being issued gradually as soon as the KBA believes that VW has provided the required evidence and submitted the documents to the KBA, and once the examinations are concluded. They are to take place step by step in the months to come, and all recalls are to start in 2016. The launch and continuation of the respective recall campaigns by VW are monitored by the KBA in that measures taken for each vehicle are reported via the manufacturer up to the complete implementation, and outstanding vehicles are tracked by the authorities. The KBA has informed the other type approval authorities of the measures mandated and the tests conducted to that end.

VW is charged with the costs for the administrative procedure and the examinations of the VW vehicles.

3. Customer Interests

To protect customers, the Commission of Inquiry urged VW to indemnify them throughout Europe and to advise them comprehensively:

- VW immediately launched a website on which customers may check via their vehicle identification number whether their vehicle is affected.
- VW waives the statute of limitation defence in view of the vehicles affected by manipulations.
- VW has set up a customer support system.
- VW has to ensure that the retrofitting is not carried out to the disadvantage of the customers affected.

II. KBA Field Examination of Diesel Vehicles

The central question of the KBA field examination and thus the essential mandate was:
"Were defeat devices in the sense of the regulations installed by other manufacturers which may unlawfully reduce the effectiveness of the emission control system under conditions that are to be expected in normal vehicle operation and use?"

In order to address this question, the KBA compiled different test routines. Not only the NEDC profile, the only statutory profile, was used but also profiles with an NEDC variation and, following the proposal of the European Commission, the RDE (Real Driving Emissions) cycle. The profiles were tested on ordinary chassis dynamometers and with portable emission measurement systems (PEMS). PEMS have been ready for series production for almost two years and enable measurements on the road with a sufficient degree of validity and reproducibility.

In total, on the date of this report, 56 measurements have been conducted and evaluated on 53 vehicle models. 51 category M1 vehicles and 5 category N1 Group III light-duty vehicles were examined. All in all, 24 vehicles were Euro 5 vehicles and 32 vehicles Euro 6 vehicles.

1. Selection of Vehicles

The KBA field investigation started with vehicles of the VW Group which were affected by the unlawful defeat device. They comprised marketable VW vehicles with diesel engines with a 2.0-, 1.6- and 1.2-litre engine capacity.

Given the suspicion of an unlawful defeat device being used in vehicles of the brands VW, Audi and Porsche with 3.0-litre diesel engines, such vehicles were included in KBA's field examination as well.

Since the central mandate was to investigate whether the use of unlawful defeat devices was an across-the-board phenomenon in the field, the vehicles of other manufacturers were chosen for the KBA field examination as well. To this end, Euro 5 and Euro 6 diesel vehicles registered in Germany between 2009 and 2015 were selected from the KBA vehicle statistics published by KBA. This selection is based on market conditions. Further, vehicles were included spontaneously in the investigations if it seemed necessary due to notifications of other organisations.

The cars were sampled in a way which ruled out any possible influence exerted by the manufacturer on the vehicles, since the vehicles were bought or rented from car dealers or rental companies. Moreover, in the case of VW, vehicles were taken directly from the manufacturing plant under the supervision of the KBA.

2. Measurement Performance and Methodology

The KBA appointed independent Technical Services and tasked them with carrying out the measurements. These designated Technical Services have the necessary test facilities and have proven their expertise to the KBA. Due to intercomparison programmes conducted by the KBA with the Technical Services in previous years, one can assume that the quality of the test results is comparable and that it meets type approval requirements.

Since the defeat device feature VW admits to had not been detected during the type tests of different authorities and Technical Services in the years before, one had to assume that the examinations described in the annexes of the emission regulations are not sufficient to detect defeat devices. That is why the KBA developed performance specifications with the following objectives:

- Recognition of unlawful defeat devices;
- Recognition of classifications and boundary conditions of test bench and cycle recognitions;
- Acceptance and usability of the test results;
- Legal certainty and reproducibility of the test findings.

The recognition of unlawful defeat devices and classifications regarding dynamometer and test cycle recognition should be achieved in particular by conducting examinations under conditions that are as real as possible (road travel) to determine whether a defeat device recognises the modification of a test cycle, and by being able to draw conclusions from comparing the different measurements.

However, to make accepted, usable, reproducible, and legally certain statements on the results and their evaluation, the planned test cycles should be very close to the statutory measurements according to Regulation (EC) No. 715/2007 in conjunction with Regulation (EC) No. 692/2008 and Annex III of the UN Regulation No. 83 (NEDC).

An indispensable part of the performance specifications were dynamometer measurements in the NEDC. This so-called Type 1 test ('cold' NEDC) with pre-conditioning serves the purpose of an initial assessment as to whether the vehicle undergoing testing is in a faultless condition and whether it meets legal regulations and threshold values. Furthermore, the dynamometer measurements conducted in the NEDC without pre-conditioning the vehicles (warm engine oil and engine coolant) ('hot' NEDC) serve the purpose of validating the values measured simultaneously with the PEMS facilities. NEDC tests conducted on the dynamometer at an ambient temperature of 10 °C (NEDC 10 °C) help to better understand the influence of outside temperatures under laboratory conditions. Modified NEDC tests conducted on the road with the same energy content (phase interchanged cycle) (NEDC back) and modified target speeds (NEDC +/- 10 %) should show anomalies in the emission of NOx. The use of an RDE measurement, envisioned to be statutory in the future, served as an additional indicator. According to the specifications regarding the examination of diesel vehicles, the following programme had to be completed:

Test cycle 1 – cold NEDC:
This test cycle served as a starting point for the respective tests. It corresponds exactly with the speed-time-profile of the cycle in the European type approval procedure and it was conducted according to the process defined for it.

Driving conditions	■ Chassis dynamometer with fixed road load (load adjustment as per manufacturer specifications) ■ Equivalent inertia according to vehicle classification in the respective inertia class
Pre-conditioning	■ Undergoing the NEDC part 2 three times ■ Temperature equalisation for the duration of 6 to 36 hours at an ambient temperature of 20 °C to 30 °C
Test sequence	■ Undergoing NEDC (Type 1 according to UN Regulation No. 83) ■ Total duration: 1180 s ■ Ambient temperature: 20 °C to 24 °C
Exhaust measurement	■ CVS measurement, bag method ■ Modal analysis with a seconds interval ■ Particle mass

Test cycle 2 – hot NEDC:
This test cycle was to show whether emission values are unlawfully optimised e.g. by switching to reduce the emission reduction measures after 1180 s.

Driving conditions	■ Chassis dynamometer with fixed road load (load adjustment as per manufacture specifications) ■ Equivalent inertia according to vehicle classification in the respective inertia class
Pre-conditioning	■ None (Testing done directly according to cold NEDC)
Test sequence	■ Undergoing NEDC (Type 1 according to UN Regulation No.83) ■ Total duration: 1180 s ■ Ambient temperature: 20 °C to 24 °C
Exhaust measurement	■ CVS measurement, bag method ■ Modal analysis with a seconds interval ■ Particle mass

Test cycle 3 - NEDC 10 °C (NEDC at an ambient temperature of 10 °C):
This test cycle was to show whether emission reduction measures are unlawfully reduced depending on the ambient temperature. This test was included because of the experience gained during the current measurement campaign.

Driving conditions	■ Chassis dynamometer with fixed road load (load adjustment as per manufacturer specifications) ■ Equivalent inertia according to vehicle classification in the respective inertia class
Pre-conditioning	■ None
Test sequence	■ Undergoing NEDC (Type 1 according to UN Regulation 83) ■ Total duration: 1180 s ■ Ambient temperature: ca. 10 °C
Exhaust measurement	■ CVS measurement, bag method ■ Modal analysis with a seconds interval ■ Particle mass

Test cycle 4 – NEDC on the road (road measurement as per NEDC):
This test cycle was conducted on the road with a vehicle with an engine at operating temperature. This was to show whether a change to the emission reduction measures occurs in the vehicle on the road depending on the conditions of the engine (coolant, oil temperature etc.).

Driving conditions	■ Driving on a flat road ■ Road load subject to road surface and wind conditions
Pre-conditioning	■ None
Test sequence	■ Undergoing NEDC (Type 1 according to UN Regulation No. 83) on a flat street ■ Total duration: 1180 s ■ Ambient temperature: subject to environmental conditions ■ Humidity: subject to environmental conditions ■ Air pressure: subject to environmental conditions
Exhaust measurement	■ PEMS

Prüfzyklus 5 - NEFZ Back (Straßenmessung NEFZ zuerst Teil 2, danach Teil 1 gefahren):
This test cycle was conducted on the road with a vehicle with an engine at operating temperature. This was to show whether a change to the emission reduction measures occurs in the vehicle depending on the driving cycle and possibly on the thermic condition of the engine.

Driving conditions	■ Driving on a flat road ■ Road load subject to road surface and wind conditions
Pre-conditioning	■ None
Test sequence	■ Undergoing NEDC (Type 1 according to UN Regulation No. 83) on a flat street ■ Total duration: 1180 s ■ Ambient temperature: subject to environmental conditions ■ Humidity: subject to environmental conditions ■ Air pressure: subject to environmental conditions
Exhaust measurement	■ PEMS

Test cycle 6 - NEDC + 10 % (road measurement with a driving duration as per NEDC with 10 % higher speeds):
This test cycle was conducted on the road with a vehicle with an engine at operating temperature. This was to show whether a change to the emission reduction measures occurs in the vehicle depending on the speed and possibly on the thermic condition of the engine.

Driving conditions	■ Driving on a flat road at 10 % higher NEDC speeds ■ Road load subject to road surface and wind conditions
Pre-conditioning	■ None
Test sequence	■ Undergoing NEDC (Type 1 according to UN Regulation No. 83) on flat street ■ Total duration: 1180 s ■ Ambient temperature: subject to environmental conditions ■ Humidity: subject to environmental conditions ■ Air pressure: subject to environmental conditions
Exhaust measurement	■ PEMS

Test cycle 7 - NEDC -10 % (road measurement with driving duration as per NEDC with speeds reduced by 10 %):
This test cycle was conducted on the road with a vehicle with an engine at operating temperature. This was to show whether a change to the emission reduction measures occurs in the vehicle depending on the speed and possibly on the thermic condition of the engine.

Driving conditions	■ Driving on a flat road at 10 % lower NEDC speeds ■ Road load subject to road surface and wind conditions
Pre-conditioning	■ None
Test sequence	■ Undergoing NEDC (Type 1 according to UN Regulation No. 83) on flat street ■ Total duration: 1180 s ■ Ambient temperature: subject to environmental conditions ■ Humidity: subject to environmental conditions ■ Air pressure: subject to environmental conditions
Exhaust measurement	■ PEMS

Test cycle 8 – RDE run (real-life measurement on the road as per future RDE regulation):
This test cycle was to illustrate the behaviour of a vehicle produced in series if a driving profile is used according to the future RDE regulation. The test was conducted according to the proposal of the European Commission for RDE, adopted by the Technical Committee Motor Vehicles (TCMV) on 19 May 2015.

Driving conditions	■ Driving on a flat street ■ Road load subject to road surface and wind conditions
Pre-conditioning	■ None
Test sequence	■ Ambient temperature: subject to environmental conditions ■ Humidity: subject to environmental conditions ■ Air pressure: subject to environmental conditions
Exhaust measurement	■ PEMS

3. Findings

a. General Findings

Almost all the vehicles complied with the threshold values for the Type 1 test (cold NEDC) on the dynamometer under type test conditions and thus fulfilled legal requirements. Only three vehicles showed slight elevations of less than 10 % during this measurement. Following the rules of the type approval regulations, these vehicles were accepted as technically flawless. According to that, a vehicle has not passed the Type 1 test if in a single measurement the threshold value is exceeded by more than 10 %.

It was possible to show the deviant emission behaviour of the VW vehicles resulting from the unlawful defeat device by repeating and slightly modifying the test runs.

When the Type 1 test was conducted without the statutory pre-conditioning period of at least six hours (hot NEDC), elevated NOx emissions occurred in some vehicles. Some on-the-road measurements yielded NOx values that significantly exceeded the threshold value. In principle, the results of the PEMS on-the-road measurements were higher than the measurement results on the dynamometer, which is due to the impact of higher loads (road load, higher mass because of two test persons inside, PEMS, test device and mass of the optional equipment).

However, this in itself does not constitute legal non-conformity since the NOx threshold value only applies to the statutory Type 1 test including all boundary conditions. Yet, it does raise the question of whether the emission control of these vehicles is modified unlawfully in normal vehicle operation and use compared to the statutory test run.

It is pointed out that the sole comparison of the vehicles' NOx values with one another during the NEDC road tests and RDE tests is of limited usefulness due to the seasonally frequent changes in weather and temperature.

In order to classify the measurements according to the amount of NOx emissions, the KBA determined a first zone of up to 2.1 times the threshold value on the basis of the RDE regulation which was not yet in force at the time of the investigation. Having regard to the deviations amounting to more than three times the threshold value in VW Group vehicles equipped with an unlawful defeat device, the KBA formed a third zone. For this field investigation, a second zone, a transitional zone, was assumed between 2.1 times and 3 times the NOx threshold value.

The manufacturers of vehicles with NOx emissions classified as being in the third zone were invited for a discussion and asked about the causes. The assessment of whether the strategies used entailed unlawful defeat devices had to include the question of whether the individual switching strategy could be justified by a legal fact.

After that, the vehicles were divided again into three assessment groups: Group I comprised all the vehicles without anomalies or for which manufacturers were able to explain certain anomalies with regard to the amount of NOx in a technically plausible and acceptable manner. Vehicles with strikingly high NOx values that could not be explained technically in an adequate manner were categorised as Group II vehicles. VW Group vehicles with unlawful defeat devices which had already been detected in view of generation EA 189 diesel engines formed Group III.

There was a broad spectrum of NOx emissions determined in laboratory tests and on-the-road. As matters stand at present, the field investigations do not indicate any further defeat devices that are based on a test cycle recognition. Therefore, the KBA, the Commission of Inquiry and, when necessary, the KBA in conjunction with the scientific expert held talks with the manufacturers concerned in order to clarify whether the defeat devices served to protect the engines.

All manufacturers named the risk of a formation of deposits in the EGR system as the reason for the ramping out of the amount of EGR depending on the ambient temperature/temperature in the intake manifold/coolant temperature. Without a doubt, this is a possible risk; this has been confirmed in independent research projects. The formation of a deposit or lacquer may lead to a failure of the EGR valve and clog the EGR cooler.

Furthermore, an additional condensate formation, particularly in the presence of sulphur, will lead to problems with corrosion. Already very small amounts of sulphur suffice, and these are even found in so-called sulphur-free fuels. The moisture content in the exhaust gas is much higher than the moisture content in the ambient air because of the combustion of hydrogen found in fuel, which then forms water vapour; therefore, condensation is high. If there is too much pollution, then in the simplest scenario this will trigger the malfunction indicator lamp (MIL) which requires an immediate visit to a car repair shop. However, defects are known which directly cause a failure of the engine.

Apart from the possibility of engine protection, another aspect needs to be considered in view of the EGR quantity reduction to assess measures to reduce emission control: If the EGR valve does not work properly anymore, or if the EGR cooler is clogged, then this will lead to a substantial reduction in the amount of EGR which in turn implicates an increase in NOx. Furthermore, a particulate deposit layer in the EGR cooler reduces the heat transfer from the exhaust gas to be recirculated into the coolant which in turn will also lead to an increase in NOx. Therefore, strategies designed to ramp out the amount of EGR can be ultimately considered as measures to ensure emission control.

At this point it is to be pointed out that the process of particulate deposit layer formation in the recirculated exhaust gas is subject to very complex mechanisms of action. There is not only a dependence on the particle content in the exhaust gas but also on its overall composition. Temperature differences between the exhaust gas and the components (cooler walls, EGR valve etc.), the content of hydrocarbon, and humidity all play a role here. In addition, condensation is possible. The composition of exhaust gas is determined by the respective engine operation point. It follows from this that the consistency of a deposited layer may change within the thickness of the layer. Thus, again there is a dependence on the sequence of the operating points with the respective temperatures. This complexity of mutual interactions makes it extraordinarily difficult, if not impossible, to give quantitatively exact temperature limits to avoid the formation of deposits.

Below, the statements of the manufacturers are assessed in view of the emission reduction measures taken by them to protect the engine. The following aspects serve as criteria:

- Defect statistic relating to environmental conditions,
- Investigations of the manufacturer into the problems at hand,
- Proof of a learning curve with information on the underlying parameters.

b. Detailed Individual Findings and Assessment of the Findings

Below, individual findings are presented for each vehicle model. Each model is categorised into the groups described in greater detail in section C.II.3.a. Within these sections the vehicles are listed in alphabetical order according to the name of the manufacturer.

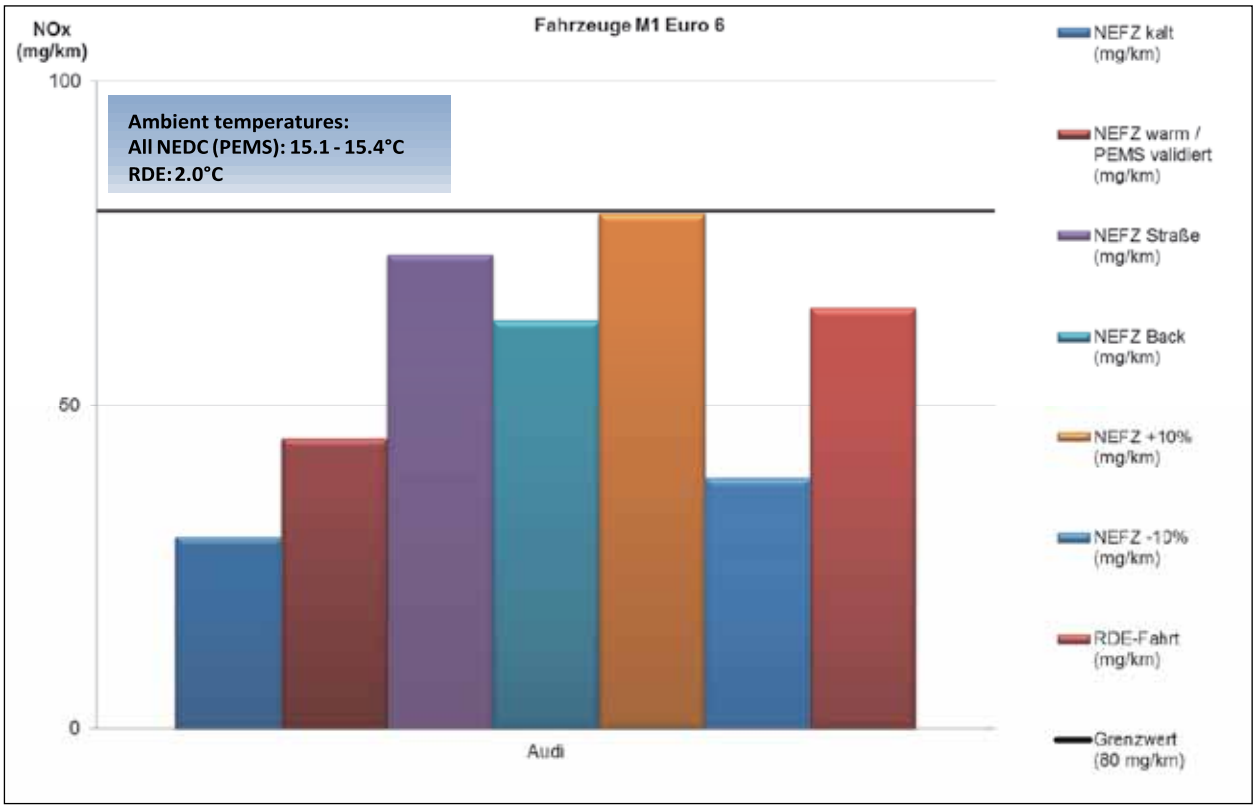
(1) Group I Vehicles

Audi A3 2.0 l Euro 6 EA 288

This vehicle is equipped with an EA 288 engine, the successor of the EA 189 engine, and fulfils Euro 6 requirements. The VW Group issued a statement saying that these vehicles were not equipped with an unlawful defeat device. It was the highest priority to verify this statement by the KBA field investigation as these vehicles correspond to the current production.

The NOx values of this vehicle are below the statutory NOx threshold values in all NEDC tests. This vehicle already complies with the requirements of the future RDE legislation.

		Chassis dynamometer		Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km))	NEDC hot/ PEMS validated (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Audi	A3 2.0l	29.50	44.80	73.22	63.15	79.44	38.66	65.03

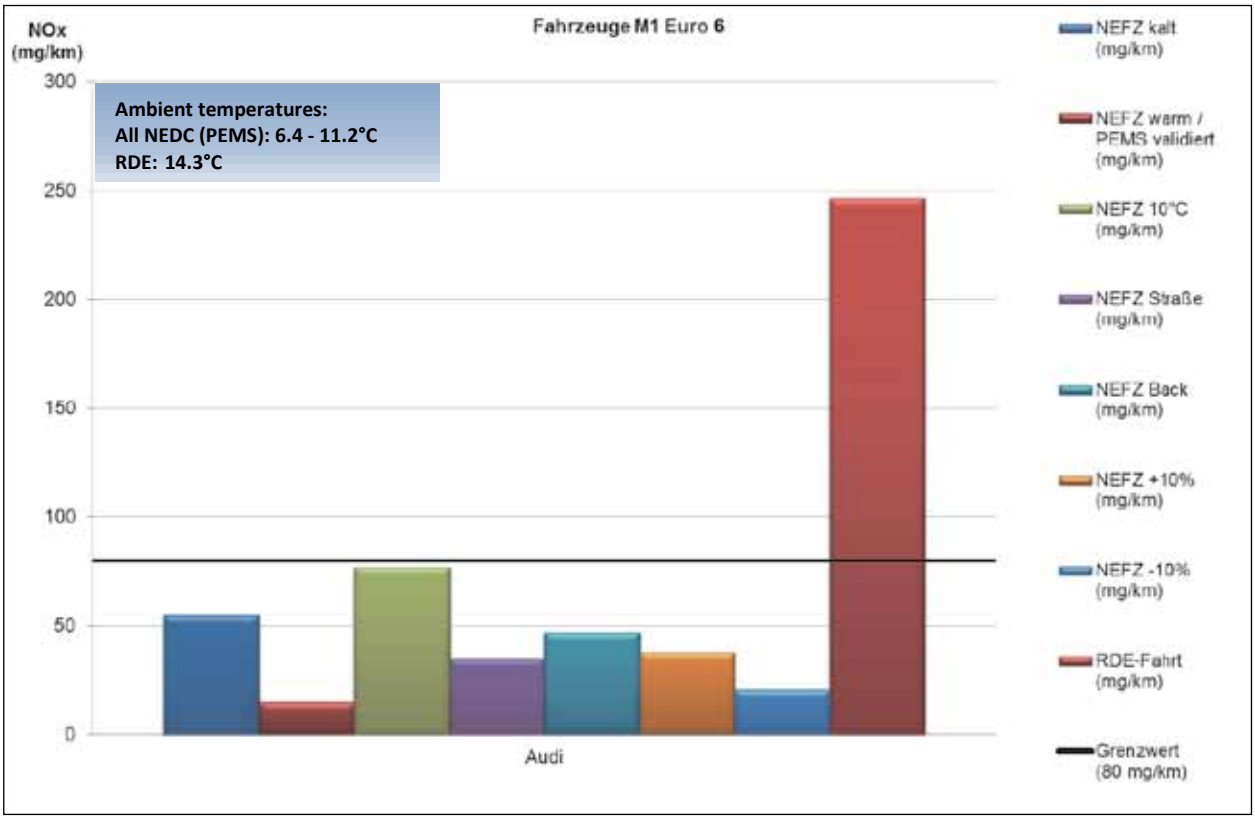


Manufacturer:		Audi
Trade name:		A3
Vehicle category:		M1
Capacity (cm^3):		1968
Emission standard:		Euro 6
Approval number:		e1*2007/46*0607*17
Type / model / version:		8V / SCUNAF1 / FM6FB001P8V067MMEM1
Engine performance (kW):		135
Mileage status (km):		3200
Condition (new / used):		used
First registration:		03 July 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	x
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1360
F0	**[N]**	126
F1	**[N/(km/h)]**	0.37
F2	**[N/(km/h)^2]**	0.0277

Audi A6 2.0 l Euro 6 EA 288

Basically the same findings apply as for all other VW Group Euro 6 vehicles with an EA 288 engine. The NOx values of this vehicle are below the statutory NOx threshold values in all NEDC tests. The RDE measurement yields a NOx value which is three times the threshold value.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEFZ 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Audi	A6 2.0l	55.00	15.00	77.00	34.82	46.89	37.94	20.69	246.59

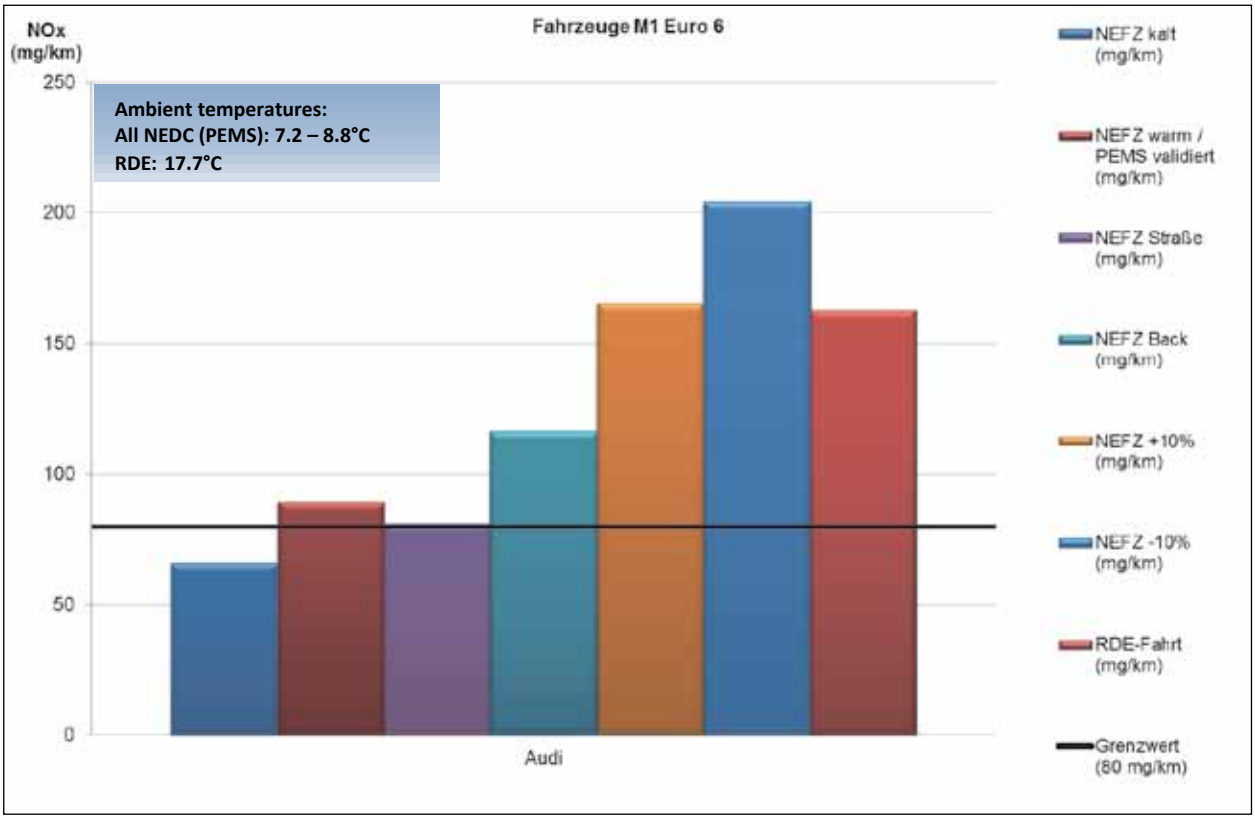


Manufacturer:		Audi
Trade name:		A6
Vehicle category:		M1
Capacity (cm^3):		1968
Emission standard:		Euro 6
Approval number:		e1*2007/46*0436*20
Type / model / version:		4G / ACNHAF1 / FD7CK001P4G03S57MMEM2
Engine performance (kW):		140
Mileage status (km):		16765
Condition (new / used):		used
First registration:		15 April 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	x (+NH3 anti slip catalyst, ASC)
Inertia class	**[kg]**	1930
F0	**[N]**	199
F1	**[N/(km/h)]**	-0.05
F2	**[N/(km/h)^2]**	0.0375

Audi A6 V6 3.0 l Euro 6

Given the discussion in the US on the lawfulness of a certain defeat device, talks were held with the VW Group. In conclusion, the shift strategy chosen by Audi (warm-up strategy) is aimed at ensuring the necessary degree of efficiency of the exhaust gas after treatment system in a shorter period of time. According to the manufacturer, this strategy is applied both on the dynamometer and on the road. The tested vehicle complies with the NOx threshold value of 80 mg/km. When tested on a dynamometer in a warm condition (hot NEDC), the vehicle slightly exceeds this value. When the same hot NEDC test is carried out on the road, the result of 81 mg/kg of NOx is acceptable given the higher loads outside of the dynamometer environment. The NOx values of the other on-road measurements are below the RDE threshold value envisioned for 2017, with the exception of the extreme low-load profile NEDC -10 %.

		Chassis dynamometer		Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Audi	A6 3.0l	65.85	89.50	81.21	116.38	165.32	204.05	162.81



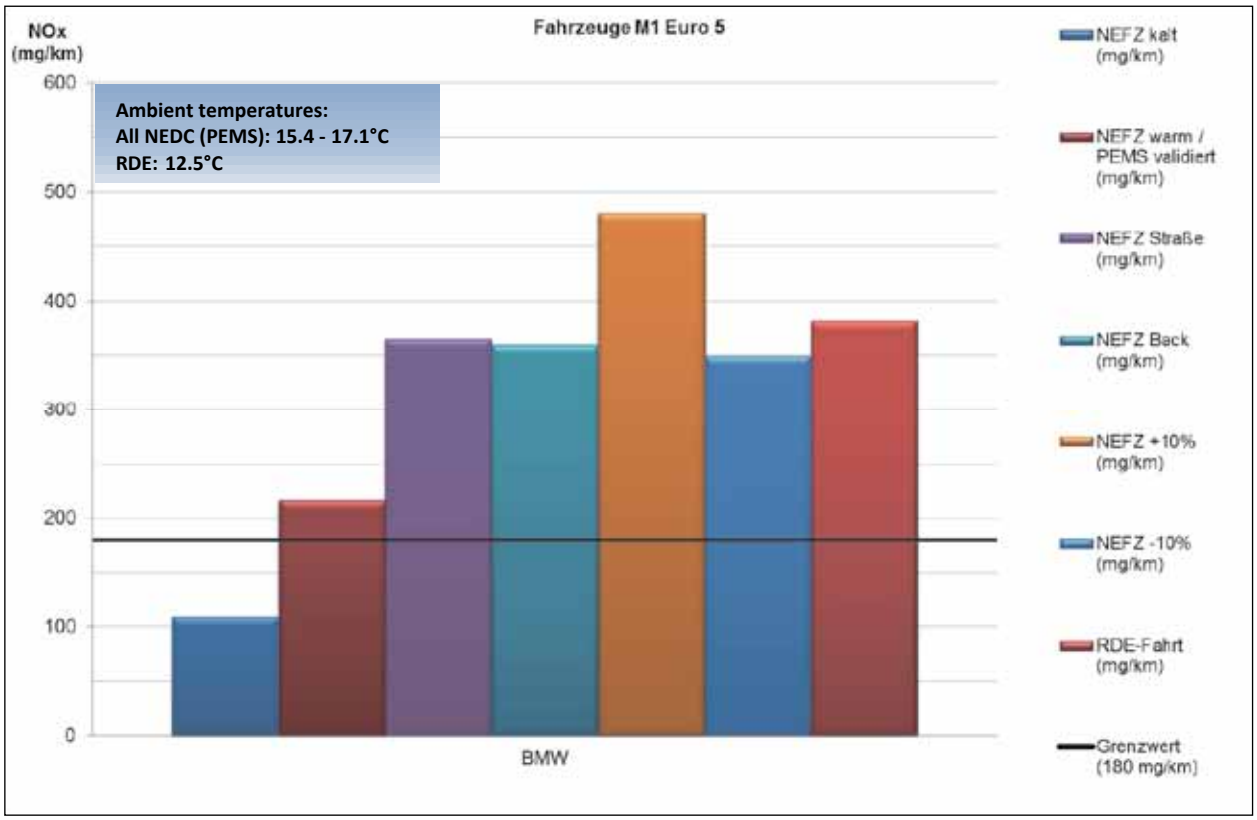
Manufacturer:		Audi
Trade name:		A6
Vehicle category:		M1
Capacity (cm^3):		2967
Emission standard:		Euro 6
Approval number:		e1*2007/46*0436*22
Type / model / version:		4G / ACLABF1 / FM6B1009R4G60S57MGEM2
Engine performance (kW):		160
Mileage status (km):		6400
Condition (new / used):		used
First registration:		12 August 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	x
Inertia class	**[kg]**	1810
F0	**[N]**	168
F1	**[N/(km/h)]**	-0.28
F2	**[N/(km/h)^2]**	0.0382

BMW 320 2.0 l Euro 5

The tested vehicle observes the threshold value of 180 mg/km when put through the cold NEDC. If tested on the dynamometer in a warm condition (hot NEDC), this value is slightly exceeded. The PEMS measurements yield values of approximately twice the threshold value. The factor 2.1 is only exceeded during the NEDC + 10 % measurement with a 10 % higher speed. Therefore, the measurement values show no anomalies.

Validation of the PEMS on the chassis dynamometer

		Chassis dynamometer		Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
BMW	320d 2.0l	109.00	216.00	365.05	359.55	480.56	349.86	381.82



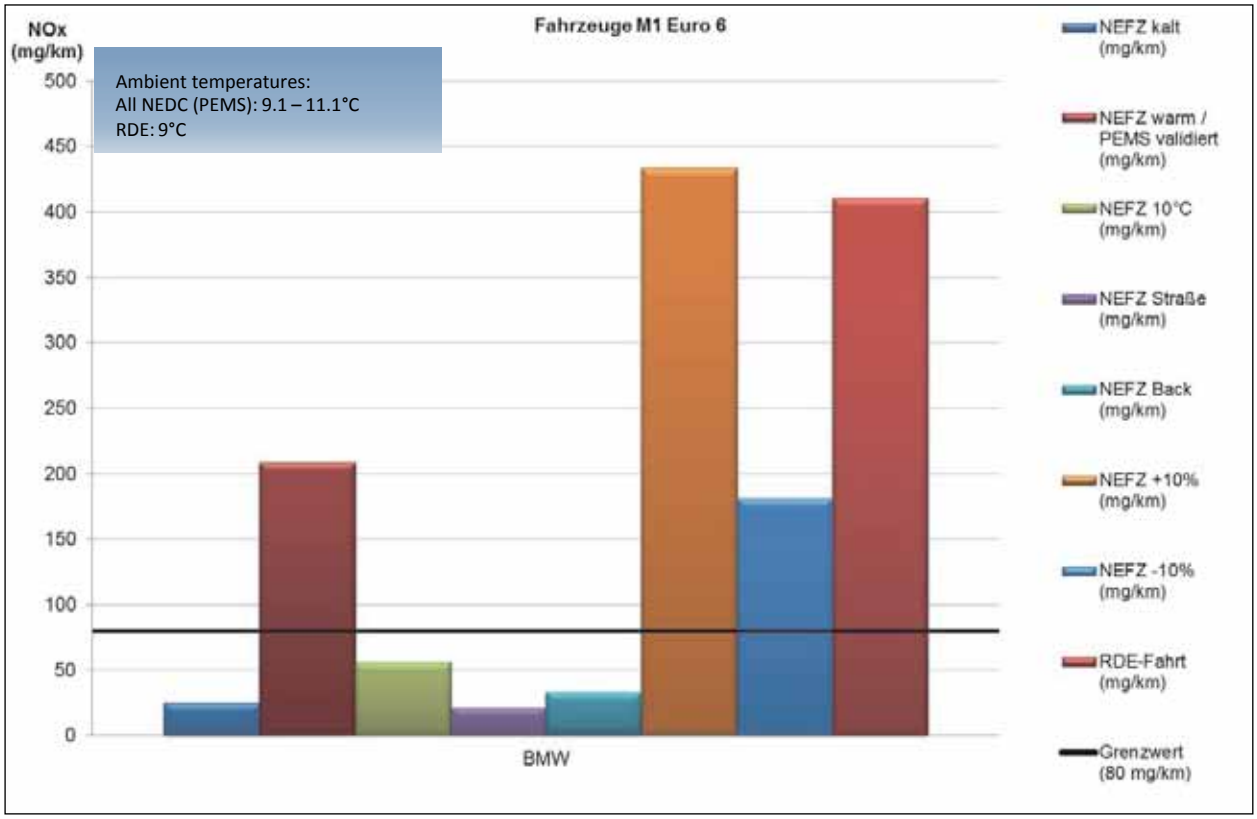
Manufacturer:		BMW
Trade name:		320d
Vehicle category:		M1
Capacity (cm^3):		1995
Emission standard:		Euro 5
Approval number:		e1*2007/46*0315*12
Type / model / version:		3K / 3K31 / 5A150000
Engine performance (kW):		135
Mileage status (km):		9179
Condition (new / used):		used
First registration:		24 November 2014
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1590
F0	**[N]**	176.74000
F1	**[N/(km/h)]**	-0.87640
F2	**[N/(km/h)²]**	0.03748

BMW 216 1.6 l Euro 6

The NOx value of this vehicle is clearly below the threshold value of 80 mg/km when put through a cold NEDC. The hot NEDC, however, shows a significant increase. The NEDC 10 °C and PEMS on-the-road tests for NEDC and NEDC back yield low results without anomalies. The elevated NOx value during the hot NEDC test indicates a faulty measurement according to the manufacturer. For clarification purposes, a measurement was conducted on a vehicle of the same construction.

This assumption was confirmed because the measurement of the hot NEDC yields a very low result. The analysis of the elevated values for the NEDC + 10 %, NEDC - 10 % and RDE measurements are indicative of a particulate filter regeneration after a modal value analysis. These values were lower during another measurement on a second vehicle. Control measurements made by a Technical Service on a third vehicle in turn confirmed low values in the hot NEDC on the chassis dynamometer and yielded NOx values below 240 mg/km for all on-the-road measurements, including RDE, on the Miramas test premises.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
BMW	216d GT 1.6l	25.00	209.00	56.00	21.29	33.43	433.80	181.07	411.00

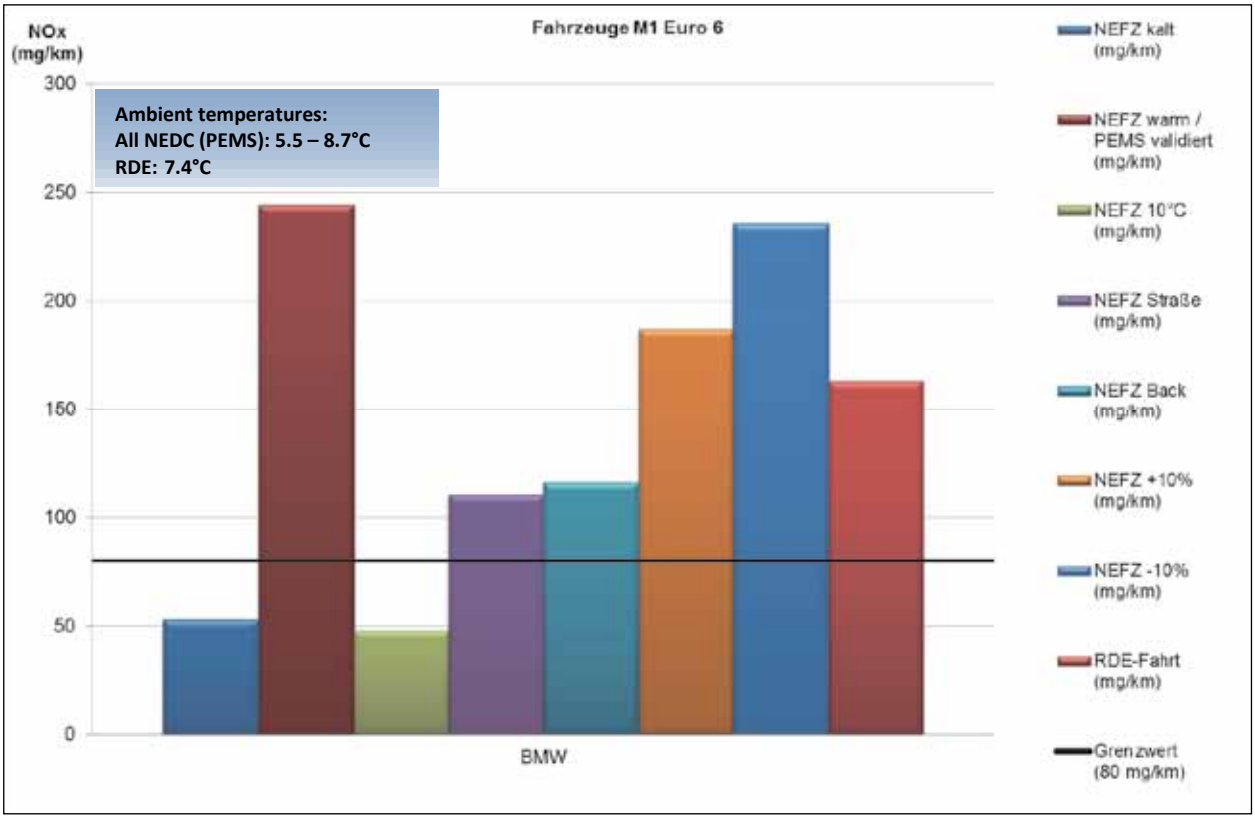


Manufacturer:		BMW
Trade name:		216d Gran Tourer
Vehicle category:		M1
Capacity (cm^3):		1496
Emission standard:		Euro 6
Approval number:		e1*2007/46*0371*22
Type / model / version:		UKL-L / 2E31 / 6A1700C0
Engine performance (kW):		85
Mileage status (km):		5216
Condition (new / used):		used
First registration:		01 October 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	x
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1470
F0	**[N]**	105.29
F1	**[N/(km/h)]**	0.187
F2	**[$N/(km/h)^2$]**	0.03001

BMW 530 3.0 l Euro 6

This vehicle complies with the threshold value in the cold NEDC test. During the hot NEDC significant increases occur, and the measured value is three times the threshold value. The PEMS on-the-road and NEDC 10 °C tests show no anomalies. Against this backdrop, the hot NEDC value is not plausible and is to be neglected during the assessment, the more so as the modal value analysis indicates a particulate filter regeneration.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
BMW	530d 3.0l	53.00	244.00	48.00	110.27	116.16	186.99	235.45	163.09



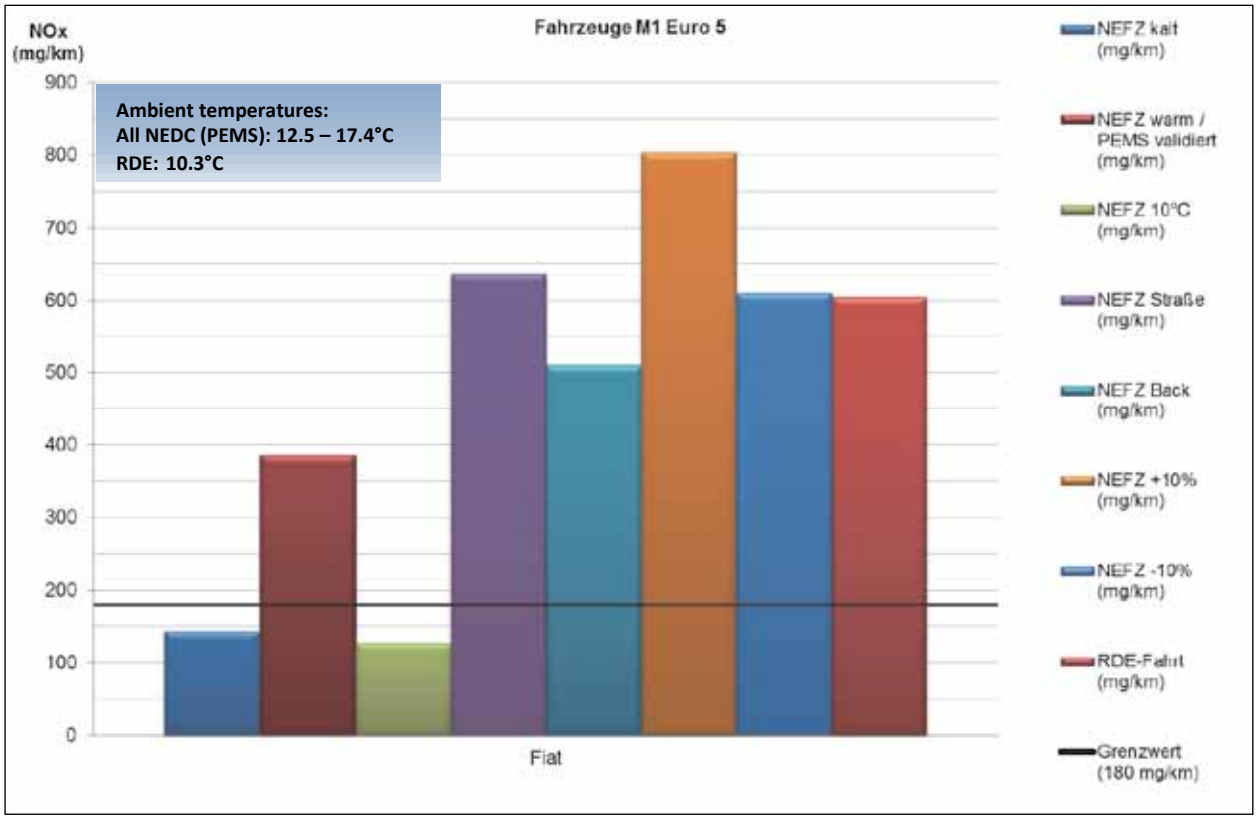
Manufacturer:		BMW
Trade name:		530d
Vehicle category:		M1
Capacity (cm^3):		2993
Emission standard:		Euro 6
Approval number:		e1*2007/46*0455*09
Type / model / version:		5K / 5K31 / 6A350000
Engine performance (kW):		190
Mileage status (km):		24974
Condition (new / used):		used
First registration:		26 February 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	x
	Particulate filter	x
	SCR cat	x
Inertia class	**[kg]**	2040
F0	**[N]**	244.96
F1	**[N/(km/h)]**	-0.5978
F2	**[N/(km/h)^2]**	0.04184

Fiat Panda 1.3 l Euro 5

The tested vehicle complies with the threshold value during the cold NEDC test. Fiat Panda shows elevated NOx values during the hot NEDC and all PEMS on-the-road measurements. According to information provided by the manufacturer, the EGR rate will be reduced based on the emission strategy. The development of this exhaust gas reduction strategy is the result of numerous defects in the field. Since then the EGR control strategy has been backed up via a separate urban heavy load cycle. The EGR rates are reduced to avoid the thermal overload of the particulate filter for certain driving conditions. This would explain the increase of the value during the hot NEDC.

With regard to the elevated values stemming from the PEMS measurements, it was taken into consideration that this lightweight vehicle concept with a low power engine is operated under significantly higher loads than required during the dynamometer test as it is equipped with the PEMS and other measurement devices, as well as the passenger required for the operation.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Fiat	Panda 1.3l	143.00	386.00	127.11	636.08	510.74	803.79	610.28	605.02

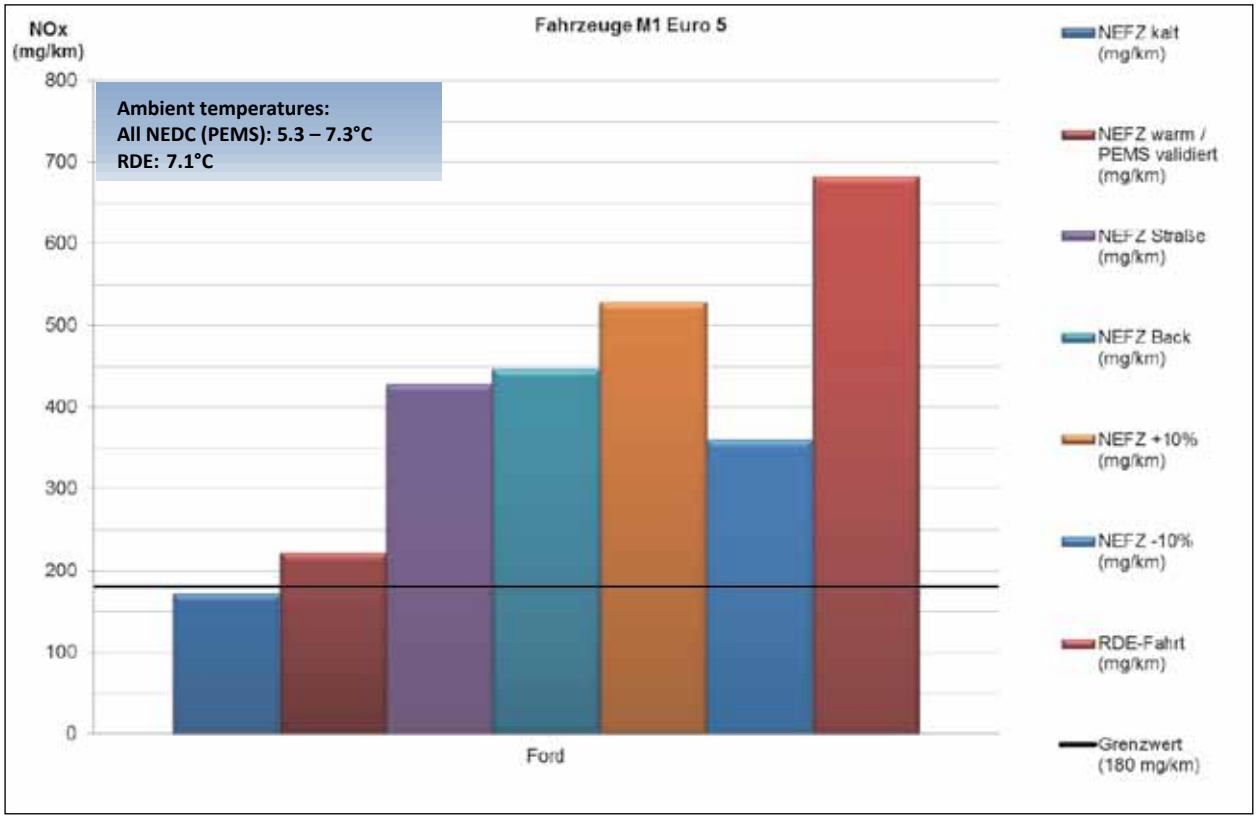


Manufacturer:		Fiat
Trade name:		Panda
Vehicle category:		M1
Capacity (cm^3):		1248
Emission standard:		Euro 5
Approval number:		e3*2007/46*0064*19
Type / model / version:		312 / PXL2A / P6B
Engine performance (kW):		55
Mileage status (km):		68
Condition (new / used):		new
First registration:		16 September 2014
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1130
F0	**[N]**	97.00000
F1	**[N/(km/h)]**	0.00000
F2	**[$N/(km/h)^2$]**	0.03480

Ford Focus 2.0 l Euro 5

Ford Focus complied with the threshold value during the cold NEDC test. During the hot NEDC, the NOx value is only slightly higher than the threshold value of 180 mg/km. In PEMS on-the-road measurements, elevations of the Type 1 threshold values occur and they amount to between 2.2 and 3 times the threshold value. Only during the RDE test, the value was slightly elevated and amounted to 3.5 times the Type 1 threshold value.

		Chassis dynamometer		Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Ford	Focus 2.0l	170.90	221.80	428.03	447.08	528.71	360.69	682.59

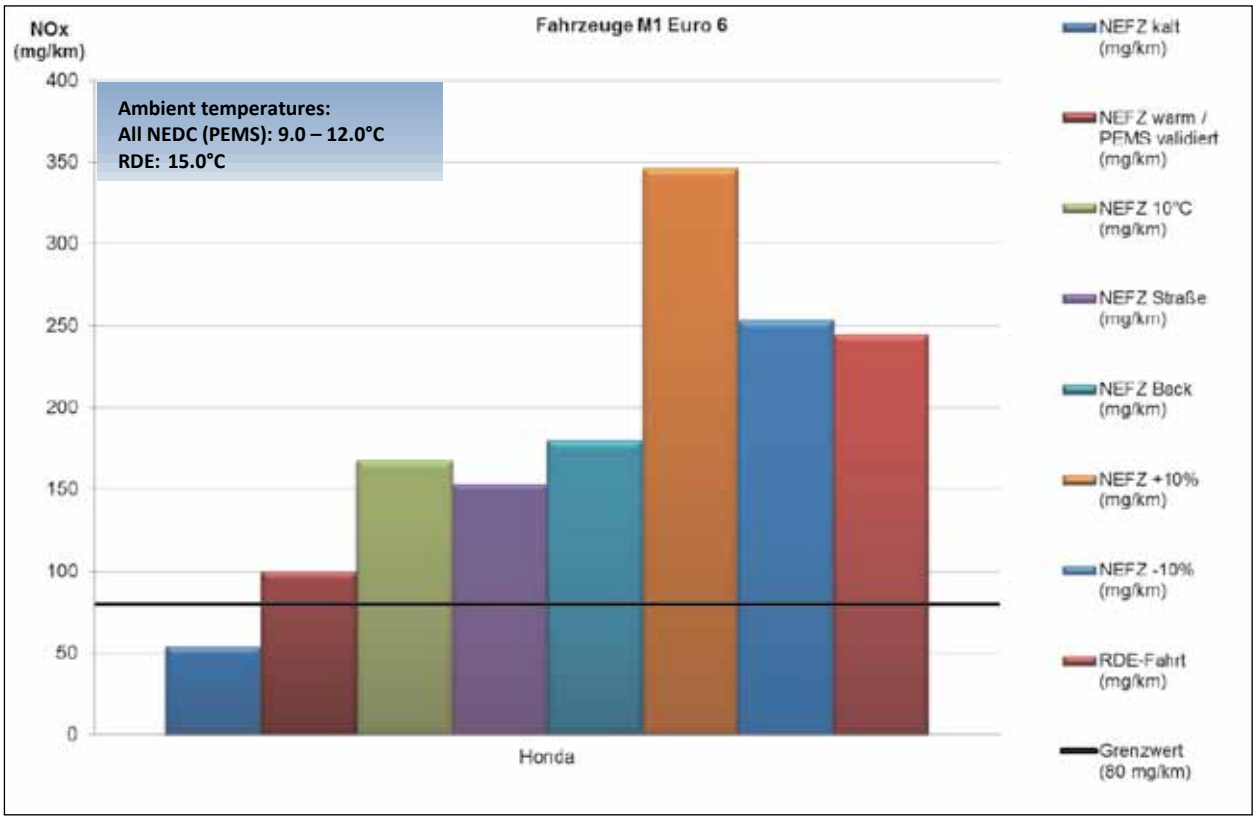


Manufacturer:		Ford
Trade name:		Focus
Vehicle category:		M1
Capacity (cm^3):		1997
Emission standard:		Euro 5
Approval number:		e13*2007/46*1138*05
Type / model / version:		DYB / UFDB1L / 5QNAND
Engine performance (kW):		103
Mileage status (km):		66800
Condition (new / used):		used
First registration:		08 June 2012
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1470
Coast down times	**[s]**	
120 km/h		7.34
100 km/h		9.86
80 km/h		13.84
60 km/h		20.54
40 km/h		32.46
20 km/h		53.80

Honda HR-V 1.6 l Euro 6

The tested vehicle easily complies with the NOx threshold value during the cold NEDC test. During the dynamometer test with a warm vehicle (hot NEDC), the NOx value increases to 1.5 times the NOx threshold value. Carrying out the same hot NEDC test at an ambient temperature of 10 °C yields a value that is 2.1 times the NOx value, i.e. there are no anomalies. During the PEMS on-the-road measurement the vehicle yields elevated values amounting to 2.3 to 3 times the NOx threshold value in NEDC test cycles. The latter also applies to the RDE test. Only the NEDC +10 % NOx value is 4.3 times the threshold value. Given the higher load conditions outside of the dynamometer environment and the known problem of vehicle concepts with LNT at a higher load, the vehicle is to be assessed as to be without anomalies.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Honda	HR-V 1.6l	54.00	100.00	168.00	153.33	180.00	346.67	253.33	244.67

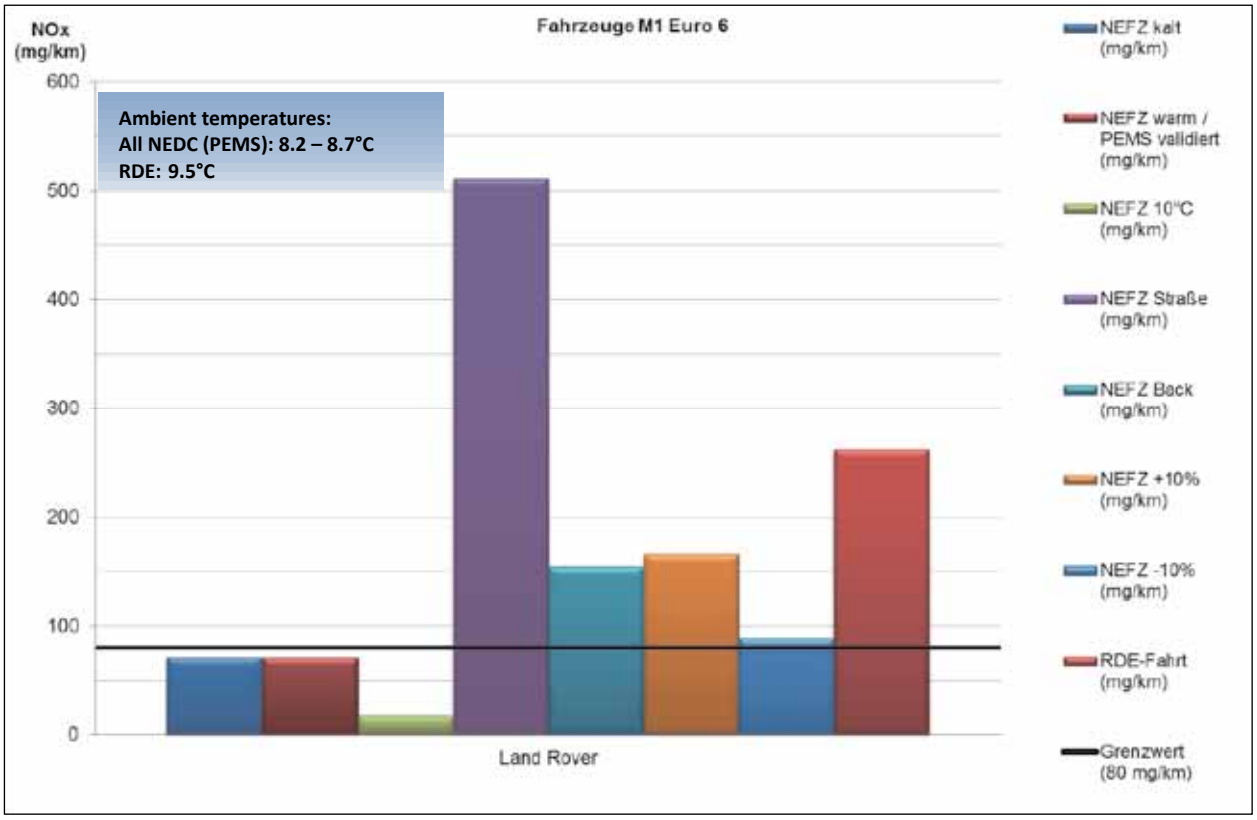


Manufacturer:		Honda
Trade name:		HR-V
Vehicle category:		M1
Capacity (cm^3):		1597
Emission standard:		Euro 6
Approval number:		e6*2007/46*0158*01
Type / model / version:		RU / RU801 / 2
Engine performance (kW):		88
Mileage status (km):		5500
Condition (new / used):		used
First registration:		20 January 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	x
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1360
F0	**[N]**	94.27
F1	**[N/(km/h)]**	0.72
F2	**[N/(km/h)^2]**	0.03433

Land Rover Range Rover Evoque 2.0 l Euro 6

The tested vehicle complies with the NOx threshold value during the hot and cold NEDC. In the NEDC 10 °C test, the vehicle's NOx value of 18.6 mg/km is extremely low. The NOx values obtained during the on-road measurements of NEDC back, NEDC +10 % and NEDC -10 % are all free from anomalies and amount to less than 2.1 times the NOx threshold value. Only the NEDC on-the-road measurement yields a high value amounting to 6.4 times the threshold value, which could be explained by the modal value analysis with a regeneration of the particulate filters launched. The RDE test yielded a value 3.2 times the threshold value and was thus free from anomalies.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Land Rover	Evoque 2.0l	71.09	71.53	18.65	511.20	154.62	165.47	88.93	262.32

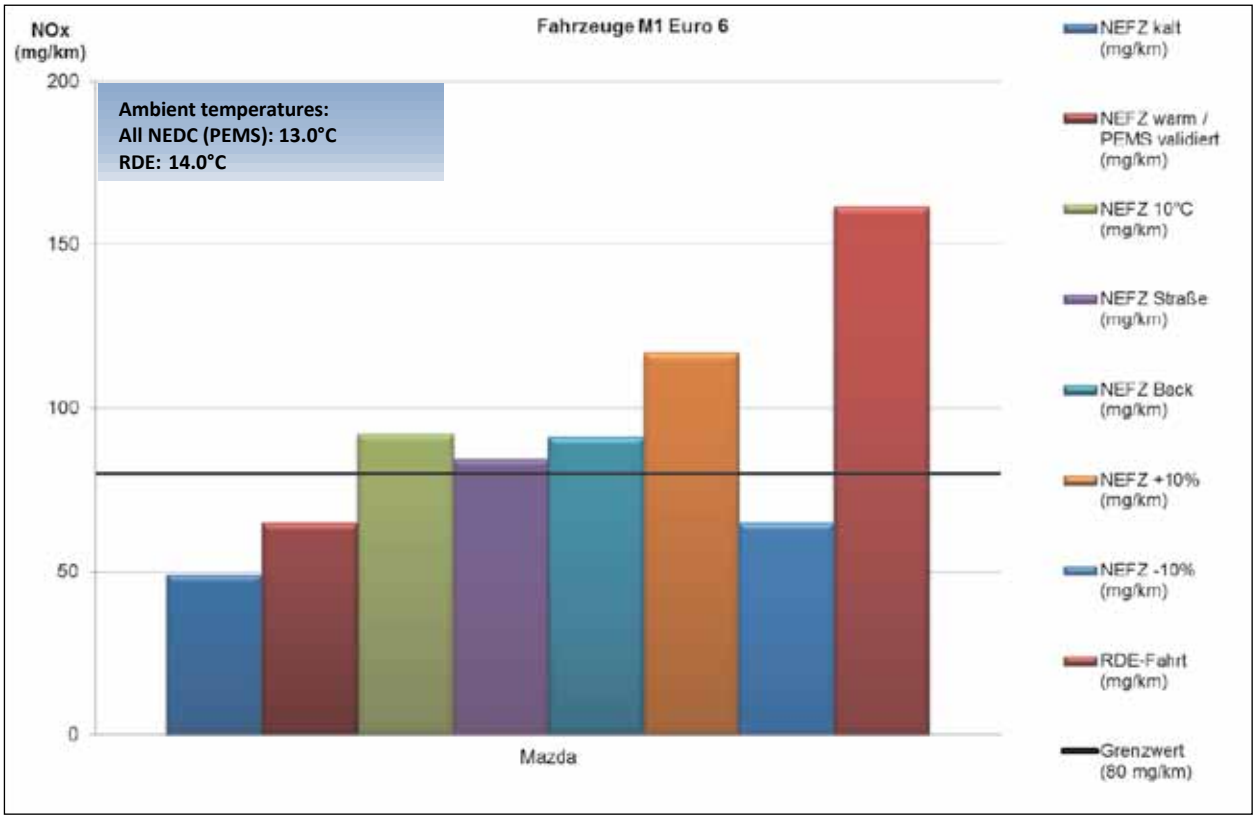


Manufacturer:		Land Rover
Trade name:		Evoque
Vehicle category:		M1
Capacity (cm^3):		1999
Emission standard:		Euro 6
Approval number:		e11*2007/46*0223*15
Type / model / version:		LV / J3DA2F / F5T2
Engine performance (kW):		132
Mileage status (km):		555
Condition (new / used):		used
First registration:		--
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	x
Inertia class	**[kg]**	1700
F0	**[N]**	118.30
F1	**[N/(km/h)]**	1.428
F2	**[$N/(km/h)^2$]**	0.029

Mazda 6 2.2 l Euro 6

The tested vehicle complies with the NOx threshold value during the cold NEDC test. When a warm vehicle is tested on a dynamometer (hot NEDC), the NOx value elevates slightly but is still clearly below the threshold value. Carrying out the same hot NEDC at an ambient temperature of 10 °C yields an increase to 92 mg/km NOx, which is still close to the threshold value limit. On the road the same test cycle yields an acceptable value with 84 mg/km of NOx given the increased load conditions outside of the dynamometer environment. The NOx values of the other on-road measurements, including the RDE test, are also free from anomalies.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Mazda	Mazda 6 2.2l	49.00	65.00	92.00	84.50	91.00	117.00	65.00	161.85



Manufacturer:		Mazda
Trade name:		Mazda 6
Vehicle category:		M1
Capacity (cm^3):		2191
Emission standard:		Euro 6
Approval number:		e1*2001/116*0448*17
Type / model / version:		GH / 692 / 62W0
Engine performance (kW):		129
Mileage status (km):		68964
Condition (new / used):		used
First registration:		30 April 2014
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1470
F0	**[N]**	79.2
F1	**[N/(km/h)]**	0.73
F2	**[N/(km/h)^2]**	0.0314

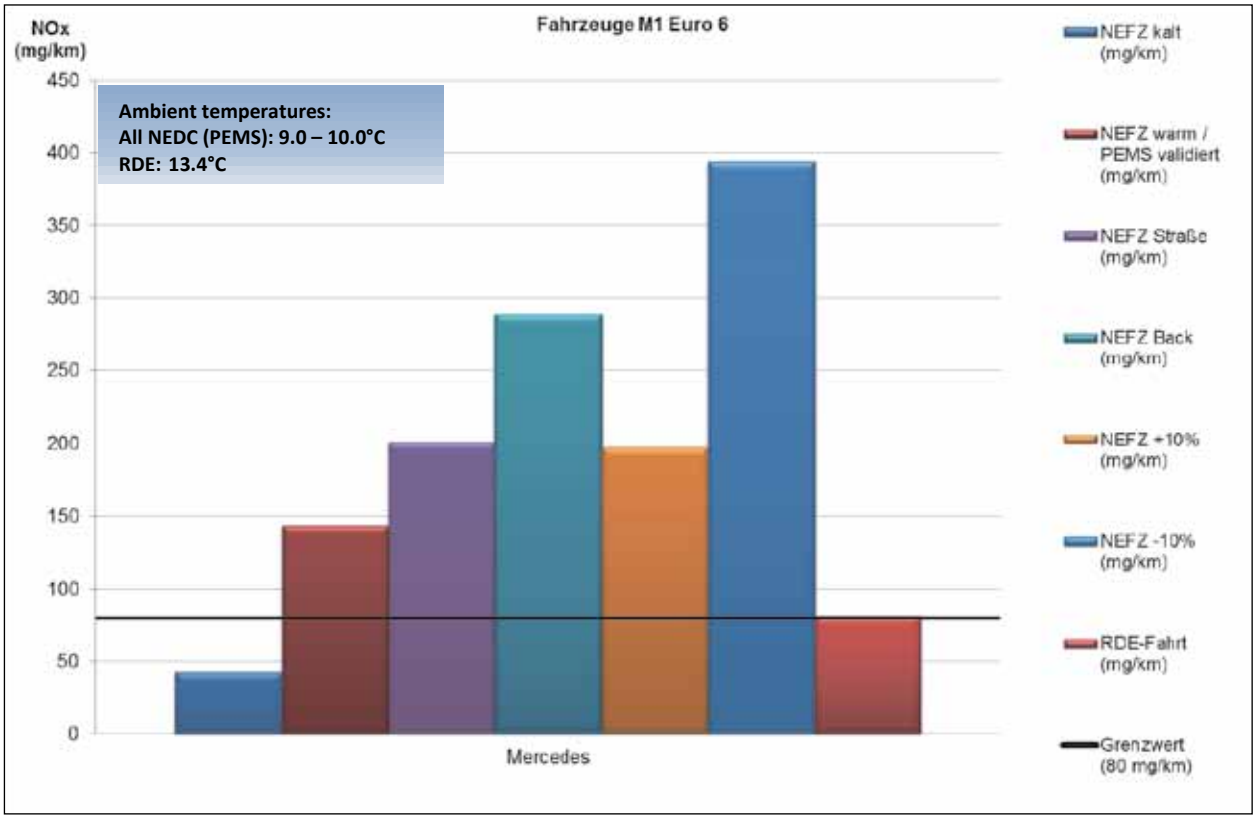
Mercedes C 220 Bluetec 2.1 l Euro 6
The C- and S-Class vehicles have comparable emission reduction strategies.

In the cold NEDC test, the C 220 complies with the threshold value. In the hot NEDC, the vehicle produces elevated values, amounting to 1.8 times the threshold value. According to the manufacturer this elevation is not comprehensible. Measurements conducted by the manufacturer show significantly lower values of less than 80 mg/km.

For higher load requirements, the C-Class produces a better NOx reduction compared to the NEDC - 10 % test which involves smaller loads. The C-Class has an SCR catalyst in an area of the exhaust system which is fairly cool and which is relatively far away from the engine (underfloor concept). If the SCR catalyst cools down, the values may increase.

As an explanation for the measurement results and the chosen emission reduction strategy, the manufacturer refers to component protection.

		Chassis dynamometer		Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Mercedes	C 220 2.1l	43.00	144.00	200.88	288.81	197.63	394.05	81.24



Manufacturer:		Mercedes
Trade name:		C 220 BLUETEC
Vehicle category:		M1
Capacity (cm^3):		2143
Emission standard:		Euro 6
Approval number:		e1*2001/116*0457*25
Type / model / version:		204 K / R20RP0 / NZAAB521
Engine performance (kW):		125
Mileage status (km):		22,861
Condition (new / used):		used
First registration:		20 October 2014
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	x
Inertia class	**[kg]**	1700
F0	**[N]**	82.00000
F1	**[N/(km/h)]**	1.71000
F2	**[N/(km/h)²]**	0.01890

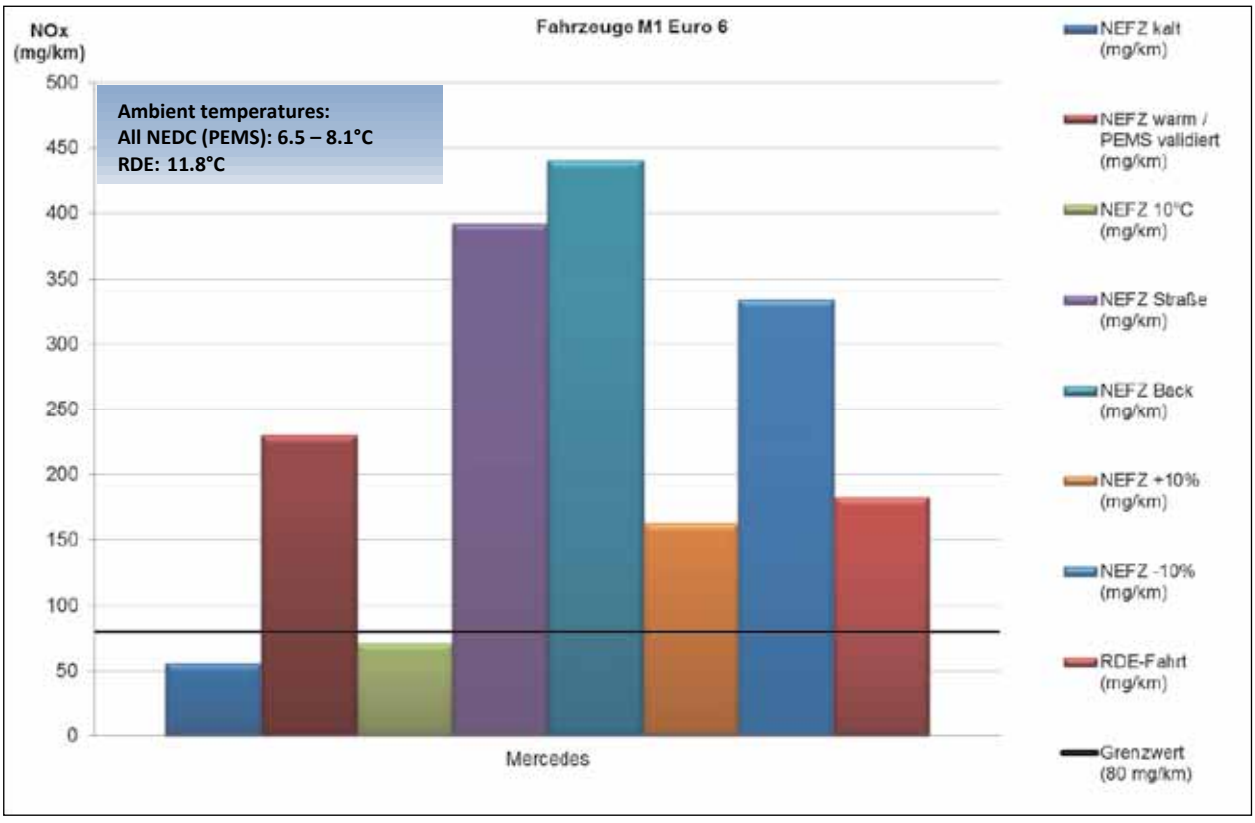
Mercedes S 350 Bluetec 3.0 l Euro 6

The vehicle complies with the threshold value during the cold NEDC test. The S 350 yields elevated values amounting to 2.8 times the threshold value during the hot NEDC test. According to the manufacturer this elevation is not comprehensible. With 80 mg/km, measurements conducted by the manufacturer yield much lower values.

For higher load requirements the S-Class has a better NOx reduction performance compared to the NEDC -10 % test which involves smaller loads. The S-class has an SCR catalyst in an area of the exhaust system which is fairly cool and which is relatively far away from the engine (underfloor concept). If the SCR catalyst cools down, the values may increase.

As an explanation for the measurement results and the chosen emission reduction strategy, the manufacturer refers to component protection.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Mercedes	S 350 3.0l	55.58	230.48	71.04	391.61	440.50	162.74	333.81	182.61



Manufacturer:		Mercedes
Trade name:		S 350 BLUETEC
Vehicle category:		M1
Capacity (cm^3):		2987
Emission standard:		Euro 6
Approval number:		e1*2001/116*0335*27
Type / model / version:		221 / P0BDP0 / NZAAB500
Engine performance (kW):		190
Mileage status (km):		3,238
Condition (new / used):		used
First registration:		01 October 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	x
Inertia class	**[kg]**	1930
F0	**[N]**	86.00000
F1	**[N/(km/h)]**	2.10000
F2	**[N/(km/h)²]**	0.01620

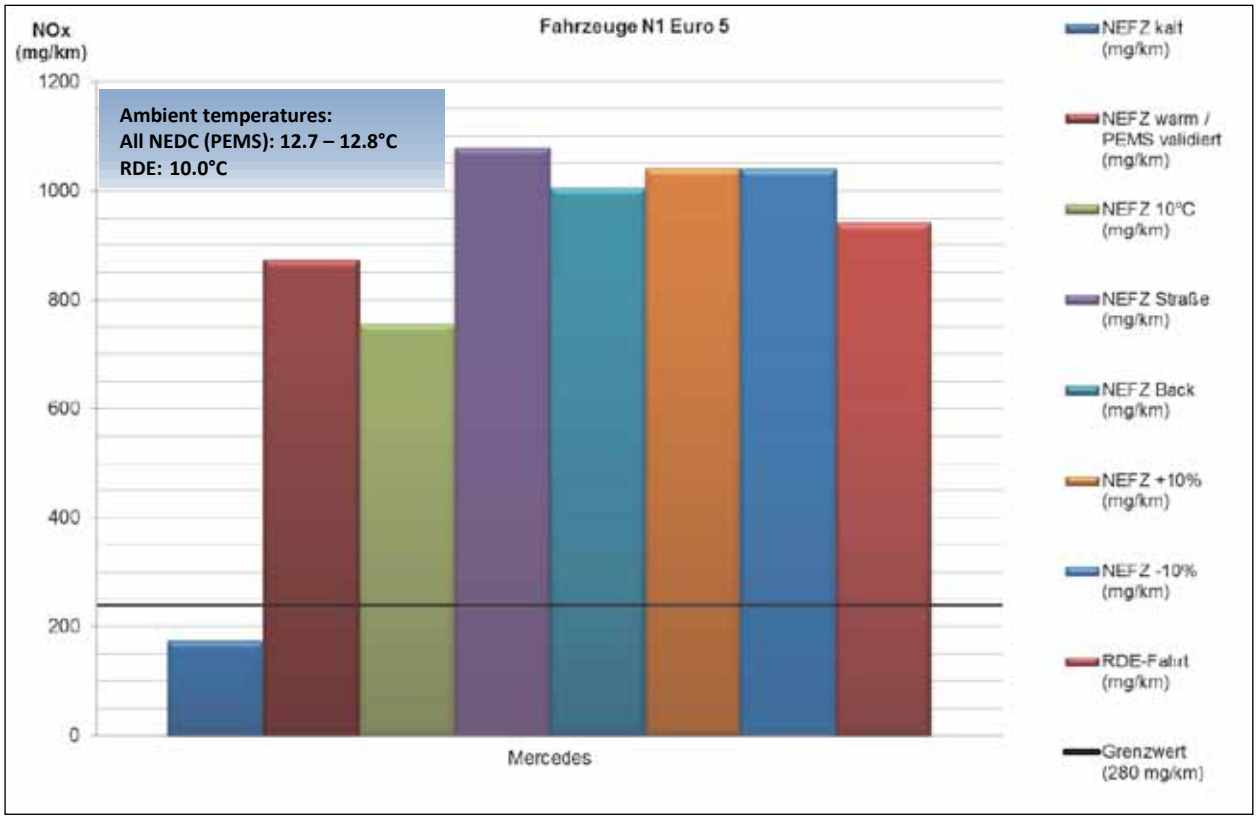
Mercedes Sprinter 2.1 l Euro 5

The Mercedes Sprinter easily complies with the threshold value during the cold NEDC. The result of the measurement of the hot NEDC is 3 times the NOx threshold value. In the cold NEDC, a higher EGR rate is used for warming up purposes than during the hot NEDC. If engine temperatures are higher, then the EGR rate is reduced compared to the warming up phase in order to reduce soot entry into the engine oil (engine protection). Compared to structurally identical engines installed in passenger cars, the full load curve of the vehicle is reduced so that the EGR is active until the full load curve is reached. The result of the measurement in the NEDC 10 °C test is 2.7 times the NOx threshold value. PEMS measurements in the NEDC test cycles on the road yield values about 3.7 times the NOx threshold value; the RDE test yields 3.3 times the NOx threshold value.

In view of the chosen emission reduction strategy, the manufacturer refers to component protection (among other things a possible ingress of water via EGR into the intake area and sooting of the EGR cooler) and defects at a lower outside temperature.

This emission reduction strategy, which is dependent on the outside temperature, reduces the effectiveness of the emission control system under conditions that are to be expected in normal vehicle operation and use. Concerning the lawfulness of the broad interpretation of the temperature range used to protect the engine, the manufacturer says, and substantiates, that it is necessary in order to protect the engine from damage.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Mercedes	Sprinter 2.1l	174.81	872.44	753.80	1076.73	1006.34	1040.59	1039.92	941.21

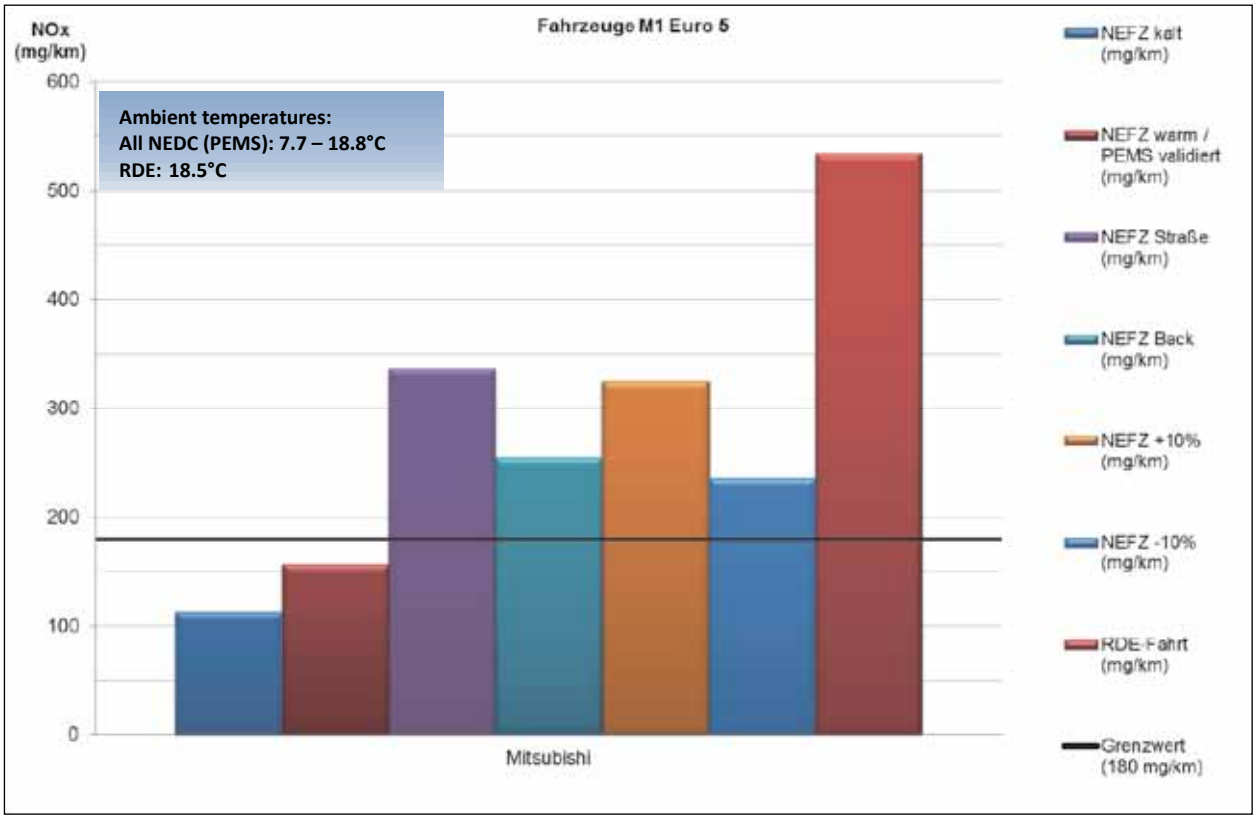


Manufacturer:		Mercedes
Trade name:		Sprinter
Vehicle category:		N1
Capacity (cm^3):		2143
Emission standard:		Euro 5
Approval number:		e1*2007/46*0301*11
Type / model / version:		906BB35 / LMMD1350E / LEB25WA6
Engine performance (kW):		120
Mileage status (km):		6946
Condition (new / used):		used
First registration:		14 April 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	2270
F0	**[N]**	12.87000
F1	**[N/(km/h)]**	0.00000
F2	**[N/(km/h)²]**	0.08800

Mitsubishi ASX 2.3 l Euro 5

Mitsubishi ASX complies with the threshold value both in the cold and hot NEDC. The values in the NEDC test cycles in the PEMS on-road measurements were generally below 2.1 times the threshold value. The only elevated value, about 3 times the Type 1 threshold value, occurs in the RDE test.

		Chassis dynamometer		Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Mitsubishi	ASX 2.3l	113.00	157.00	337.14	254.89	325.39	235.00	534.18

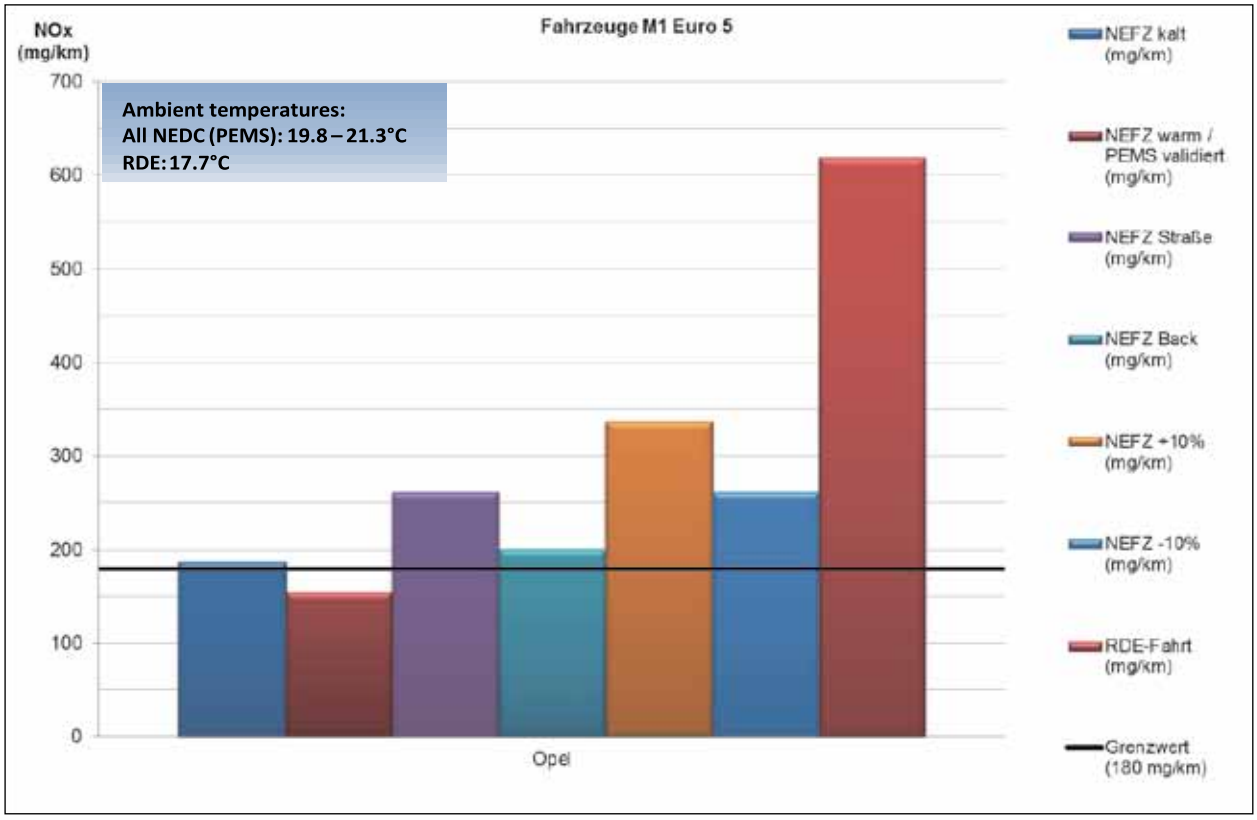


Manufacturer:		Mitsubishi
Trade name:		ASX
Vehicle category:		M1
Capacity (cm^3):		2268
Emission standard:		Euro 5
Approval number:		e1*2007/46*0368*09
Type / model / version:		GA0 / GA921 / AHAAB6A5AAAC
Engine performance (kW):		110
Mileage status (km):		4997
Condition (new / used):		used
First registration:		01 June 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1700
F0	**[N]**	129.8
F1	**[N/(km/h)]**	1.1018
F2	**[N/(km/h)²]**	0.0333

Opel Astra 2.0 l Euro 5

In the cold NEDC, Opel Astra slightly exceeds the threshold value, although by less than 10 %. Since no technical defects were discovered and the exceedance was not considered relevant, the vehicle could remain in the test. In the hot NEDC, the vehicle complied with the threshold value. The NEDC values in the PEMS on-the-road measurements were all below 2.1 times the threshold value. The only moderate increase of about 3.5 times the Type 1 threshold value was observed during the RDE test.

		Chassis dynamometer		Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Opel	Astra 2.0l	187.00	154.00	261.13	200.87	336.70	261.13	618.87

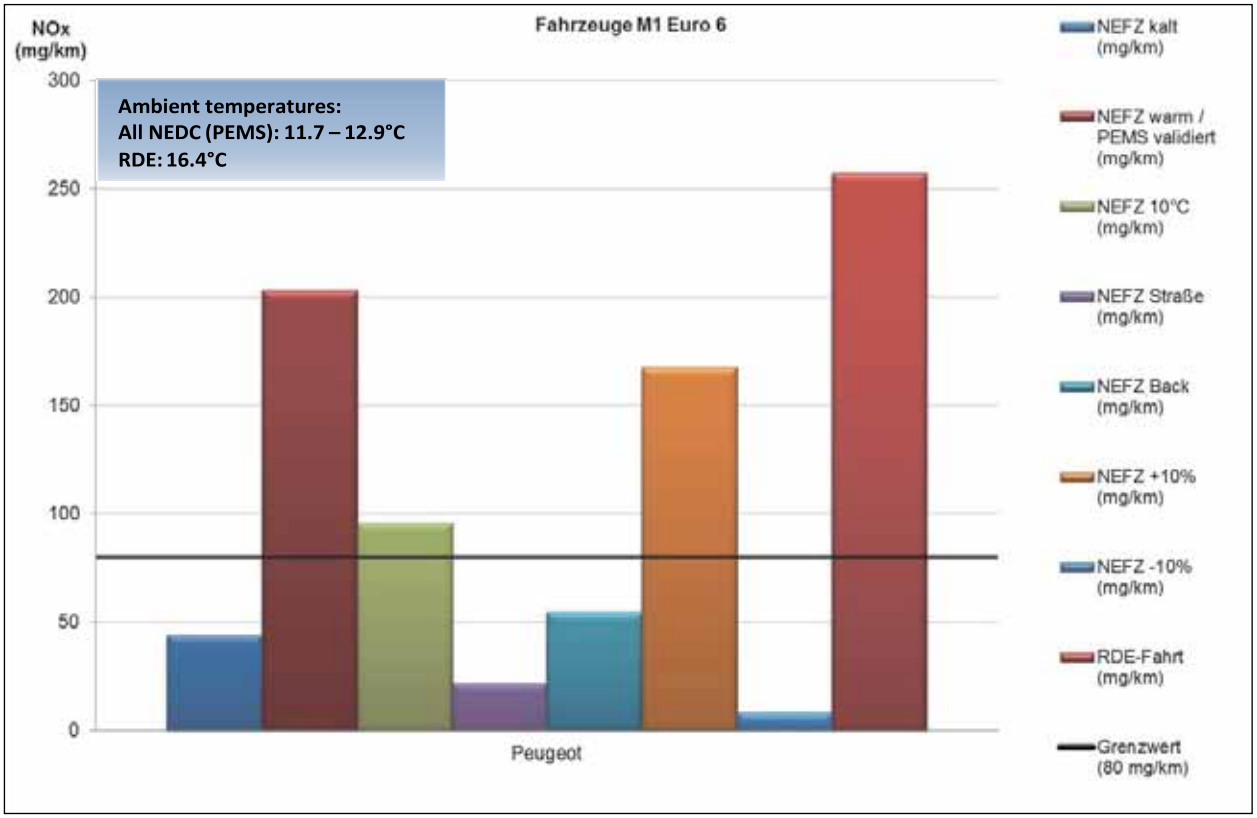


Manufacturer:		Opel
Trade name:		Astra
Vehicle category:		M1
Capacity (cm^3):		1956
Emission standard:		Euro 5
Approval number:		e4*2007/46*0204*17
Type / model / version:		P-J / DAHCA12 / BA1L2FPFA5
Engine performance (kW):		121
Mileage status (km):		17614
Condition (new / used):		used
First registration:		04 September 2014
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1590
F0	**[N]**	106.59
F1	**[N/(km/h)]**	0.3972
F2	**[$N/(km/h)^2$]**	0.0316

Peugeot 308 SW 1.6 l Euro 6

Two vehicles were tested, since the value of one vehicle slightly exceeded the threshold value during the cold NEDC. The second Peugeot 308 passes the cold NEDC test. During the hot NEDC the vehicle yielded an excessive value of 2.5 times the threshold value. Within the PEMS on-the-road measurements in the NEDC test cycles, the value is below 2 times the threshold value; the RDE measurement yields a value 3 times the threshold value. In the new generations, the after treatment of exhaust gas components are to be optimised according to Peugeot in order to reach the future RDE level early on. The manufacturer was able to explain the emission reduction strategy mechanism and give plausible physical reasons for the restrictions of the emission reduction.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Peugeot	308 SW 1.6 l	44.00	203.00	96.00	21.86	54.73	167.40	8.51	257.11



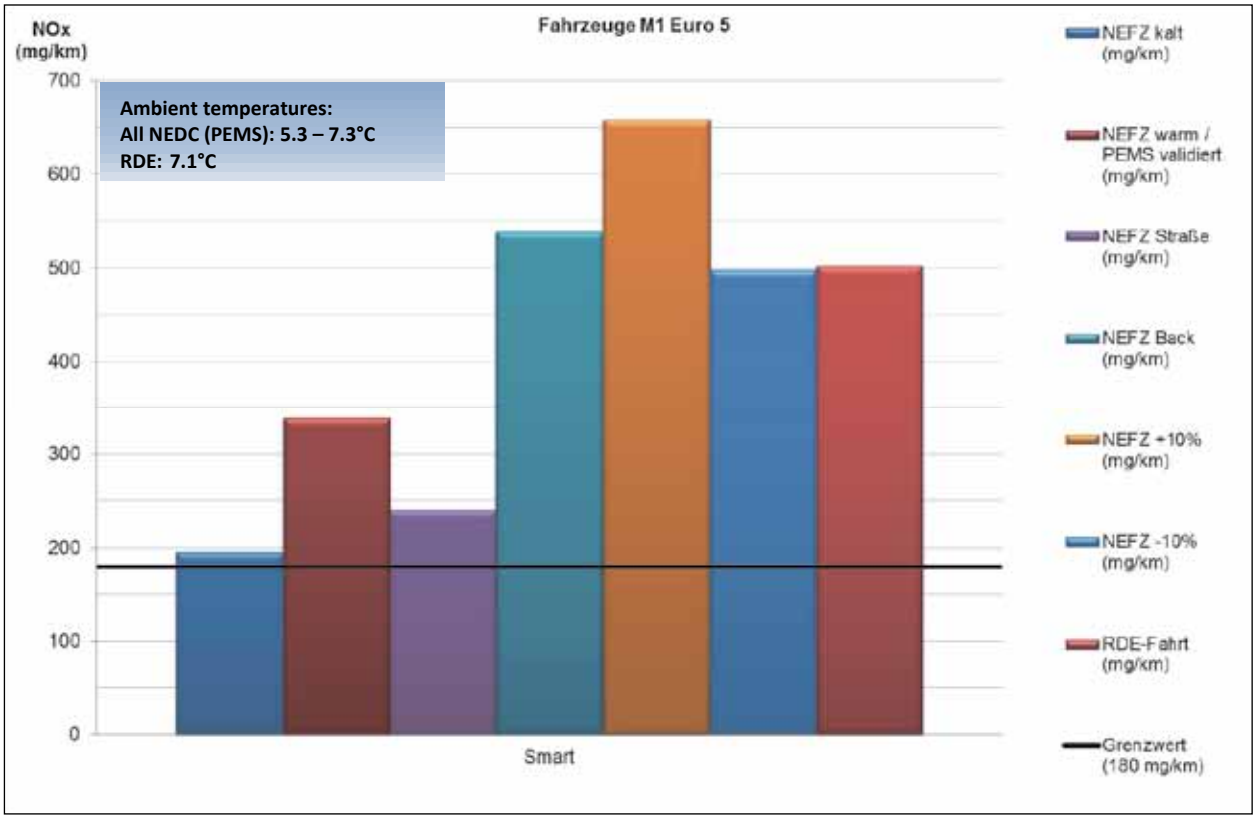
Manufacturer:		Peugeot
Trade name:		308 SW
Vehicle category:		M1
Capacity (cm^3):		1560
Emission standard:		Euro 6
Approval number:		e2*2007/46*0405*04
Type / model / version:		L / C / BHZH-R26000
Engine performance (kW):		88
Mileage status (km):		6,399
Condition (new / used):		used
First registration:		21 July 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	x
Inertia class	**[kg]**	1250
F0	**[N]**	56.79000
F1	**[N/(km/h)]**	0.50120
F2	**[N/(km/h)²]**	0.02956

Smart fortwo 0.8 l Euro 5

In the cold NEDC this vehicle slightly exceeds the threshold value by less than 10 %. Since no technical defects were discovered and the exceedance was not considered relevant, the vehicle could remain in the test.

The values measured were elevated in the hot NEDC and PEMS on-the-road measurements in the NEDC test cycles, particularly as far as the NEDC + 10 % measurement was concerned. According to the manufacturer, the membrane of the pneumatic EGR valve is the limiting component at high temperatures. Thus the hot NEDC measurement yields a higher value. The elevated values on the road can be explained partly by the high weight because of the measurement device and load (close to the permitted total weight) with regard to the mass of the vehicle and by the temperature-dependent correction of the EGR rate to protect the engine. If the ambient temperature is lower, the EGR rate needs to be reduced for this small engine with high losses through cylinder walls in order to ensure a safe combustion behaviour. Since the maximum speed of the Smart is almost reached during the NEDC + 10 % measurements, the vehicle is almost at full load. Given the high engine and component temperatures, the EGR rate needs to be reduced to protect the components.

		Chassis dynamometer		Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Smart	Fortwo 0.8l	195.09	338.78	239.92	538.66	659.21	498.05	502.28

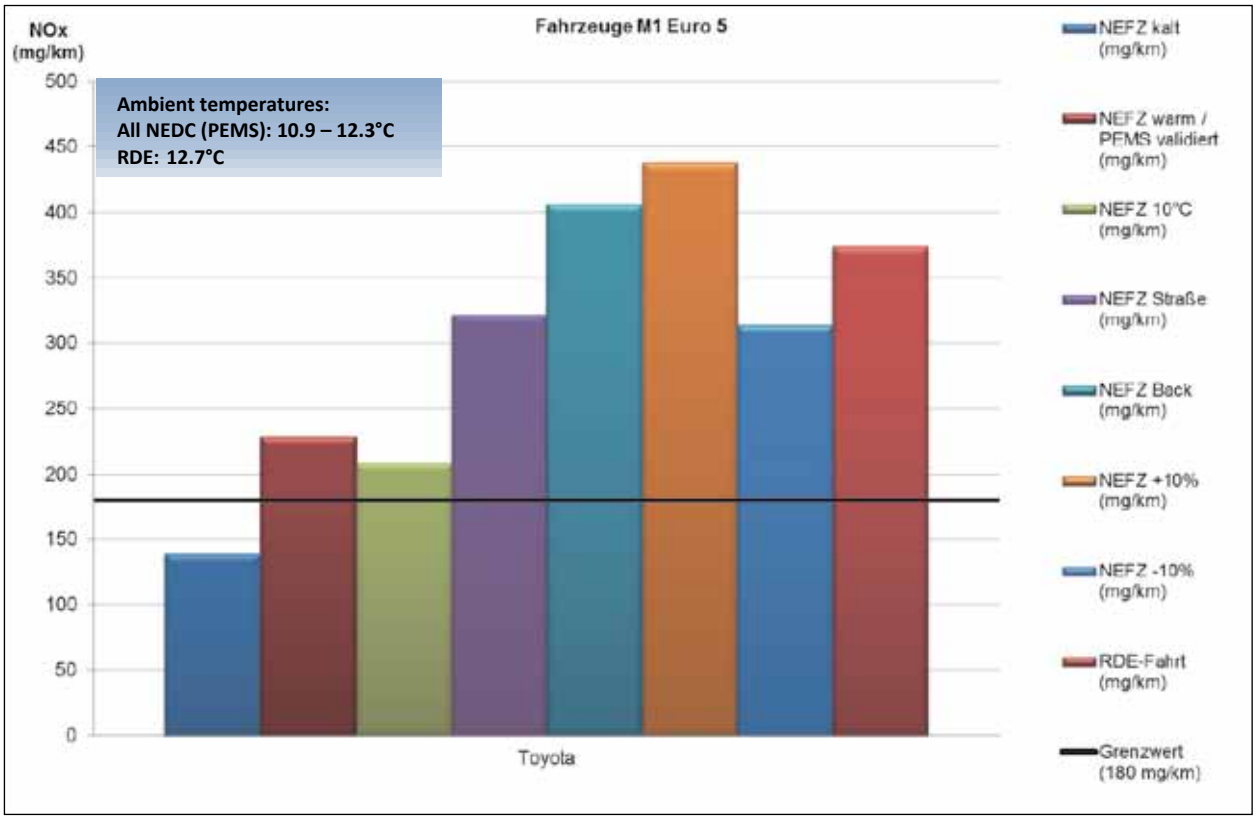


Manufacturer:		Smart
Trade name:		Fortwo Coupe CDI
Vehicle category:		M1
Capacity (cm^3):		799
Emission standard:		Euro 5
Approval number:		e1*2001/116*0413*20
Type / model / version:		451 / 4303F0 / SZAAA200
Engine performance (kW):		40
Mileage status (km):		23247
Condition (new / used):		used
First registration:		01 October 2013
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	910
F0	**[N]**	77.710
F1	**[N/(km/h)]**	0.863
F2	**[N/(km/h)^2]**	0.034

Toyota Auris 2.0 l Euro 5

The Auris complies with the threshold value in the cold NEDC. In the hot NEDC the value only slightly exceeds the threshold value of 180 mg/km. In the NEDC test cycles on the road conducted with PEMS and during the RDE test the elevations amount to 2 times the threshold value.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Toyota	Auris 2.0l	139.70	228.35	208.77	321.72	406.50	438.25	313.39	373.80

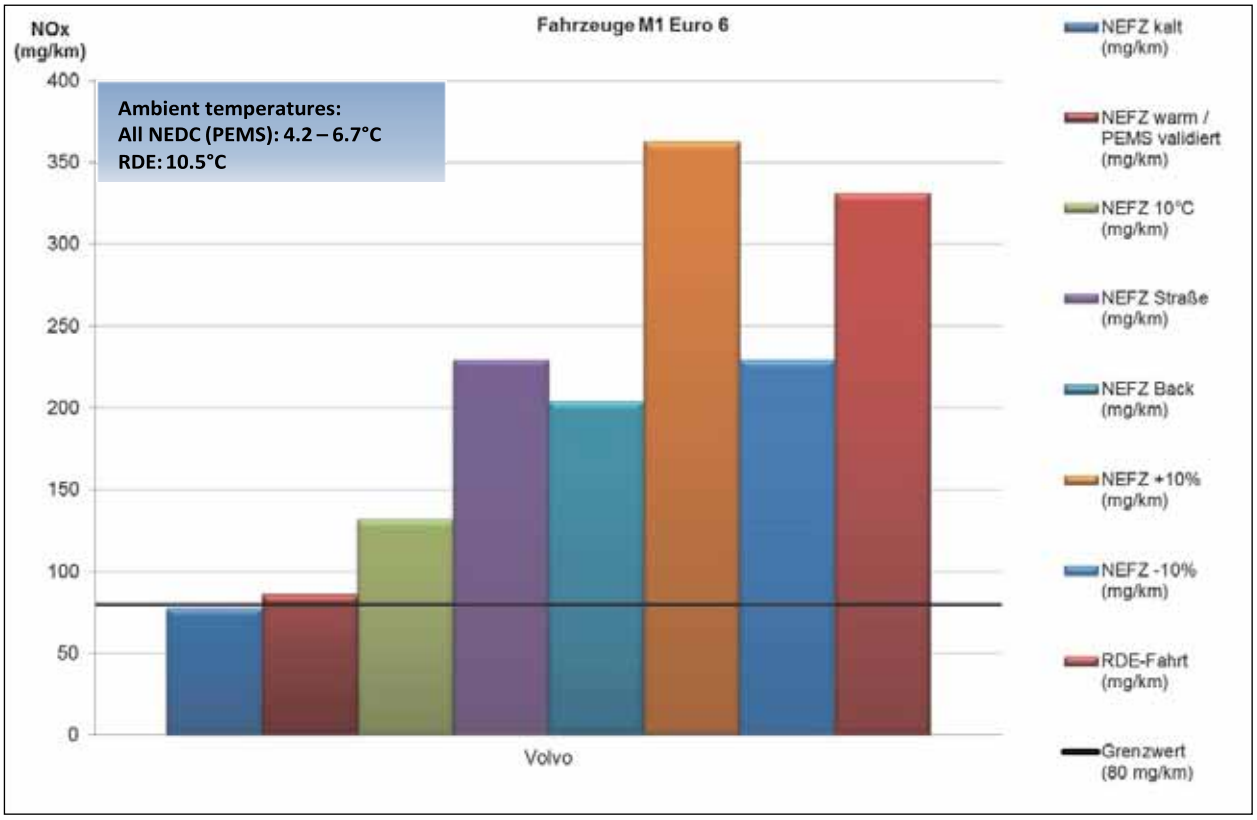


Manufacturer:		Toyota
Trade name:		Auris
Vehicle category:		M1
Capacity (cm^3):		1998
Emission standard:		Euro 5
Approval number:		e11*2001/116*0305*07
Type / model / version:		E15UT(a) / ADE186(W) / ADE186L-DWFNXW(1T)
Engine performance (kW):		91
Mileage status (km):		33400
Condition (new / used):		used
First registration:		09 February 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1470
F0	**[N]**	100.477
F1	**[N/(km/h)]**	0
F2	**[$N/(km/h)^2$]**	0.03678

Volvo V60 2.0 l Euro 6

Initially, the first vehicle produced values that were not plausible but, in retrospect, these values could be explained by the particulate filter regeneration taking place. Thus, another vehicle of the same construction was included in the test programme. This Volvo V60 did comply with the NOx threshold value during the cold NEDC test. During the hot NEDC test, the value only slightly exceeds the threshold value of 80 mg/km. Most NEDC test cycles conducted with a PEMS on the road yield an increase of the Type 1 values between 2.2 times and 3 times the threshold value. In the NEDC +10 % test and during the RDE test, values were about 4.5 times and about 4.1 times the threshold value.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Volvo	V60 2.0l	77.42	86.15	131.90	229.25	203.91	362.78	229.65	331.25



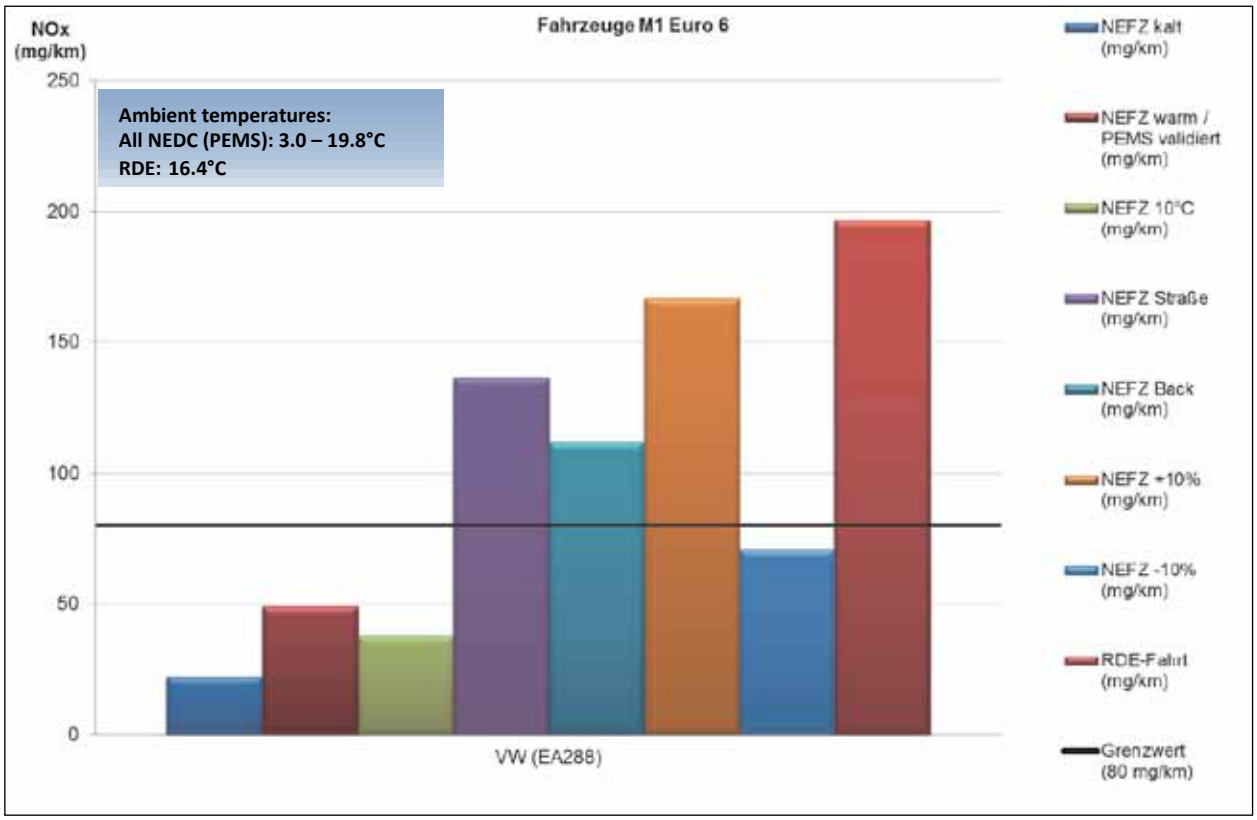
Manufacturer:		Volvo
Trade name:		V60
Vehicle category:		M1
Capacity (cm^3):		1969
Emission standard:		Euro 6
Approval number:		e9*2007/46*0023*22
Type / model / version:		F /FW79 / FW7980
Engine performance (kW):		110
Mileage status (km):		18500
Condition (new / used):		used
First registration:		18 August2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1590
Coast down times	**[s]**	
120 km/h		7.11
100 km/h		9.39
80 km/h		12.82
60 km/h		18.19
40 km/h		26.67
20 km/h		39.17

VW Golf VII 1.6 l Blue Motion Euro 6 EA 288
VW Golf VII 2.0 l Euro 6 EA 288
VW Passat 2.0 l Euro 6 EA 288
VW Sportsvan 2.0 l Euro 6 EA 288
VW Touran 2.0 l Euro 6 EA 288
These vehicles are equipped with the engine type EA 288, the successor of the engine EA 189, and comply with Euro 6 requirements. The VW Group issued a statement saying that these vehicles are not equipped with an unlawful defeat device. It was the highest priority to verify this statement by the KBA field investigation as these vehicles correspond to the current production.

With the exception of those equipped with LNT (VW Golf VII 2.0 l), the VW Group vehicles already comply with the requirements of the future RDE legislation. In all of the NEDC on-the-road tests conducted with PEMS, the NOx values of the vehicles are below the NOx threshold values, and in the case of the LNT models the values are about 2-3 times the NOx threshold value.

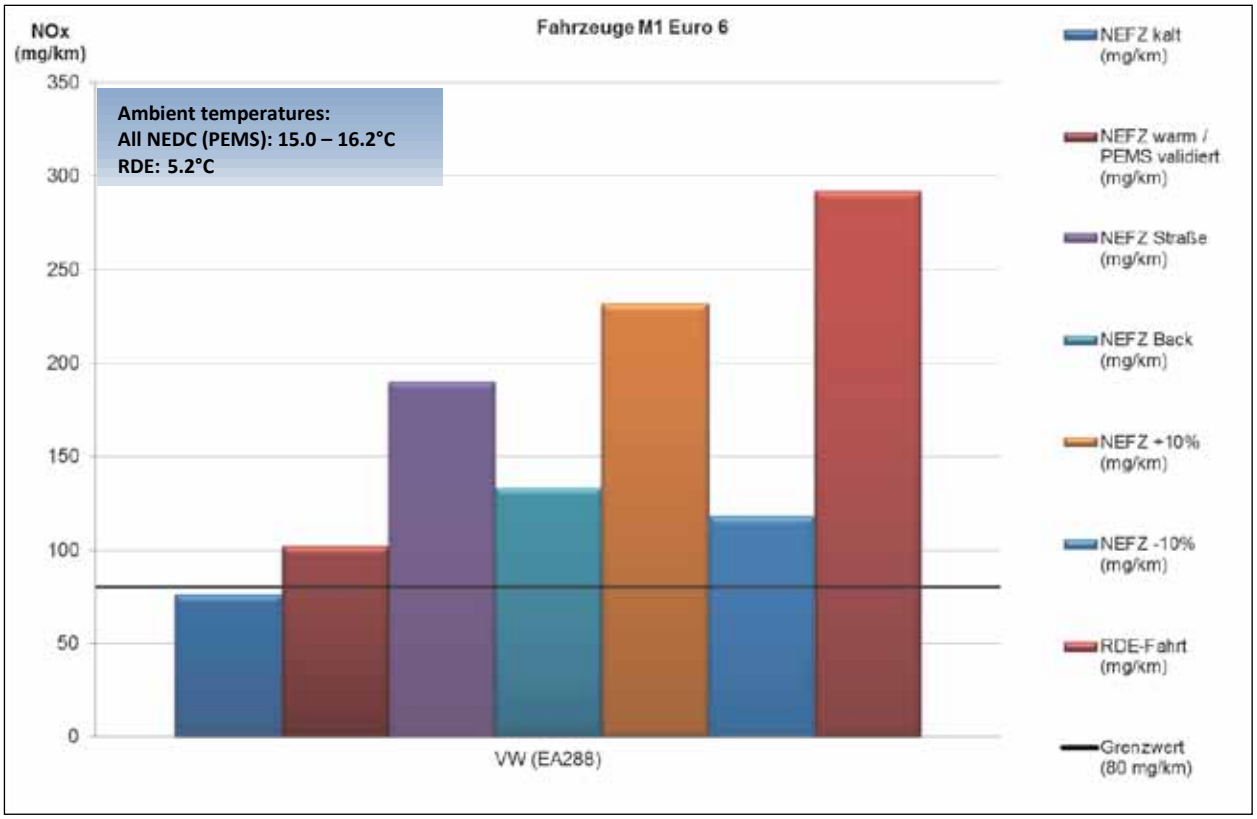
Installation of a PEMS in a car

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
VW (EA288)	Golf 1.6l BMT	22.00	49.00	38.00	136.49	111.94	166.98	70.95	196.68



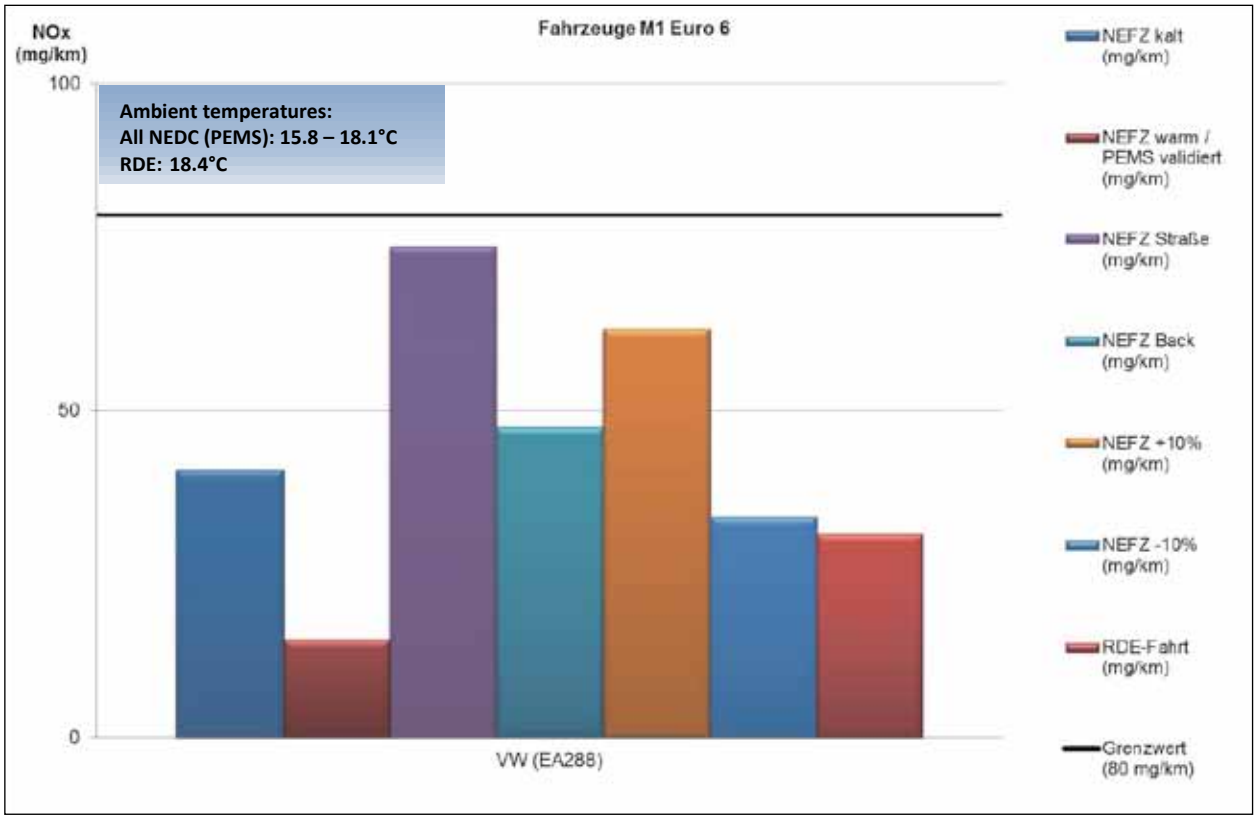
Manufacturer:		VW
Trade name:		GOLF EA288
Vehicle category:		M1
Capacity (cm^3):		1598
Emission standard:		Euro 6
Approval number:		e1*2007/46*0623*17
Type / model / version:		AU / GAC4DBKAX0 / FM6FM62S030B7MMON1?L67VR2
Engine performance (kW):		81
Mileage status (km):		5
Condition (new / used):		new
First registration:		-
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	x
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1250
F0	**[N]**	59.00000
F1	**[N/(km/h)]**	0.59700
F2	**[N/(km/h)²]**	0.02450

		Chassis dynamometer		Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
VW (EA288)	Golf VII 2.0l	76.00	102.00	190.09	133.30	231.82	118.23	291.91



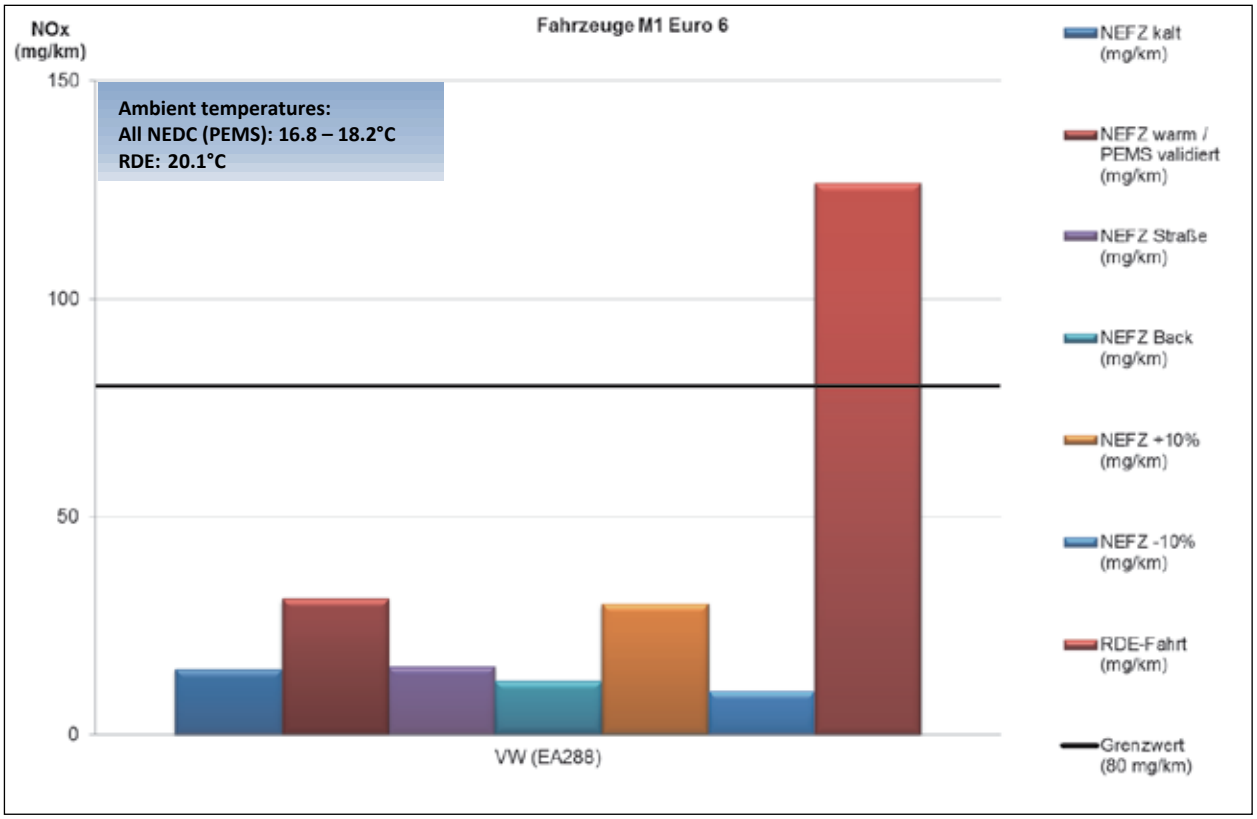
Manufacturer:		VW
Trade name:		GOLF EA288
Vehicle category:		M1
Capacity (cm^3):		1968
Emission standard:		Euro 6
Approval number:		e1*2007/46*0623*07
Type / model / version:		AU / AC4UNAX0 / FD6FD6D9006S7MMMMLVR2
Engine performance (kW):		135
Mileage status (km):		22617
Condition (new / used):		used
First registration:		05 September 2013
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	x
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1470
F0	**[N]**	104.000
F1	**[N/(km/h)]**	0.700
F2	**[N/(km/h)²]**	0.028

		Chassis dynamometer		Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
VW (EA288)	Passat 2.0l	41.00	15.00	75.00	47.50	62.50	33.75	31.25



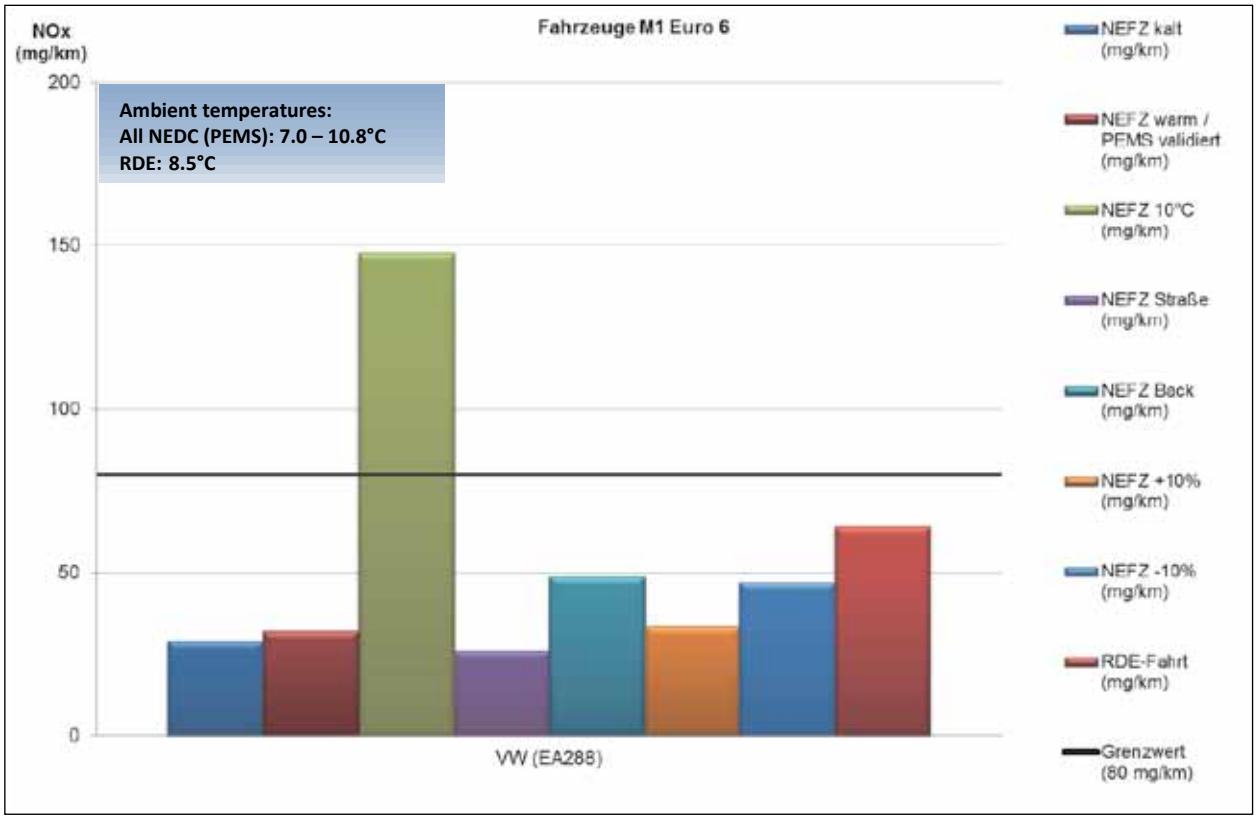
Manufacturer:		VW
Trade name:		Passat EA288
Vehicle category:		M1
Capacity (cm^3):		1968
Emission standard:		Euro 6
Approval number:		e1*2001/116*0307*39
Type / model / version:		3C / ACDDAAX0 / FD6FD6D9002SH7MMVR262
Engine performance (kW):		140
Mileage status (km):		2314
Condition (new / used):		used
First registration:		03 July 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	x
Inertia class	**[kg]**	1590
F0	**[N]**	130.000
F1	**[N/(km/h)]**	0.580
F2	**[N/(km/h)²]**	0.030

		Chassis dynamometer		Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
VW (EA288)	Sportsvan 2.0l	15.02	31.08	15.54	12.21	29.97	9.99	126.55



Manufacturer:		VW
Trade name:		Golf Sportsvan EA288
Vehicle category:		M1
Capacity (cm^3):		1968
Emission standard:		Euro 6
Approval number:		e1*2007/46*0627
Type / model / version:		AUV / - / -
Engine performance (kW):		110
Mileage status (km):		4
Condition (new / used):		new
First registration:		-
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	x
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1470
F0	**[N]**	92.100
F1	**[N/(km/h)]**	1.010
F2	**[N/(km/h)²]**	0.029

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
VW (EA288)	Touran 2.0l	29.00	32.00	147.70	26.05	48.57	33.56	46.90	64.25

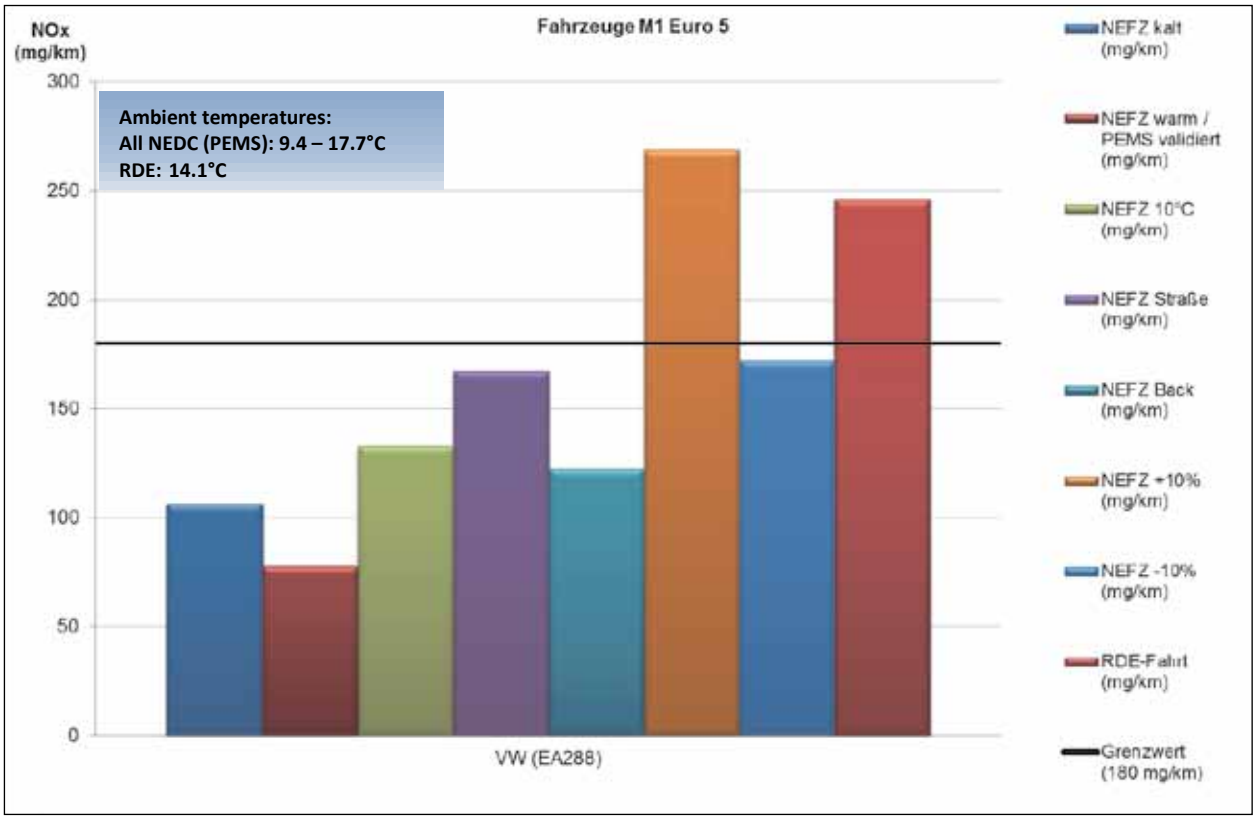


Manufacturer:		VW
Trade name:		Touran
Vehicle category:		M1
Capacity (cm^3):		1968
Emission standard:		Euro 6
Approval number:		e1*2001/116*0211*37
Type / model / version:		1T / DFEAAF / FD6FD6D90027MMS71VR261
Engine performance (kW):		110
Mileage status (km):		6
Condition (new / used):		new
First registration:		-
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	x
Inertia class	**[kg]**	1590
F0	**[N]**	125.7
F1	**[N/(km/h)]**	0.576
F2	**[N/(km/h)²]**	0.0342

VW Golf VII 1.6 l Euro 5 EA 288

This vehicle uses the new engine generation EA 288; however, it was approved according to Euro 5. This vehicle complies with the Type 1 test, and in all the other tests, the vehicle's NOx value is below 2.1 times the NOx threshold value.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
VW (EA288)	Golf VII 1.6l	106.00	78.00	133.00	167.02	122.39	268.62	171.94	246.14

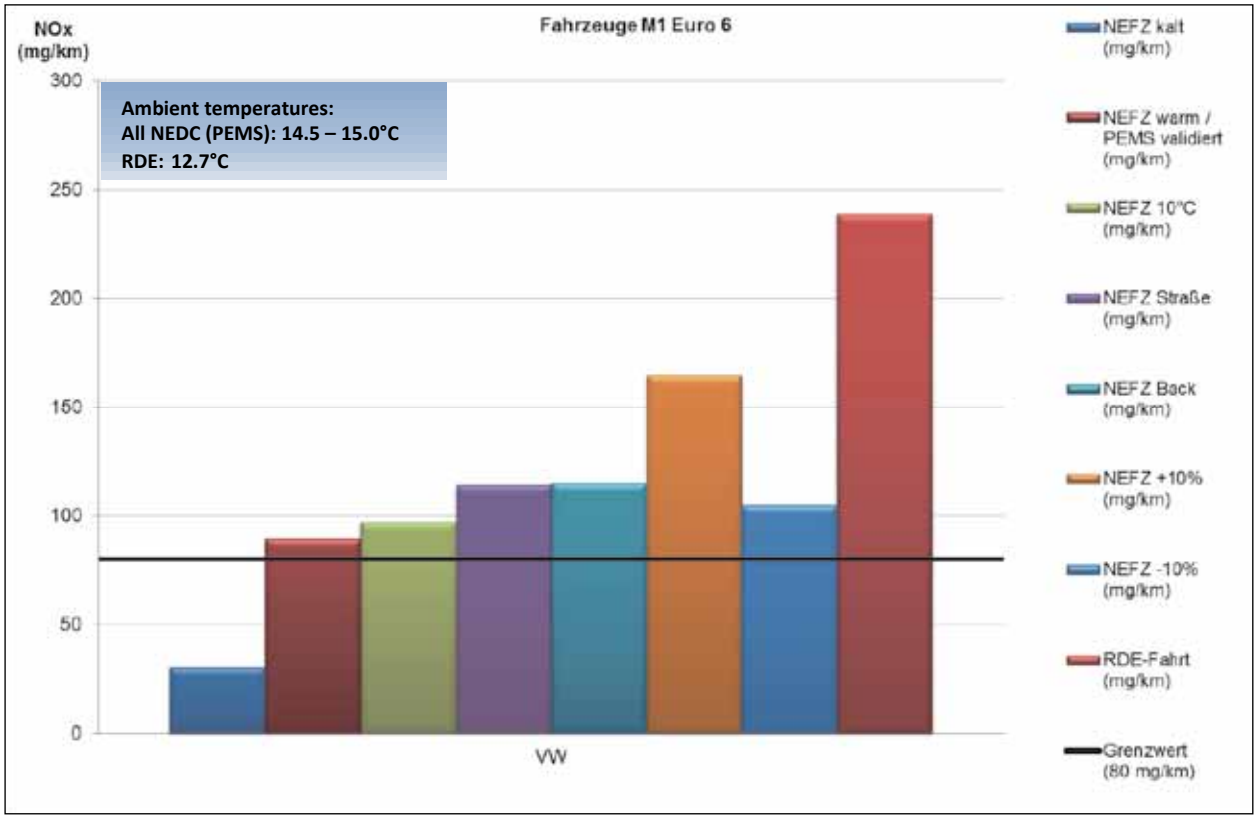


Manufacturer:		VW
Trade name:		GOLF EA288
Vehicle category:		M1
Capacity (cm^3):		1598
Emission standard:		Euro 5
Approval number:		e1*2007/46*0623*11
Type / model / version:		AU / GAC4CLHAX0 / FM5FM5A4051N7MJON1VL00VR2
Engine performance (kW):		77
Mileage status (km):		10,134
Condition (new / used):		used
First registration:		14 January 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1470
F0	**[N]**	87.00000
F1	**[N/(km/h)]**	0.37000
F2	**[N/(km/h)²]**	0.03050

VW Touareg V6 3.0 l Euro 6

The tested vehicle easily complies with the NOx threshold value in the cold NEDC. During the dynamometer test with a warm vehicle (hot NEDC) the NOx value increases slightly and is slightly above the threshold value. Carrying out the same hot NEDC test on the road yields an acceptable NOx value of 114 mg/km considering the higher load conditions outside of the dynamometer environment. The NOx values of the other on-the-road measurements are without anomalies, with the exception of the RDE profile.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
VW	Touareg 3.0l	30.77	89.31	97.14	114.0	114.78	164.95	104.85	238.93



Manufacturer:		VW
Trade name:		Touareg
Vehicle category:		M1G
Capacity (cm^3):		2967
Emission standard:		Euro 6
Approval number:		e1*2007/46*0376*12
Type / model / version:		7P / ACCVVAX1 / AA8AA8C8034NVR67MMO
Engine performance (kW):		193
Mileage status (km):		1759
Condition (new / used):		used
First registration:		02 November 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	x
Inertia class	**[kg]**	2270
F0	**[N]**	179.000
F1	**[N/(km/h)]**	0.790
F2	**[N/(km/h)^2]**	0.045

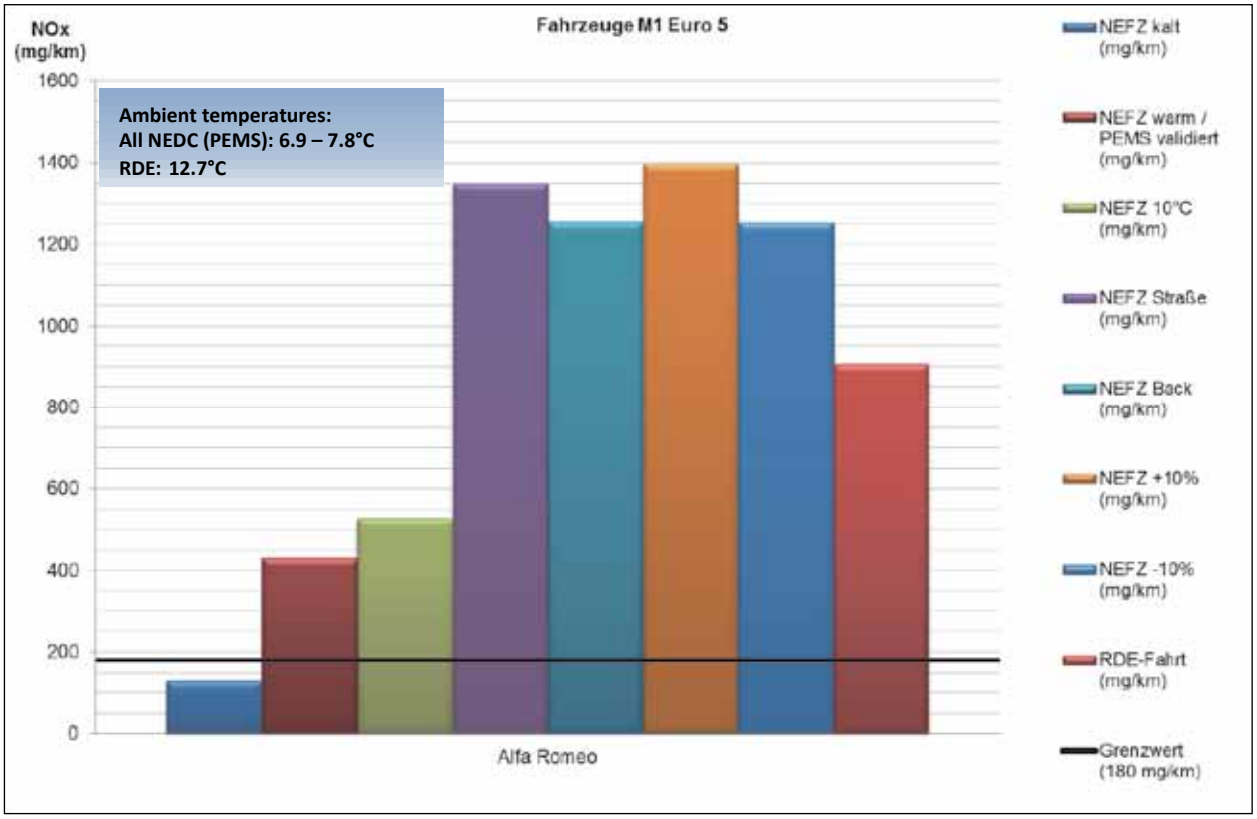
(2) Group II Vehicles

Alfa Romeo Giulietta 2.0 l Euro 5

During the cold NEDC test, the tested vehicle complied with the NOx threshold value. During the hot NEDC, values were measured that were higher than twice the threshold value. PEMS measurements under road conditions at ambient temperatures ranging between 7 °C and 8 °C yielded NOx emissions amounting to up to 7.8 times the threshold value. During the RDE test at a temperature of 13 °C, this vehicle produced 5 times the threshold value. Overall, it can be concluded that the EGR rate is highly dependent on the outside temperature, and this is verified by a statement of Fiat Chrysler Automobiles N. V. (FCA), according to which the EGR rate is reduced at temperatures between below 20 °C and 5 °C, in order to ensure a stable combustion pattern and to avoid damages to the EGR components and the particulate filter.
According to the manufacturer, the EGR rate is reduced on the basis of the emission strategy. The development of the emission reduction strategy is the result of defects in the field. Since then, the EGR control strategy has been backed up via a separate urban heavy load cycle. For certain driving conditions, the EGR rates are reduced to avoid a thermal overload of the particulate filter. According to the present state of information, this would explain the rise of the value during the hot NEDC test. Accordingly, in the NEDC 10 °C test, values amounted to about 3 times the threshold value.

This emission reduction strategy, which is dependent on the outside temperature, reduces the effectiveness of the emission control system under conditions which are to be expected in normal vehicle operation and use. Concerning the lawfulness of the broad interpretation of the temperature range used to protect the engine, the manufacturer says, and substantiates, that it is necessary in order to protect the engine from damage

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Alfa Romeo	Giulietta 2.0l	130.96	430.77	525.21	1346.34	1254.99	1396.17	1254.41	905.37



Manufacturer:		Alfa Romeo
Trade name:		Giulietta
Vehicle category:		M1
Capacity (cm^3):		1956
Emission standard:		Euro 5
Approval number:		e3*2007/46*0027*16
Type / model / version:		940 / FXQ1A / 15
Engine performance (kW):		110
Mileage status (km):		18197
Condition (new / used):		used
First registration:		30 July 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1360
F0	**[N]**	103.110
F1	**[N/(km/h)]**	1.082
F2	**[$N/(km/h)^2$]**	0.027

Audi A6 V6 3.0 l Euro 5

The Audi A6 Euro 5 complies with the threshold value during the cold and hot NEDC tests. The NEDC 10 °C test produces a NOx value which is 4 times the threshold value. All PEMS measurements on the road are slightly below 6.2 times the threshold value, except for the NEDC +10 % test which produces 5.5 times the threshold value. The RDE test produces about 7 times the NOx threshold value. The measurements were conducted at an outside temperature of about 7 °C and strong wind.

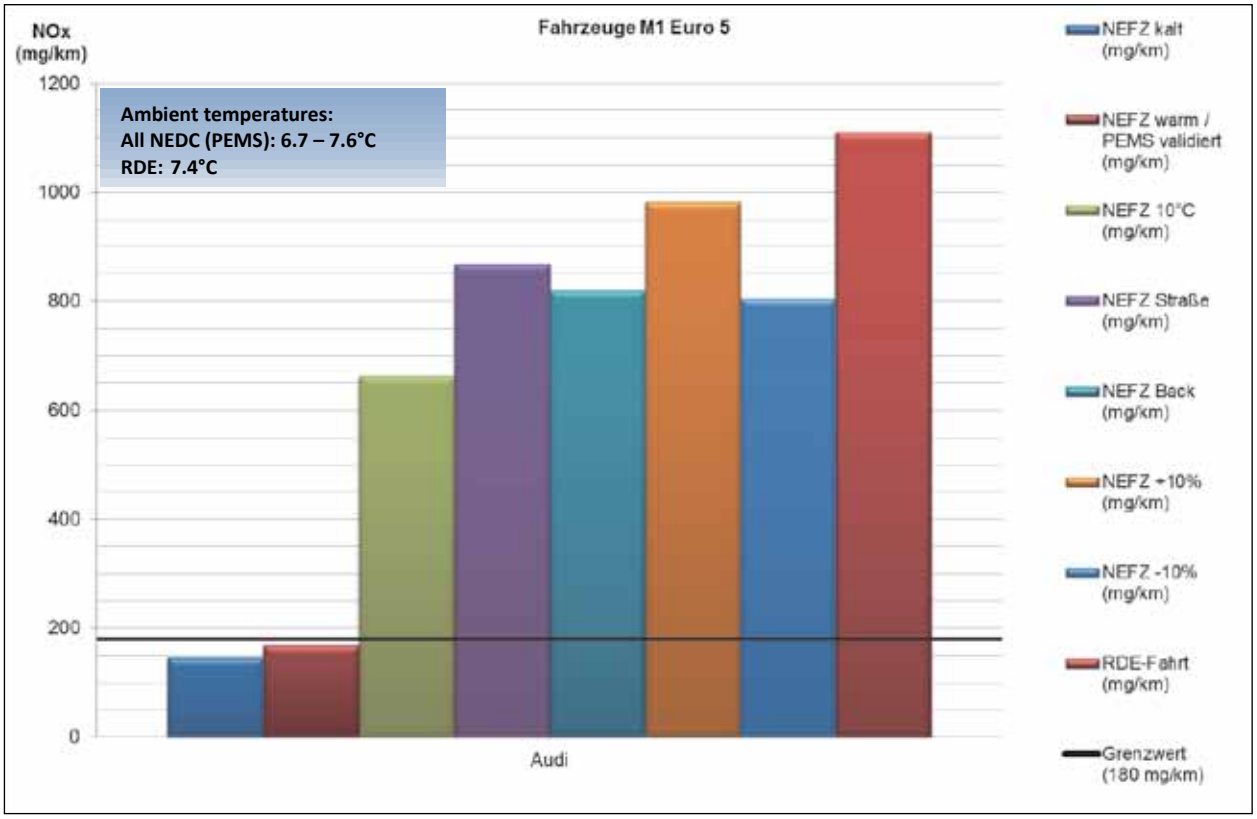
In a statement on its emission reduction strategy, the manufacturer explains the temperature-dependent reduction of the EGR rate with the protection of components. This emission reduction strategy is confirmed by the measurement values. According to the manufacturer, an additional share of the increase in NOx is due to a load increase during the measurements on the road as a result of environmental factors.

The temperature-dependent reduction of the EGR rate could be considered a change in the emission behaviour of the exhaust gas system. However, Audi cites the protection of components in the spirit of article 5(2) of the Regulation (EC) No. 715/2007 as of overriding importance and proves this with defect rates in the field.

The manufacturer explains that the EGR rates were reduced due to massive problems in the field at outside temperatures below 17 °C. In its interpretation, the manufacturer acted in line with the latest state of technology and in accordance with the experience gained over the years. This way, complaints reduced to a low level.

Nevertheless, the manufacturer agreed to optimise its vehicles in the field by means of a software update starting in the summer of 2016. If the manufacturer takes the measures as planned, and the KBA verifies their effectiveness, doubts regarding the lawfulness of the defeat device for reasons of engine protection would cease to exist.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Audi	A6 3.0l	145.00	168.00	663.00	868.13	819.90	980.67	803.83	1109.28



Manufacturer:		Audi
Trade name:		A6
Vehicle category:		M1
Capacity (cm^3):		2967
Emission standard:		Euro 5
Approval number:		e1*2007/46*0436*06
Type / model / version:		4G / LCRTEQ1 / QD7B5034P4G03S57MMEM2
Engine performance (kW):		150
Mileage status (km):		63495
Condition (new / used):		used
First registration:		02 May 2012
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1930
F0	**[N]**	134
F1	**[N/(km/h)]**	0.450
F2	**[N/(km/h)^2]**	0.0286

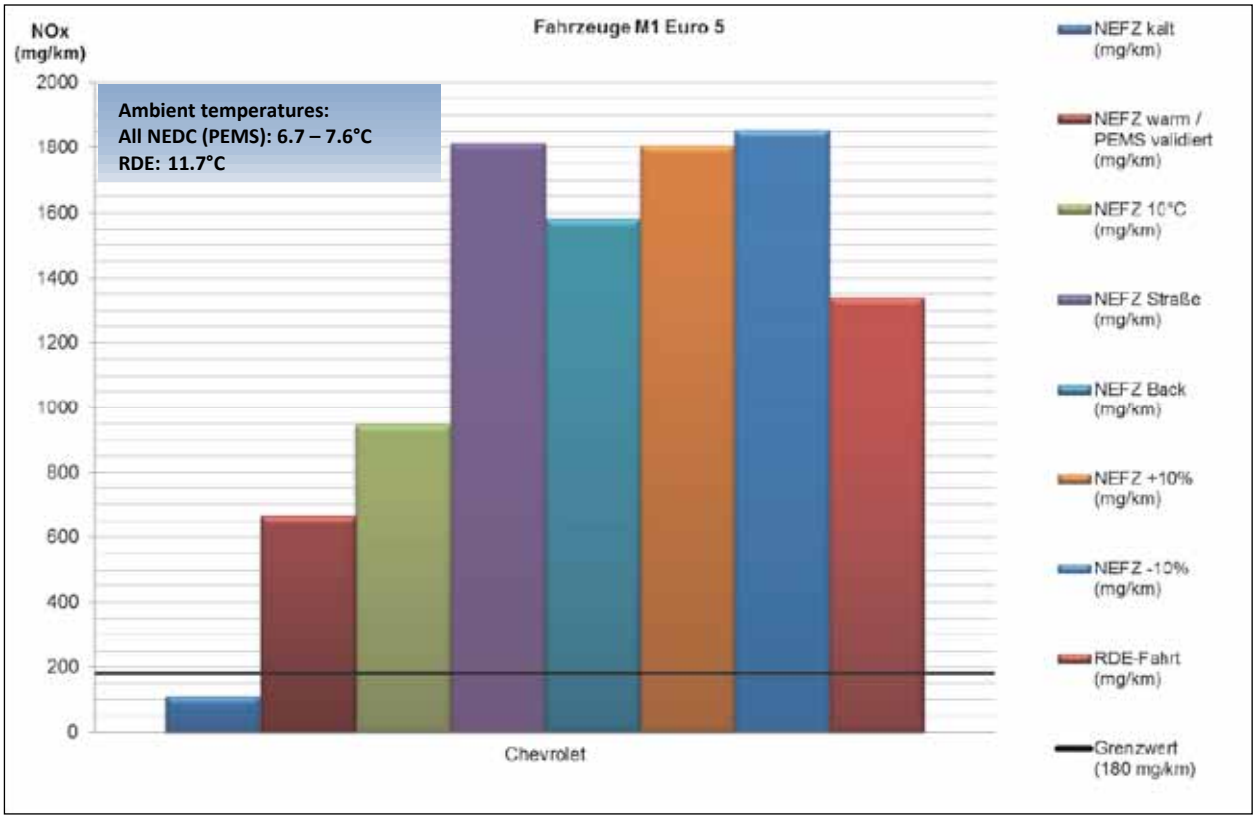
Chevrolet Cruze 2.0 l Euro 5

In the cold NEDC test, the Chevrolet complies with the threshold value. In the hot NEDC test, this value increases significantly and is more than 3 times the threshold value. The NEDC 10 °C test produces a NOx value that is 5 times the threshold value. All NEDC values of the PEMS on-the-road measurements exceed the threshold value more than eightfold. The RDE measurement amounts to about 7 times the NOx threshold value. The measurements were conducted at an ambient temperature of about 7 °C.

A statement issued by Opel AG as the representative of Chevrolet in Germany confirms the outside temperature-dependent changes to the EGR rate. More information was promised; however, the fact that Chevrolet has given up its business in Europe and its diesel development poses a difficulty.

The broad interpretation of the temperature range to protect components is considered lawful by the manufacturer and explained with this being necessary in order to protect the engine from damage. The emission reduction strategy, which is dependent on the outside temperature, reduces the effectiveness of the emission control system under conditions that are to be expected in normal vehicle operation and use. Concerning the lawfulness of the broad interpretation of the temperature range used to protect the engine, the manufacturer says, and substantiates, that it is necessary to protect the engine.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Chevrolet	Cruze 2.0l	109.00	664.00	947.00	1813.45	1581.60	1805.26	1855.39	1340.57



Manufacturer:		Chevrolet
Trade name:		Cruze
Vehicle category:		M1
Capacity (cm^3):		1998
Emission standard:		Euro 5
Approval number:		e4*2001/116*0140*09
Type / model / version:		KL1J / JNF11 / FJ5
Engine performance (kW):		120
Mileage status (km):		36,262
Condition (new / used):		used
First registration:		11 October 2012
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1470
F0	**[N]**	90.30000
F1	**[N/(km/h)]**	0.87500
F2	**[N/(km/h)^2]**	0.02720

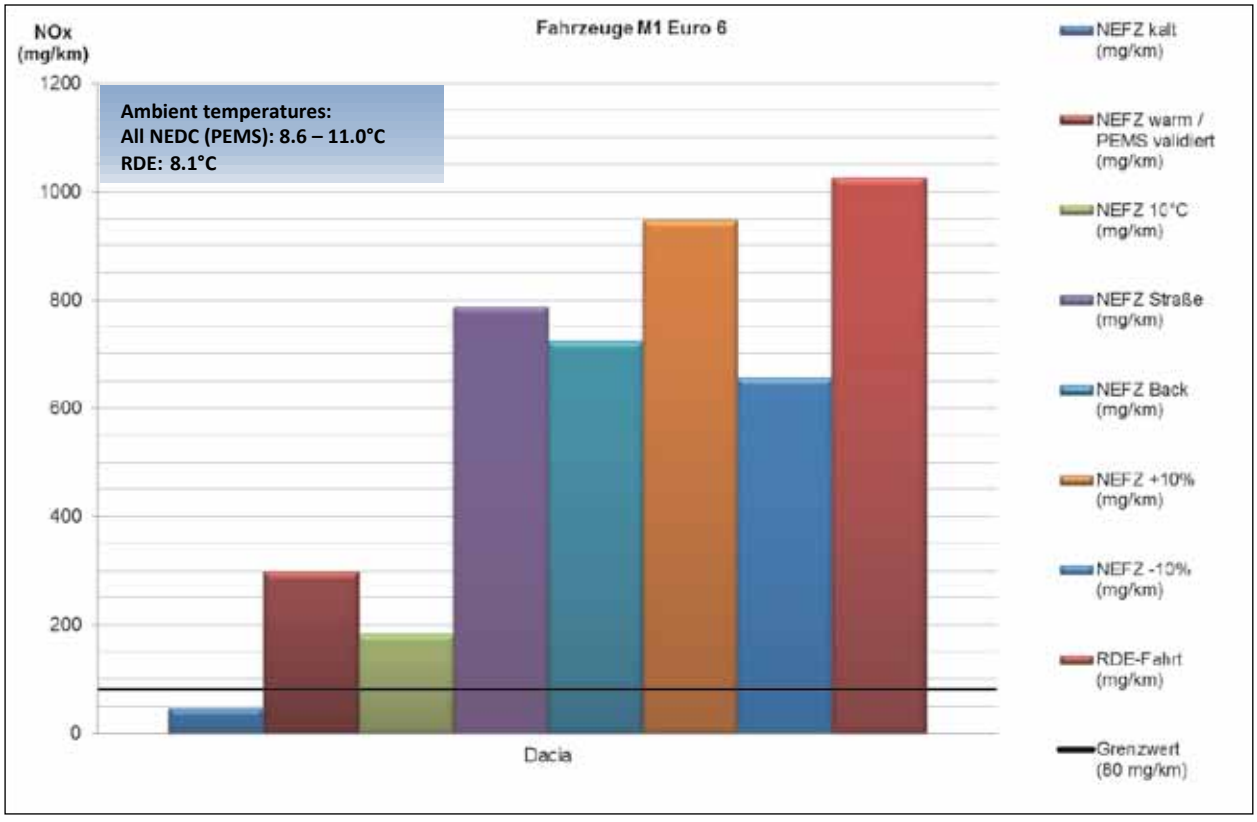
Dacia Sandero 1.5 l Euro 6

The Dacia Sandero complies with the threshold values of the Type 1 test. The measurement results obtained in the hot NEDC test, however, are 3.7 times the threshold value and thus remarkably high. The NEDC 10 °C tests produce 2.3 times the NOx threshold value. The PEMS measurements on the road in the NEDC test cycles produce particularly striking elevations of more than 10-12 times the NOx threshold value; this holds true for the RDE value as well.

According to Renault, Dacia vehicles use the engine range of Renault and, thus, the same emission reduction strategy. Therefore, the statements regarding the Renault vehicles also apply to Dacia vehicles, regardless of the weight categories. This implies a temperature-dependent ramp functionality to reduce the EGR rates as is the case with Renault Kadjar, and this was confirmed by a statement made by Renault.

This emission reduction strategy, which is dependent on the outside temperature, reduces the efficiency of the emission control system under conditions which are to be expected in normal vehicle operation and use. Concerning the lawfulness of the broad interpretation of the temperature range used to protect the engine, the manufacturer says, and substantiates, that this is necessary to protect the engine from damage.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Dacia	Sandero 1.5l	46.03	298.65	182.99	788.14	723.28	948.13	656.80	1025.06



Manufacturer:		Dacia
Trade name:		Sandero
Vehicle category:		M1
Capacity (cm^3):		1461
Emission standard:		Euro 6
Approval number:		e2*2001/116*0314*76
Type / model / version:		SD / 5SDCJ / 5SDCJ5
Engine performance (kW):		66
Mileage status (km):		1769
Condition (new / used):		used
First registration:		01 October 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	x
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1130
F0	**[N]**	62.170
F1	**[N/(km/h)]**	0.530
F2	**[N/(km/h)^2]**	0.034

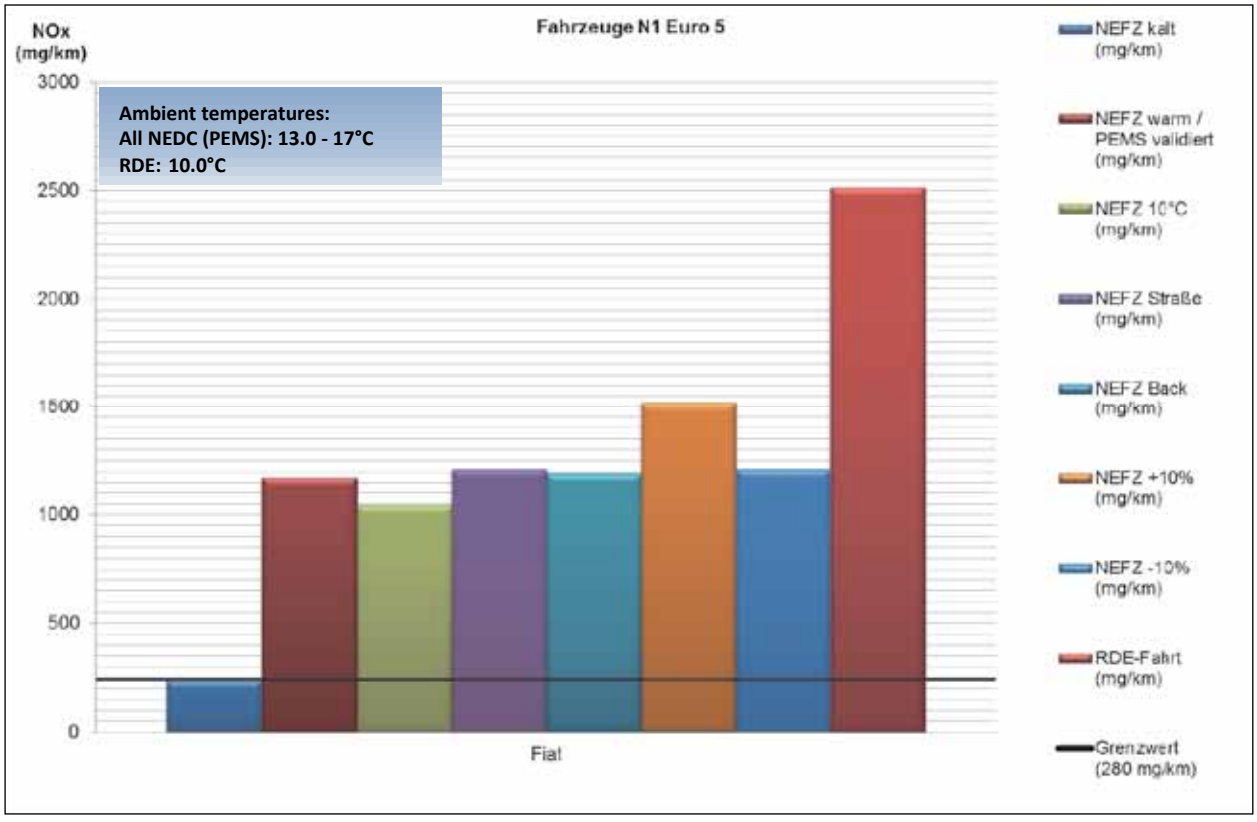
Fiat Ducato 3.0 l Euro 5

Fiat Ducato complies with the NOx threshold value of 280 mg/km for the heavy group of light-duty vehicles during the cold NEDC test. In the hot NEDC the NOx values were more than 4 times the threshold value. The measurements with PEMS on the road at ambient temperatures between 13 °C and 17 °C yielded NOx values higher than 4 times the threshold value. During the RDE test at 10 °C, the value was 9 times the threshold value. All in all, this implies a heavy dependence of the EGR rate on the outside temperature. This is verified in a statement by the manufacturer FCA according to which the EGR rate is reduced at temperatures between below 20 °C and 5 °C in order to guarantee a stable combustion pattern and to avoid damage to the EGR components and the particulate filter.

According to information provided by the manufacturer, the EGR rate is reduced based on the emission reduction strategy. This emission reduction strategy is the result of numerous damages in the field. Since then the EGR control strategy has been backed up via a separate urban heavy load cycle. For certain driving conditions, the EGR rates are reduced to avoid the thermal overload of the particulate filter. According to the current state of knowledge, this would explain the increase in the value during the hot NEDC test. Accordingly, in the NEDC 10 °C test, values amount to about 3.5 times the threshold value.

This emission reduction strategy, which is dependent on the outside temperature, reduces the efficiency of the emission control system under conditions which are to be expected in normal vehicle operation and use. Concerning the lawfulness of the broad interpretation of the temperature range used to protect the engine, the manufacturer says, and substantiates, that this is necessary to protect the engine from damage.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Fiat	Ducato 3.0l	236.00	1171.00	1042.00	1209.39	1190.20	1516.54	1209.39	2514.77



Manufacturer:		Fiat
Trade name:		Ducato
Vehicle category:		N1
Capacity (cm^3):		2999
Emission standard:		Euro 5
Approval number:		e3*2007/46*0044*08
Type / model / version:		250 / CPMFC / EY
Engine performance (kW):		130
Mileage status (km):		17504
Condition (new / used):		used
First registration:		27 January 2014
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	2270
F0	**[N]**	11.8
F1	**[N/(km/h)]**	0
F2	**[$N/(km/h)^2$]**	0.0805

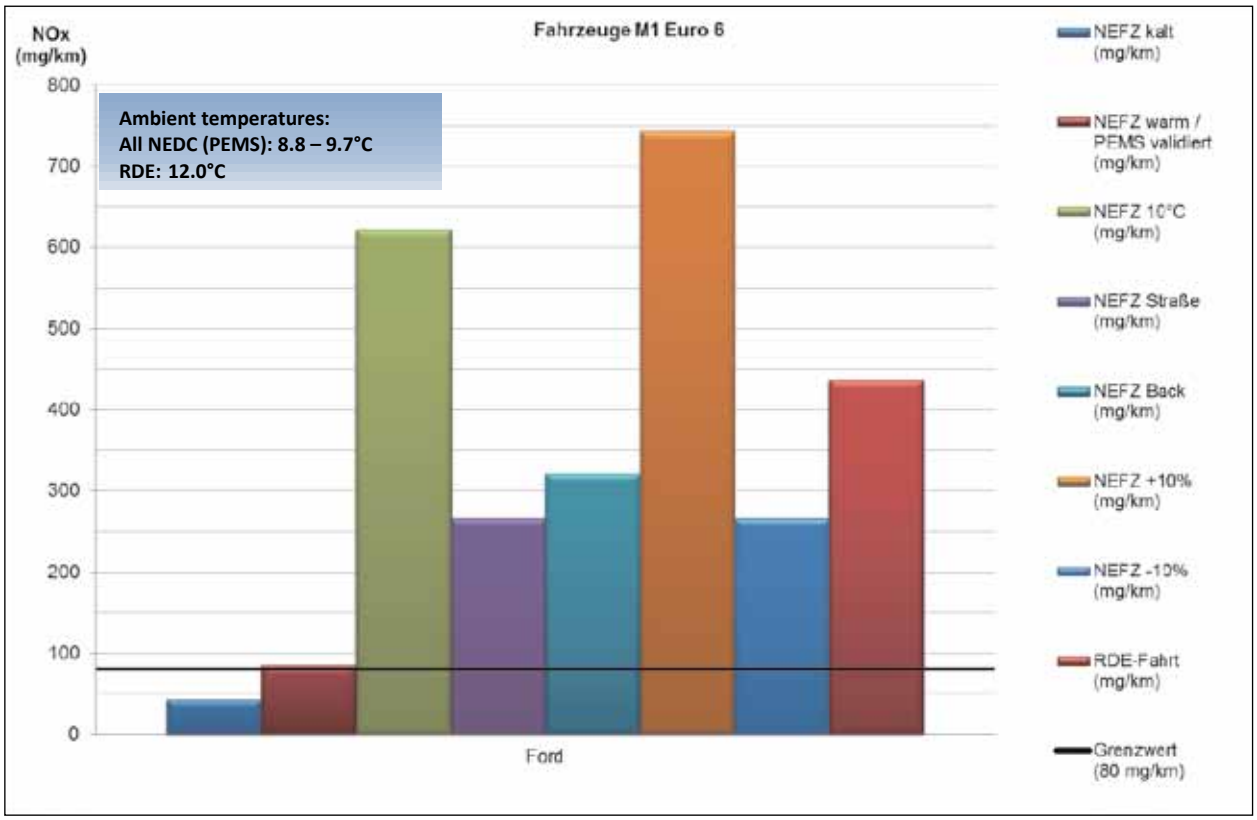
Ford C-Max 1.5 l und 2.0 l Euro 6

Both models use the same emission reduction strategy according to the manufacturer. Both easily comply with the NOx threshold value during the cold NEDC test. Also during the hot NEDC test, they comply with the threshold value. The NEDC 10 °C test, however, produces higher NOx values. The behaviour of the Ford C-Max on the road, tested with PEMS during the NEDC tests leads to elevations of up to 4-5 times the Type 1 threshold value. In the NEDC +10 % PEMS test with a higher load requirement, the value is very high and amounts to 9 times or 7 times the Type 1 threshold value.

According to an assessment made by the manufacturer and after a modal value breakdown of the measurement, the relatively high values for NEDC 10 °C occur especially in a peak emission during the acceleration phase at the end of the cycle. Ford's own measurements also indicate a relative peak. However, KBA's value for the 1.5 l engine was incomprehensible to Ford because its own measurement values were much lower. According to Ford, this can be explained by the start of the LNT regeneration process, which is triggered by the increase in the exhaust gas temperature due to the acceleration phase. It is said that this regeneration is necessary because the LNT has reached the end of its NOx adsorption capacity. This was due to high levels of NOx deposits already trapped in the LNT prior to the measurement. This is possible because the KBA deliberately abstains from the standardised pre-conditioning intended for Type 1 tests to empty the LNT prior to the start of the measurement, in order not to trigger a possible pre-conditioning recognition system. For test purposes, additional measurements were conducted on another Ford C-Max 1.5 l. The hot NEDC test was conducted with different levels of already existing deposits in the LNT. Ford's explanation - depending on the level of already existing deposits, higher NOx emissions occur - was confirmed. Since the measurement of the 2.0 l engine shows a peak emission on the same position during the NEDC 10 °C test, albeit less pronounced, the explanation of the supersaturation of the LNT is confirmed so that there is no reason to suspect a defeat device.

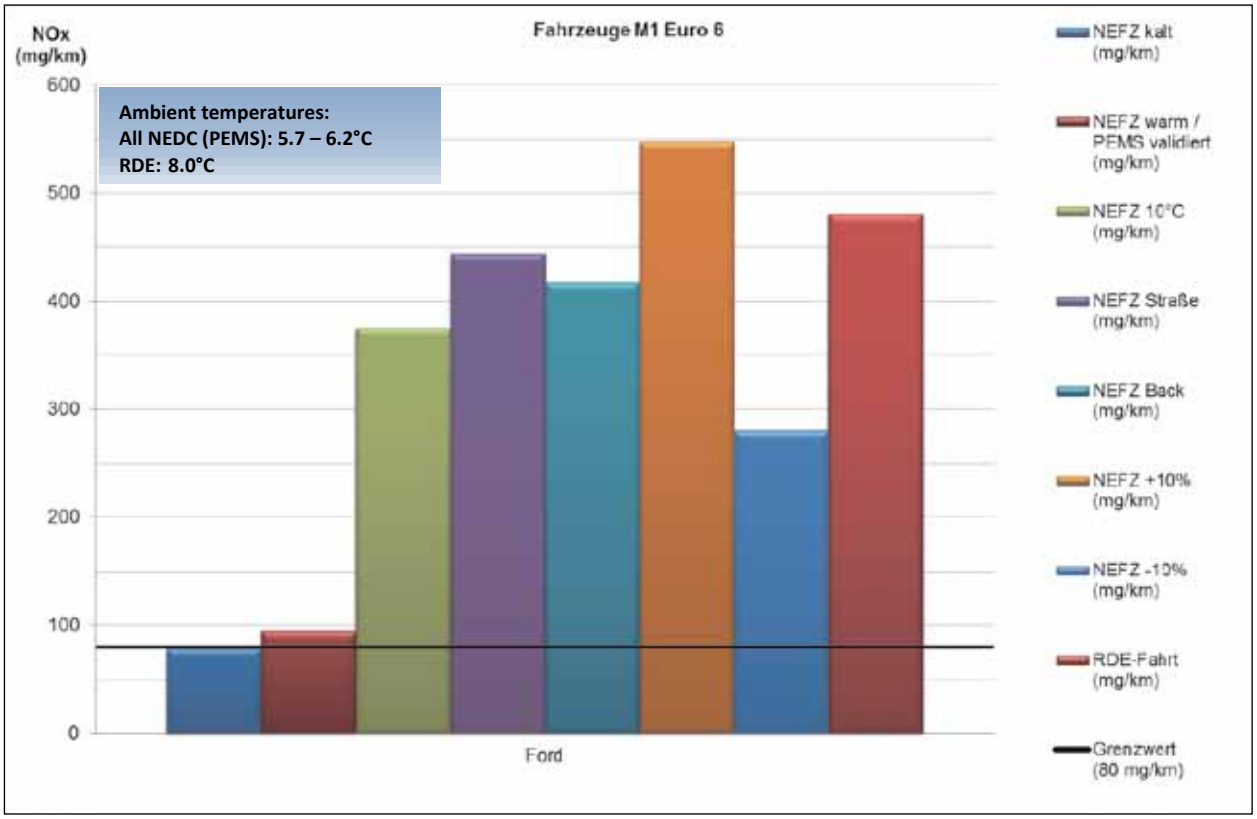
Ford explains the higher NOx values obtained during the measurements on the road on the basis of PEMS in comparison to the dynamometer measurements with the higher vehicle load on the road which includes an emissions measurement device, an additional testing person and additional equipment installed in the vehicle, which may be neglected during the Type 1 test. The CO2 values obtained by the KBA do reflect this increase in load.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Ford	C-Max 1.5l	43.00	85.00	622.00	265.63	321.94	743.75	265.63	436.69



Manufacturer:		Ford
Trade name:		C-Max (1.5)
Vehicle category:		M1
Capacity (cm^3):		1499
Emission standard:		Euro 6
Approval number:		e13*2007/46*1103*15
Type / model / version:		DXA / XWDB1V / 5HA1NA
Engine performance (kW):		88
Mileage status (km):		15731
Condition (new / used):		used
First registration:		07 August 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	x
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1470
F0	**[N]**	49.049
F1	**[N/(km/h)]**	0.8055
F2	**[N/(km/h)²]**	0.0342

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Ford	C-Max 2.0l	79.00	95.00	375.13	443.33	417.53	547.72	280.31	480.86



Manufacturer:		Ford
Trade name:		C-Max (2.0)
Vehicle category:		M1
Capacity (cm^3):		1997
Emission standard:		Euro 6
Approval number:		e13*2007/46*1103*15
Type / model / version:		DXA 7 T7DB1W / 7QL4PL
Engine performance (kW):		110
Mileage status (km):		15076
Condition (new / used):		used
First registration:		15 July 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	x
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1590
F0	**[N]**	73.442
F1	**[N/(km/h)]**	0.7295
F2	**[N/(km/h)²]**	0.0355

Hyundai ix35 2.0 l Euro 5

The Hyundai ix35 complies with the threshold values during the cold NEDC and hot NEDC tests. During the NEDC 10 °C test, a significant increase occurs and the value is 2.7 times the threshold value. The PEMS on-the-road measurements produce very high values between 4.4 times (NEDC road) and 6.2 times (NEDC +10°C) the threshold value.

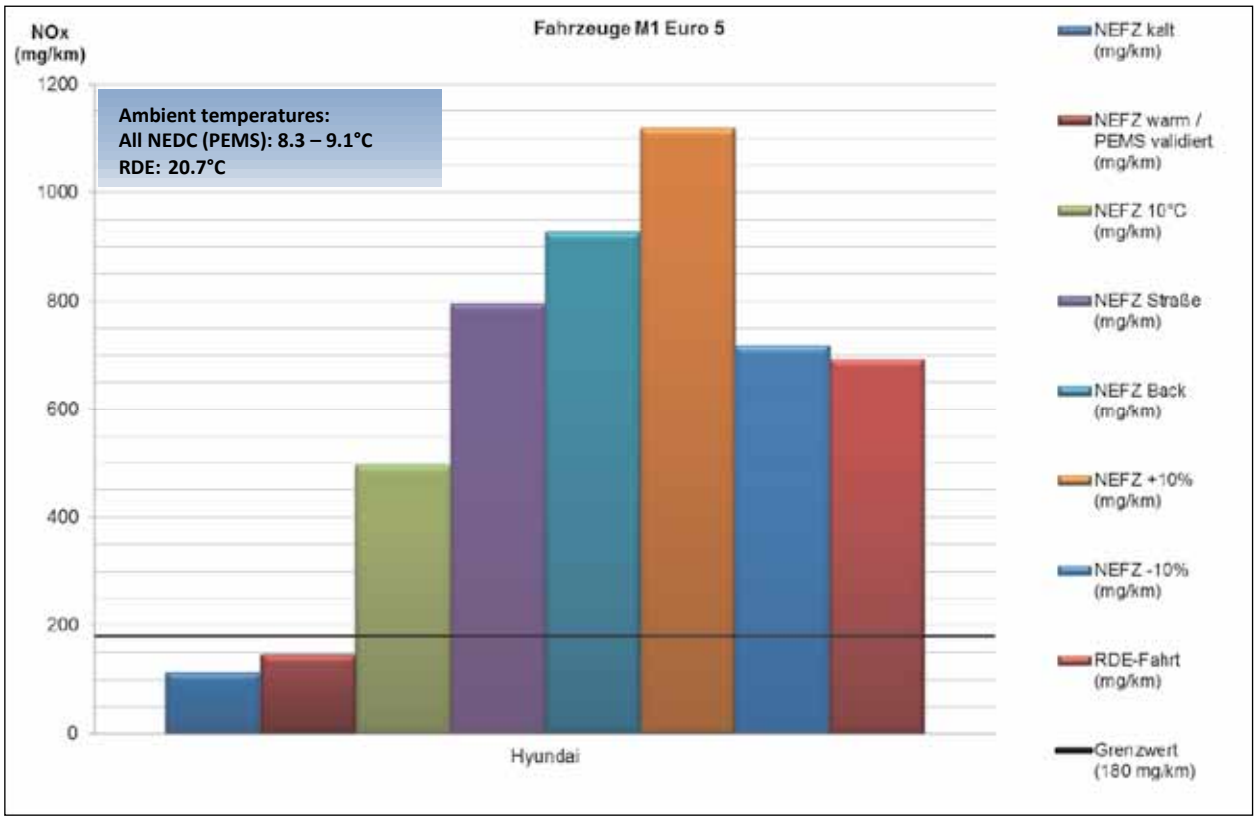
In a statement, Hyundai explains the temperature-dependent reduction of the EGR rate. According to Hyundai, it depends on the intake and cooling water temperature. Hyundai explains that the exhaust after treatment system is designed in a way that it lasts the entire life cycle of a vehicle without any restrictions. According to Hyundai, this means that all the installed parts need to be protected against damage or destruction. That is why the EGR rate was adjusted to prevent sootiness, coking or the like in the exhaust gas recirculation system.

According to Hyundai, the EGR rate depends on numerous external (ambient temperature, humidity, etc.) and internal factors (engine speed, load, coolant temperature, etc.). Thus, the engine control unit would calculate all the load points towards the basic airflow in a way that the EGR valve is controlled to ensure a stable combustion pattern. It is noted that the EGR works in an outside temperature range of 20 °C to 30 °C, i.e. the statutory Type 1 test temperature range. Given the elevated failure rates of this vehicle type's EGR valve in the field, about 0.39 % compared to 0.27 % of the EGR valves of the other Hyundai vehicle types, the manufacturer considers it to be proven that the temperature-dependent correction of the EGR was not chosen too conservatively and that the reduction in the efficiency of the emission control system serves to protect the engine.

The manufacturer was able to show that its emission reduction strategy was not solely based on the ambient temperature but that the engine temperature and load were also factored in. Upon request, the manufacturer was not able to submit more specific evidence or tests regarding the necessity of the correction functionality which depends on the ambient air.

This emission reduction strategy, which is largely dependent on the outside temperature, reduces the efficiency of the emission control system under conditions which are to be expected in normal vehicle operation and use. Concerning the lawfulness of the broad interpretation of the temperature range used to protect the engine, the manufacturer says, and substantiates, that this is necessary to protect the engine from damage.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Hyundai	ix 35 2.0l	114.00	147.00	496.84	794.52	927.99	1118.28	719.67	692.61



Manufacturer:		Hyundai
Trade name:		ix35
Vehicle category:		M1
Capacity (cm^3):		1995
Emission standard:		Euro 5
Approval number:		e11*2007/46*0192*08
Type / model / version:		ELH / F5D24 / A63AZ1
Engine performance (kW):		100
Mileage status (km):		13257
Condition (new / used):		used
First registration:		06 May 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1590
F0	**[N]**	126,48
F1	**[N/(km/h)]**	1.4719
F2	**[N/(km/h)^2]**	0.0368

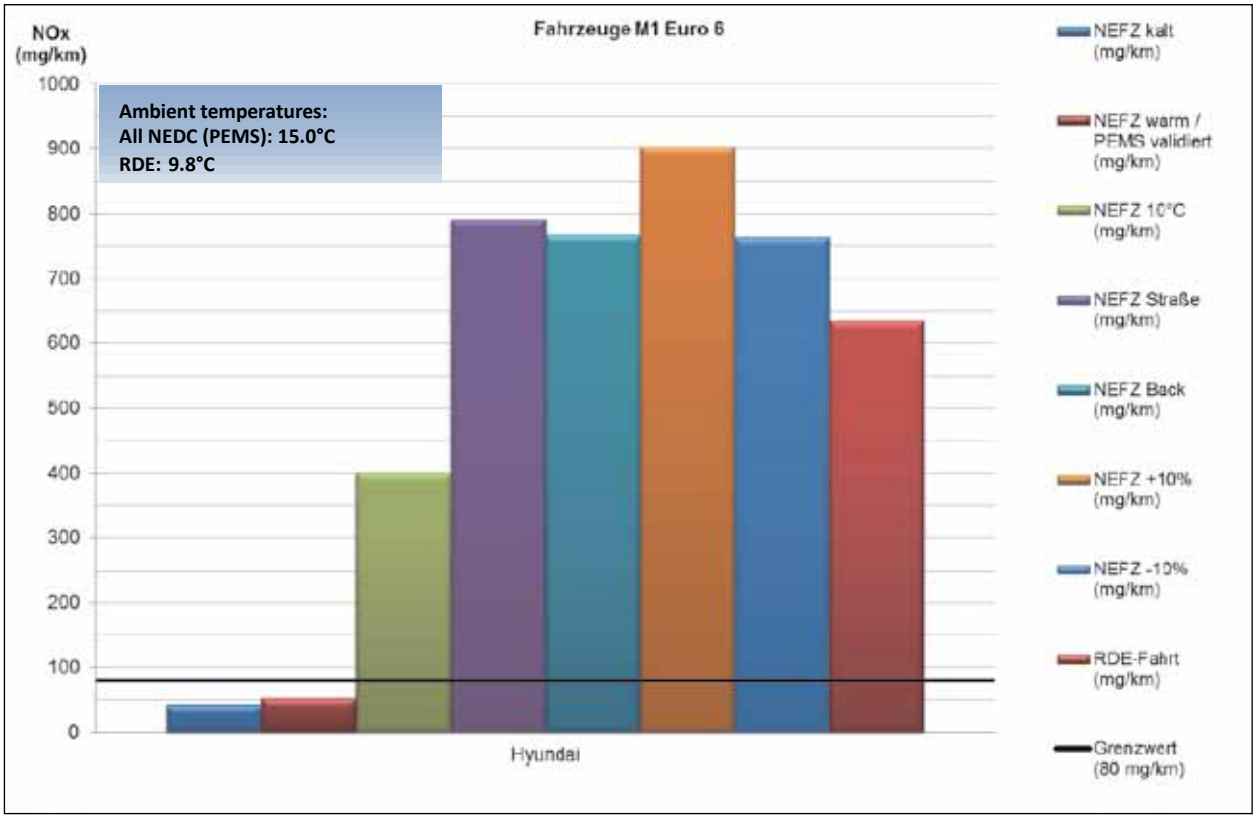
Hyundai i20 1.1 l Euro 6

Apart from a high pressure EGR, the Hyundai i20 has an LNT installed in the underfloor in order to reduce NOx. The i20 showed similar behaviour to the ix35 during the cold and hot NEDC tests, the NEDC 10 °C test, as far as the PEMS on-the-road NEDC values are concerned, as well as during the RDE test. The values obtained are extremely similar, although stricter Euro 6 requirements apply. In relative terms, this vehicle type produces elevated NOx values on the road which are up to 11 times the threshold value.

The explanations regarding the emission reduction strategy of the ix35 cannot be translated to the i20 according to the manufacturer. Although the EGR rate is reduced via the declining inlet temperature as well, this does not primarily serve to protect the EGR cooler and the EGR valve but to prevent the problematic dilution of oil. Given that the LNT and particulate filter are installed at a relative distance to the engine due to package reasons in the underfloor, relatively large post injections are necessary for regeneration purposes. They lead to a high fuel ingress into the engine oil so that engine failures occurred during field tests, especially in the winter. That is why the manufacturer reduced the EGR rates in view of falling temperatures in order to reduce HC and particulate emissions.

This emission reduction strategy, which is largely dependent on the outside temperature, reduces the efficiency of the emission control system under conditions which are to be expected in normal vehicle operation and use. Concerning the lawfulness of the broad interpretation of the temperature range used to protect the engine, the manufacturer says, and substantiates, that this is necessary to protect the engine from damage.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Hyundai	i20 1.1l	42.00	53.03	400.54	791.61	766.57	903.09	763.34	634.91



Manufacturer:		Hyundai
Trade name:		i20
Vehicle category:		M1
Capacity (cm^3):		1120
Emission standard:		Euro 6
Approval number:		e11*2007/46*1600*01
Type / model / version:		GB / B5D11 / M62BZ
Engine performance (kW):		55
Mileage status (km):		13432
Condition (new / used):		used
First registration:		21 April 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	x
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1250
F0	**[N]**	69.107
F1	**[N/(km/h)]**	0.6076
F2	**[N/(km/h)²]**	0.0267

Jaguar XE 2.0 l Euro 6

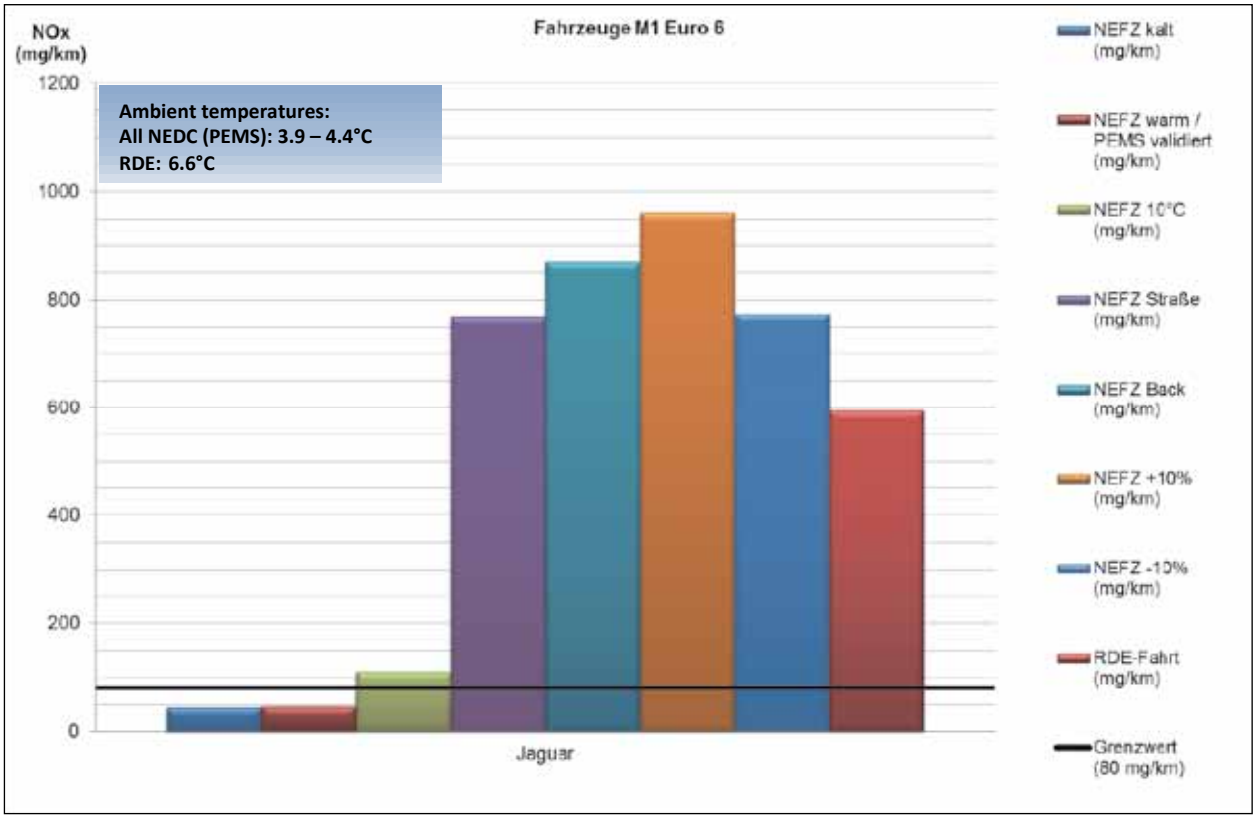
This vehicle complies with the NOx threshold value during the cold NEDC test. During the hot and 10 °C NEDC tests, the values only slightly exceed the NOx threshold value. However, during the NEDC test cycles on the road with a PEMS and during the RDE test, the vehicle produces NOx values that are more than 9 and more than 7 times the threshold value, respectively.

It becomes clear from the explanations provided by the manufacturer that the EGR rate is reduced in line with a declining inlet temperature and depending on the load. Given the high weight of the vehicle, even small accelerations require high loads, and therefore the EGR rate is reduced early on. The manufacturer explains its emission and component protection strategy using curve presentations and examples of component failures in the field.

Due to the season, the vehicle was tested at very low ambient temperatures (about 4 °C); thus, the NOx values, which are very high in relative terms (up to 12 times), can be explained by the temperature-dependent reduction in the EGR rate and a reduction in the injection of urea.

This emission reduction strategy, which is dependent on the outside temperature, reduces the efficiency of the emission control system under conditions which are to be expected in normal vehicle operation and use. Concerning the lawfulness of the broad interpretation of the temperature range used to protect the engine, the manufacturer says, and substantiates, that this is necessary to protect the engine from damage.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Jaguar	XE 2.0l	45.00	47.00	109.00	768.35	869.50	961.46	773.46	593.63



Manufacturer:		Jaguar
Trade name:		XE
Vehicle category:		M1
Capacity (cm^3):		1999
Emission standard:		Euro 6
Approval number:		e11*2007/46*2150*00
Type / model / version:		JA / C / 504
Engine performance (kW):		120
Mileage status (km):		20248
Condition (new / used):		used
First registration:		16 July 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	x
Inertia class	**[kg]**	1590
F0	**[N]**	108
F1	**[N/(km/h)]**	0.48
F2	**[N/(km/h)^2]**	0.0264

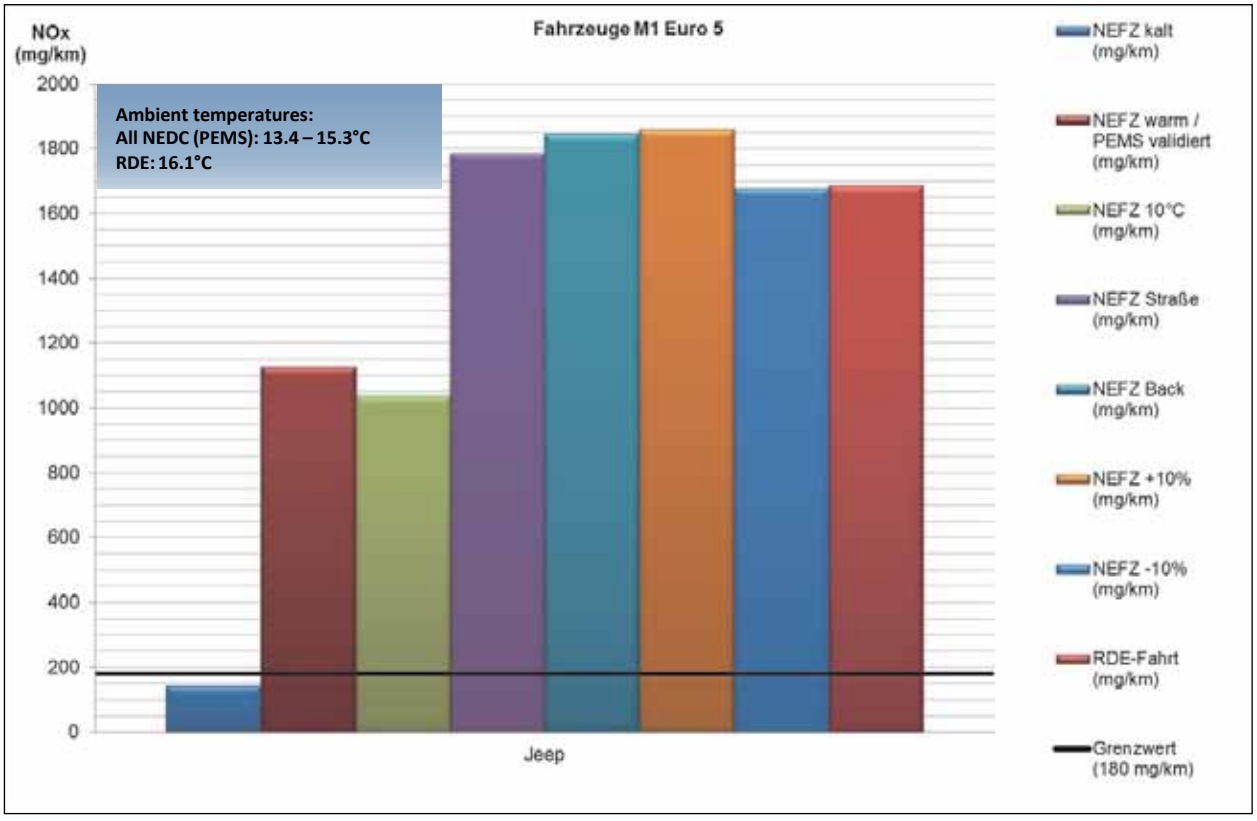
Jeep Cherokee 2.0 l Euro 5

After one Jeep Cherokee was tested and found to produce very high NOx values, a second vehicle was tested by a different Technical Service. Both vehicles complied with the threshold value during the cold NEDC test. The NOx values are more than 5 times the threshold value during the hot NEDC test. According to the manufacturer, the EGR rate is reduced based on the emission reduction strategy. This exhaust gas reduction strategy is the result of numerous defects in the field. Since then the EGR control strategy has been backed up via a separate urban heavy load cycle. The EGR rates are reduced for certain driving conditions to avoid a thermal overload of the particulate filter. This would explain the rise during the hot NEDC test. Accordingly, the NEDC 10 °C test produces a value more than 5 times the threshold value.

The PEMS measurements under road conditions conducted for all the different NEDC test cycles at ambient temperatures ranging from 17 °C to 10 °C produce NOx emissions of up to 12.5 times the threshold value. The RDE tests tended to produce comparable results. Overall, this implies a strong dependence of the EGR rate on the outside temperature. This is verified in a statement by the manufacturer FCA, according to which the EGR rate is reduced at temperatures ranging between below 20 °C and 5 °C to ensure a stable combustion pattern and to avoid damage to the EGR components and particulate filter.

This emission reduction strategy, which is dependent on the outside temperature, reduces the efficiency of the emission control system under conditions which are to be expected in normal vehicle operation and use. Concerning the lawfulness of the broad interpretation of the temperature range used to protect the engine, the manufacturer says, and substantiates, that this is necessary to protect the engine from damage.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Jeep	Cherokee 2.0l	144.00	1127.00	1039.32	1784.49	1847.15	1859.87	1678.24	1687.32



Manufacturer:		Jeep
Trade name:		Cherokee
Vehicle category:		M1
Capacity (cm^3):		1956
Emission standard:		Euro 5
Approval number:		e4*2007/46*0783*04
Type / model / version:		KL / JETCT / F5HD1A
Engine performance (kW):		125
Mileage status (km):		21345
Condition (new / used):		used
First registration:		03 March 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1930
F0	**[N]**	175.1
F1	**[N/(km/h)]**	0
F2	**[N/(km/h)^2]**	0.045

Land Rover Range Rover 3.0 l Euro 5

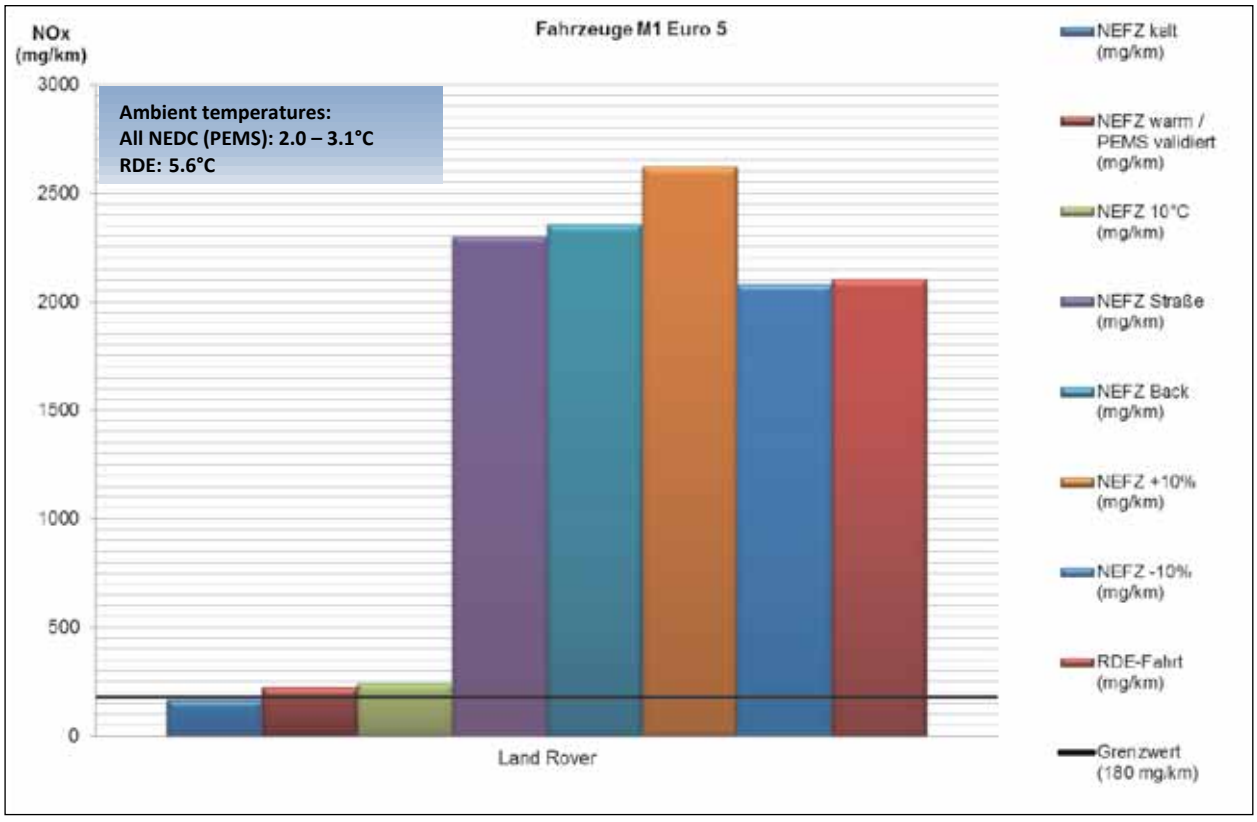
This vehicle complies with the NOx threshold value during the cold NEDC test. The hot NEDC and NEDC 10 °C tests produce values that only slightly exceed the NOx threshold value. However, the Range Rover produces excessive values higher than 11 times the threshold value during the PEMS on-the-road measurements in the NEDC test cycles and during the RDE test.

It becomes clear from the explanations provided by the manufacturer that the EGR rate is reduced in line with a declining inlet temperature and depending on the load. Given the high weight of the vehicle, even small accelerations require high loads, and therefore the EGR rate is reduced early on. The manufacturer explains its emission and component protection strategy using curve presentations and examples of component failures in the field.

Due to the season, the vehicle was tested at very low ambient temperatures (2 °C - 5 °C); thus, the NOx values, which are very high in relative terms (up to 14 times), can be explained by the temperature-dependent reduction in the EGR rate.

This emission reduction strategy, which is dependent on the outside temperature, reduces the efficiency of the emission control system under conditions which are to be expected in normal vehicle operation and use. Concerning the lawfulness of the broad interpretation of the temperature range used to protect the engine, the manufacturer says, and substantiates, that this is necessary to protect the engine from damage.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Land Rover	Range Rover 3.0l	165.62	222.88	243.36	2298.35	2359.24	2620.03	2078.21	2101.98



Manufacturer:		Land Rover
Trade name:		Range Rover
Vehicle category:		M1
Capacity (cm^3):		2993
Emission standard:		Euro 5
Approval number:		e11*2007/46*0649*05
Type / model / version:		LG / S5KY2F / D5Z1
Engine performance (kW):		190
Mileage status (km):		25900
Condition (new / used):		used
First registration:		23 May 2014
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	2270
Coast down times	**[s]**	
120 km/h		6.59
100 km/h		8.63
80 km/h		11.49
60 km/h		15.24
40 km/h		20.26
20 km/h		25.51

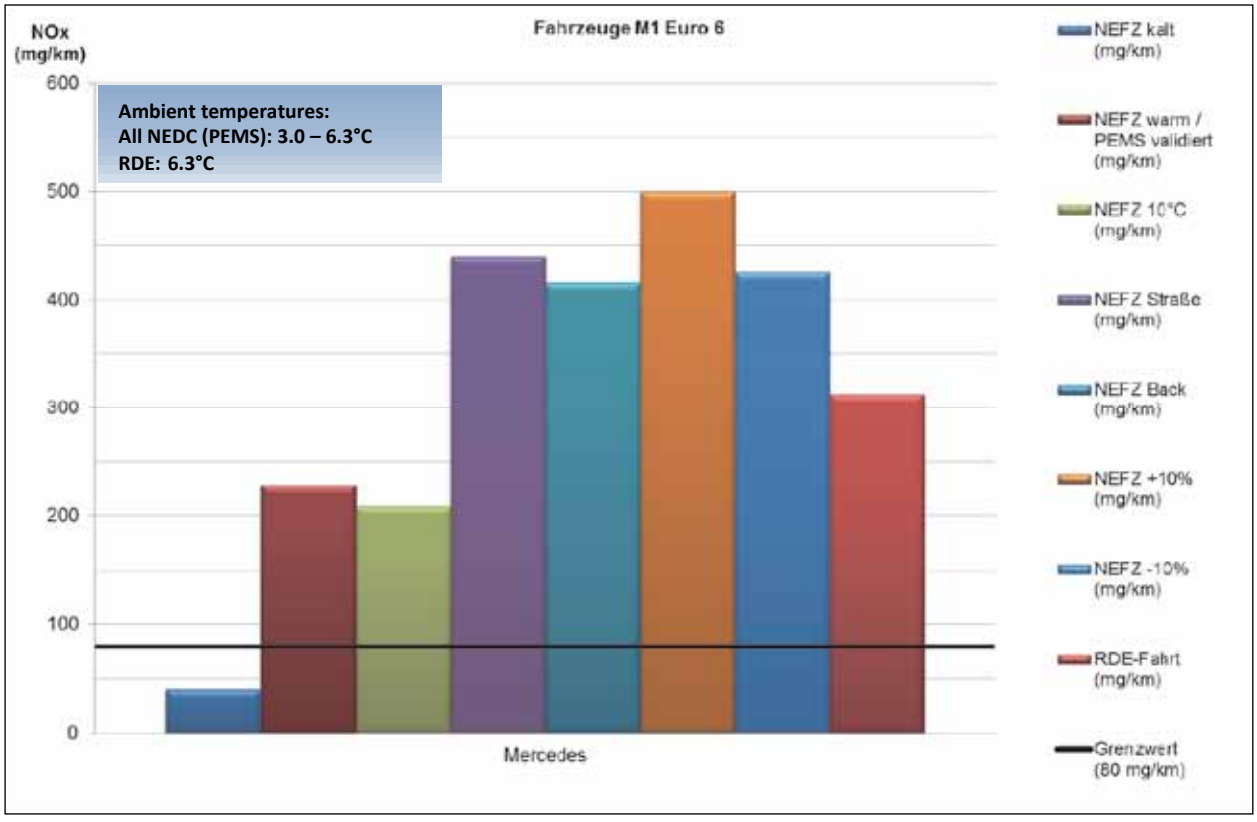
Mercedes V 250 Bluetec 2.1 l Euro 6

The V-Class complies with the threshold value during the cold NEDC test. The measurement of the hot NEDC test yields a value that is 2.9 times the NOx threshold value. According to the manufacturer, the rise in NOx emissions during the hot NEDC test is not plausible. Measurements conducted by the manufacturer show substantially lower values. It is reported that the V-Class produces 80 mg/km of NOx (+/- 40 mg/km) according to comparative measurements conducted by the manufacturer.

The NEDC 10 °C test yields 2.6 times the NOx threshold value. The PEMS on-the-road measurements produce 5-6 times the NOx threshold value for the NEDC test cycles. The manufacturer explains that due to the cold temperatures (3 °C to 6.3 °C) during the series of measurements, the SCR emission control takes place at the lower temperature limit. The NOx value of the RDE test exceeds the threshold value fourfold.

The manufacturer agrees to introduce an extended temperature range into the current production in the summer of 2016 by way of a set of measures. This will also be available to all the vehicles in the field as part of a service campaign. If the manufacturer assumes these measures as planned and if the KBA verifies their effectiveness, then doubts as to the lawfulness of the defeat device for reasons of engine protection would cease to exist.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Mercedes	V-Klasse 2.1l	39.79	228.66	208.51	439.55	415.84	500.00	426.05	312.98



Manufacturer:		Mercedes
Trade name:		V-Klasse
Vehicle category:		M1
Capacity (cm^3):		2143
Emission standard:		Euro 6
Approval number:		e1*2007/46*0457*12
Type / model / version:		639/2 / KLA8L305N / 2FLU7T28BE
Engine performance (kW):		140
Mileage status (km):		13700
Condition (new / used):		used
First registration:		28 April 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	x (2x)
Inertia class	**[kg]**	2150
F0	**[N]**	139.61000
F1	**[N/(km/h)]**	1.69170
F2	**[N/(km/h)²]**	0.03827

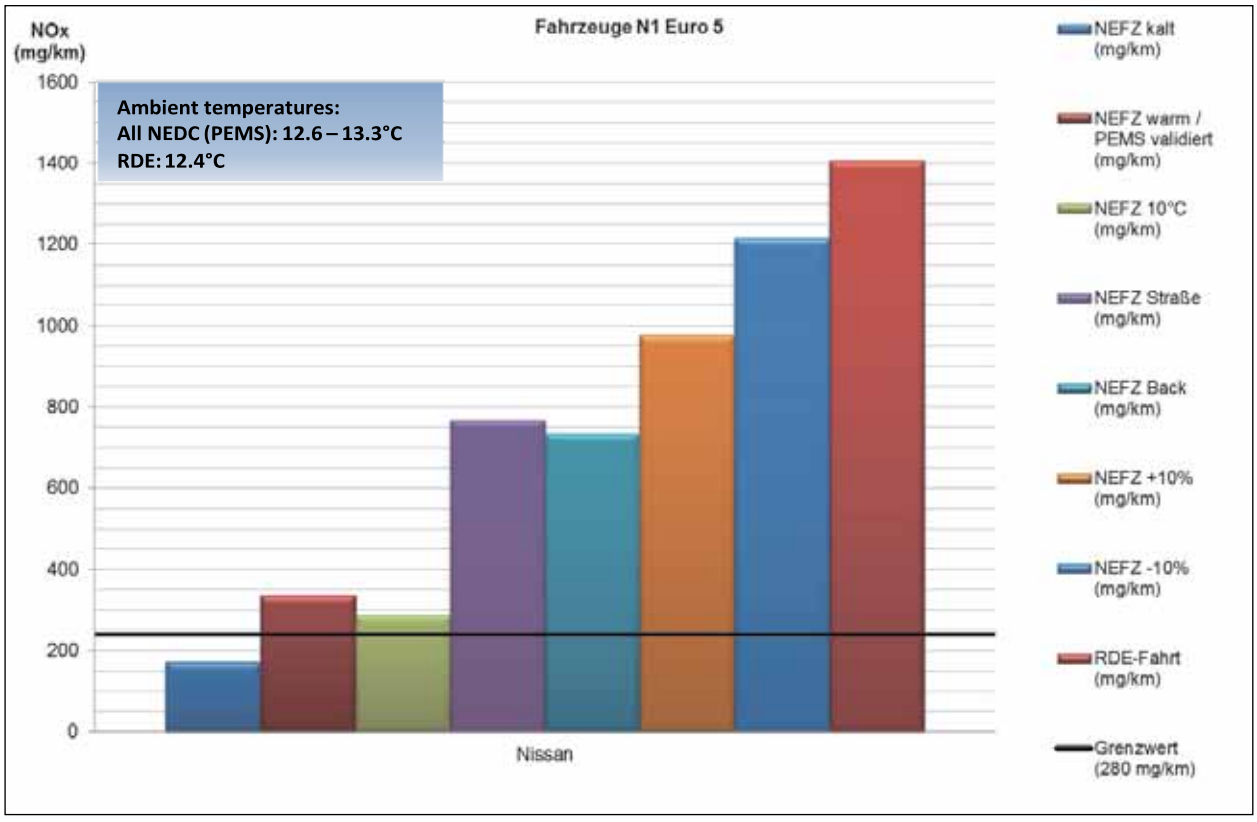
Nissan Navara 2.5 l Euro 5

Two vehicles were tested. The first vehicle did not comply with the initial cold NEDC test so that a defect was assumed and another vehicle was included in the test programme. This vehicle then did comply with the threshold value during the cold NEDC test. The threshold value is slightly exceeded during the hot NEDC test; however, during the NEDC test at about 11 °C, the vehicle complies with the threshold value. During the PEMS on-the-road measurements in the NEDC cycles at ambient temperatures of around 13 °C, the measurement values amounted to between 2.5 times and more than 4 times the threshold value; during the RDE test it was more than 5 times the threshold value.

During talks held with the manufacturer, the manufacturer said it suspected the first vehicle was defective. The values of the second vehicle were then recorded. An EGR and an LNT are used primarily to reduce emissions. The manufacturer confirms a great reduction in the EGR rate in a first step from 17 °C to 15 °C and a reduction to 0 at 10 °C. The manufacturer explains the chosen emission reduction strategy especially against the backdrop of the failure rates detected in the earlier engine generation. These failure rates had prompted the manufacturer in the current series to reduce the EGR rate at an earlier stage depending on the temperature in order to protect components.

This emission reduction strategy, which is dependent on the outside temperature, may reduce the efficiency of the emission control system under conditions which are to be expected in normal vehicle operation and use. Concerning the lawfulness of the broad interpretation of the temperature range used to protect the engine, the manufacturer says, and substantiates, that this is necessary to protect the engine from damage.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Nissan	Navara 2.5l	170.83	337.04	286.85	768.18	734.30	976.46	1214.41	1407.14



Manufacturer:		NISSAN
Trade name:		Navara
Vehicle category:		N1
Capacity (cm^3):		2488
Emission standard:		Euro 5
Approval number:		e9*2007/46*0018*16
Type / model / version:		D401/CDB2S/6M1C3BS5
Engine performance (kW):		140
Mileage status (km):		1258
Condition (new / used):		used
First registration:		24 September 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	2040
F0	**[N]**	175.300
F1	**[N/(km/h)]**	0.000
F2	**[N/(km/h)²]**	0.063

Opel Insignia 2.0 l

Opel Insignia complies with the threshold value during the cold NEDC test. The values increase only moderately during the hot NEDC test. There was no evidence of a pre-conditioning recognition. Comparisons of the results obtained on a single-axle dynamometer with those obtained on an all-wheel dynamometer did not indicate a dynamometer recognition. Turning off the air conditioning did not significantly impact the NOx values so that there is no indication of an unlawful defeat device.

During the NEDC 10 °C test, the NOx values were 5 times the threshold value. In the NEDC on-the-road test cycles the threshold was exceeded by more than 5 times.

In principle, Opel confirmed the results of the measurements conducted by the KBA (high NOx values in a cool temperature range).

According to Opel, EGR and the SCR injection work to the full extent in the temperature range of 20 °C – 30 °C; this temperature range is defined by Opel as "normal use" according to the regulation. Below that, the EGR rate is reduced iteratively. The injection of urea (AdBlue) works both on the dynamometer and on the road between -30 ° and 50 °C; it is reduced at an ambient temperature of below 17 °C.

According to Opel, the EGR rate is reduced in order to protect components. The sootiness of sensors in the intake and exhaust system, blocked EGR valves, clogged EGR coolers, and at times blocked intake and exhaust valves are given as examples. Furthermore, Opel names the increased instable nature of combustion at declining outside temperatures, which, in extreme cases, may even damage parts because of the stall in the turbocharger.

Regarding the SCR injection, it is stated that the SCR dosing mode was designed with the highest precision possible in the 20 °C – 30 °C ambient temperature range. According to the manufacturer, the model accuracy below this temperature is not sufficient so that the transient AdBlue injection continues unchanged while the AdBlue dosing strategy to load the SCR catalyst no longer works.

To break down NOx, SCR systems need ammonia (AdBlue is the source material). The system can store ammonia at catalyst temperatures starting at about 205 °C, so that it is available at lower temperatures when ammonia cannot be formed.

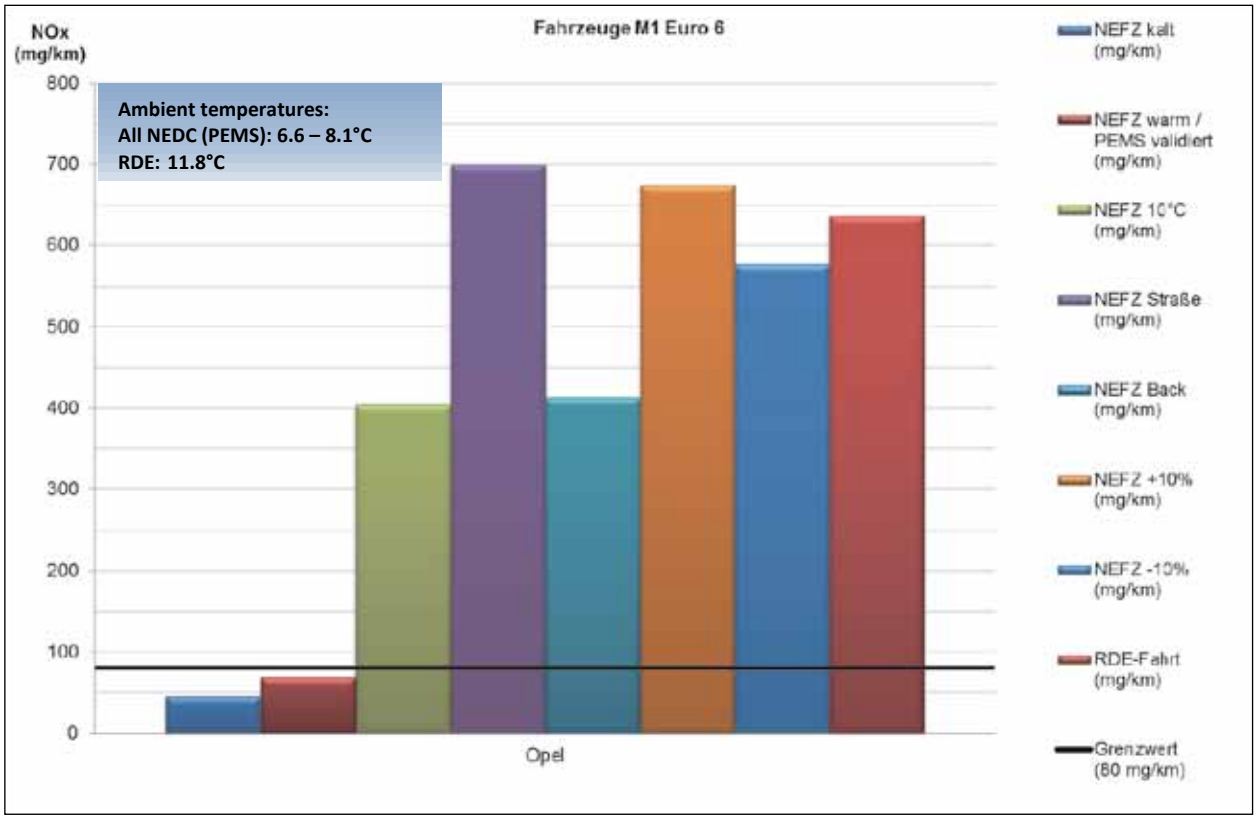
At low exhaust, component or outside temperatures, injected AdBlue may crystallise for the purpose of storing ammonia. This effect is supported by the installation of the SCR catalyst in the underfloor far away from the engine. Ammonia can also be released into the environment via the exhaust. Opel has explained the calibration on the basis of the ambient temperature in a way that the emission control system is protected from damage due to crystallisation and the release of ammonia is prevented.

This emission reduction strategy, which is dependent on the outside temperature, reduces the efficiency of the emission control system under conditions which are to be expected in normal vehicle operation and use. Concerning the lawfulness of the broad interpretation of the temperature range used to protect the components, the manufacturer says, and substantiates, that this is necessary to protect the engine from damage in view of the EGR, to protect the after treatment system from damage in view of the AdBlue injection, and to protect the environment from harmful ammonia emissions.

The manufacturer has agreed to improve the effectiveness of its combined EGR and SCR system across a broad temperature range up to its physical limits. Since vehicles with corresponding equipment have driven many kilometres in the field and since Opel thus understands the SCR technology better, it will review the calibration swiftly and make improvements with the future RDE requirements in mind.

These measures are intended to be available in mid-2016 for vehicles in production and vehicles in the field. If the manufacturer takes these measures as planned, and the KBA verifies their effectiveness, the suspicion of an unlawful reduction in the effectiveness of emission control systems for reasons of component protection would cease to exist.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Opel	Insignia 2.0l	45,00	68,00	404,00	698,79	413,37	674,63	577,11	637,05



Manufacturer:		Opel
Trade name:		Insignia
Vehicle category:		M1
Capacity (cm^3):		1956
Emission standard:		Euro 6
Approval number:		e1*2007/46*0374*17
Type / model / version:		0G-A DAHMC12 / BA1R5FMHL5
Engine performance (kW):		125
Mileage status (km):		5477
Condition (new / used):		used
First registration:		08 September 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	x
Inertia class	**[kg]**	1700
F0	**[N]**	122.98
F1	**[N/(km/h)]**	0.6392
F2	**[N/(km/h)²]**	0.0267

Opel Zafira 1.6 l Euro 6

The Opel Zafira complies with the threshold value during the cold NEDC test. The hot NEDC test produces only moderately elevated values. There was no evidence of a pre-conditioning recognition. Comparisons of the results obtained on a single-axle dynamometer with those obtained on an all-wheel dynamometer did not indicate a dynamometer recognition. Turning off the air conditioning did not significantly impact the NOx values so that there is no indication of an unlawful defeat device.

During the NEDC 10 °C test, the NOx values were 6.5 times the threshold value. In the NEDC on-the-road cycles the threshold was exceeded by more than 5 times.

In principle, Opel confirmed the results of the measurements conducted by the KBA (high NOx values in a cool temperature range).

According to Opel, EGR and the SCR injection work to the full extent in the temperature range of 20 °C – 30 °C; this temperature range is defined by Opel as "normal use" according to the regulation. Below that, the EGR rate is reduced iteratively. The injection of urea (AdBlue) works both on the dynamometer and on the road between -30 ° and 50 °C; it is reduced at an ambient temperature of below 17 °C.

According to Opel, the EGR rate is reduced in order to protect components. The sootiness of sensors in the intake and exhaust system, blocked EGR valves, clogged EGR coolers, and at times blocked intake and exhaust valves are given as examples. Furthermore, Opel names the increased instable nature of combustion at declining outside temperatures, which, in extreme cases, may even damage parts because of the stall in the turbocharger.

Regarding the SCR injection, it is stated that the SCR dosing mode was designed with the highest precision possible in the 20 °C – 30 °C ambient temperature range. According to the manufacturer, the model accuracy below this temperature is not sufficient so that the transient AdBlue injection continues unchanged, while the AdBlue dosing strategy to load the SCR catalyst no longer works.

To break down NOx, SCR systems need ammonia (AdBlue is the source material). The system can store ammonia at catalyst temperatures starting at about 205 °C, so that it is available at lower temperatures when ammonia cannot be formed.

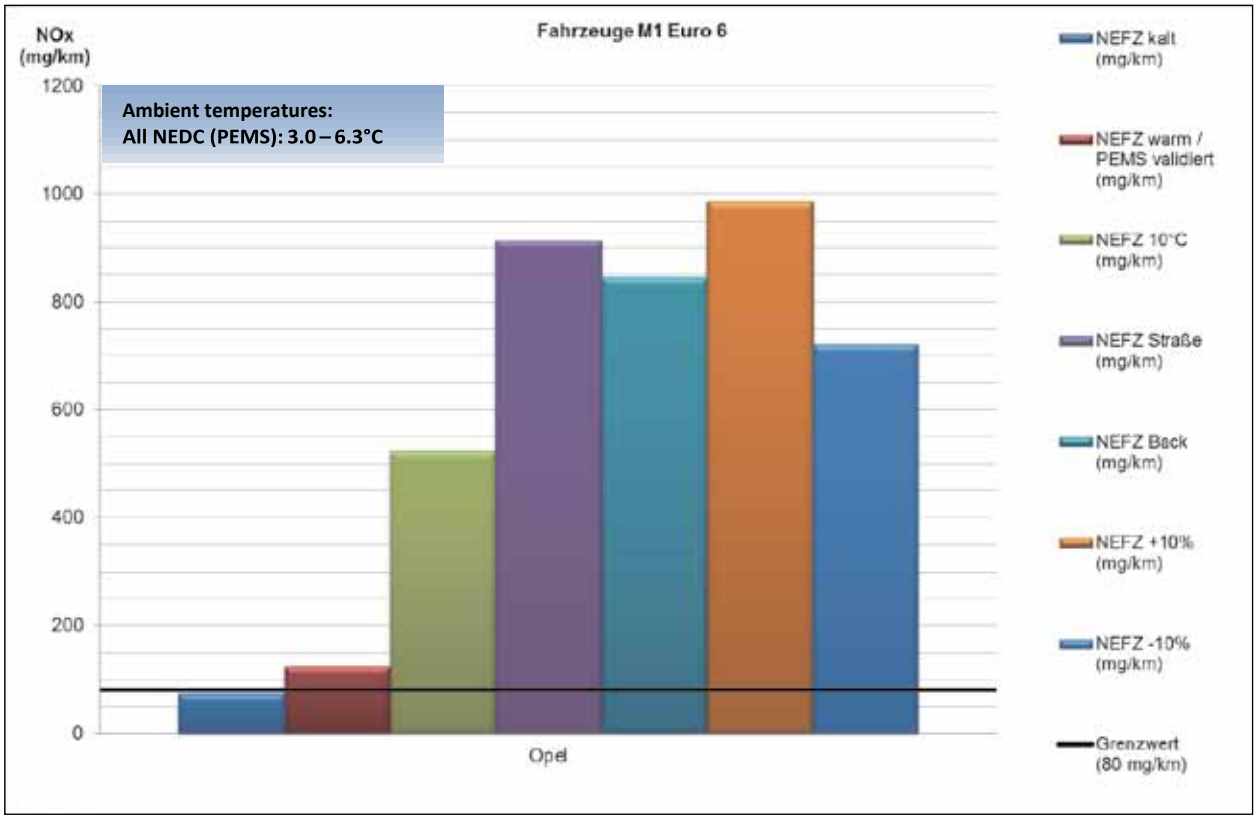
At low exhaust, component or outside temperatures, injected AdBlue may crystallise for the purpose of storing ammonia. This effect is supported by the installation of SCR catalysts in the underfloor far away from the engine. Ammonia can also be released into the environment via the exhaust. Opel has explained the calibration on the basis of the ambient temperature in a way that the emission control system is protected from damage due to crystallisation and the release of ammonia is prevented.

This emission reduction strategy, which is dependent on the outside temperature, reduces the efficiency of the emission control system under conditions which are to be expected in normal vehicle operation and use. Concerning the lawfulness of the broad interpretation of the temperature range used to protect the components, the manufacturer says, and substantiates, that this is necessary to protect the engine from damage in view of the EGR, to protect the after treatment system from damage in view of the AdBlue injection, and to protect the environment from harmful ammonia emissions.

The manufacturer has agreed to improve the effectiveness of its combined EGR and SCR system across a broad temperature range up to its physical limits. Since vehicles with corresponding equipment have driven many kilometres in the field and since Opel thus understands the SCR technology better, it will review the calibration swiftly and make improvements with the future RDE requirements in mind.

These measures are intended to be available in mid-2016 for vehicles in production and vehicles in the field. If the manufacturer takes these measures as planned, and the KBA verifies their effectiveness, the suspicion of an unlawful reduction in the effectiveness of emission control systems for reasons of component protection would cease to exist.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)			
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)
Opel	Zafira 1.6l	73.52	124.25	523.32	912.60	845.29	986.23	719.96



Manufacturer:		Opel
Trade name:		Zafira Tourer
Vehicle category:		M1
Capacity (cm^3):		1598
Emission standard:		Euro 6
Approval number:		e4*2007/46*0204*21
Type / model / version:		P-J/SW /EBEGC12 / BA2R5FPHA7
Engine performance (kW):		100
Mileage status (km):		264
Condition (new / used):		used
First registration:		13 September 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	x
Inertia class	**[kg]**	1810
F0	**[N]**	115.470
F1	**[N/(km/h)]**	-0.508
F2	**[N/(km/h)²]**	0.042

Porsche Macan 3.0 l V6 Euro 6

The Porsche Macan uses the 3.0 l V6 diesel engine produced by Audi, part of the VW Group. The emission reduction strategy comprises a warming up strategy which kicks in once following ignition.

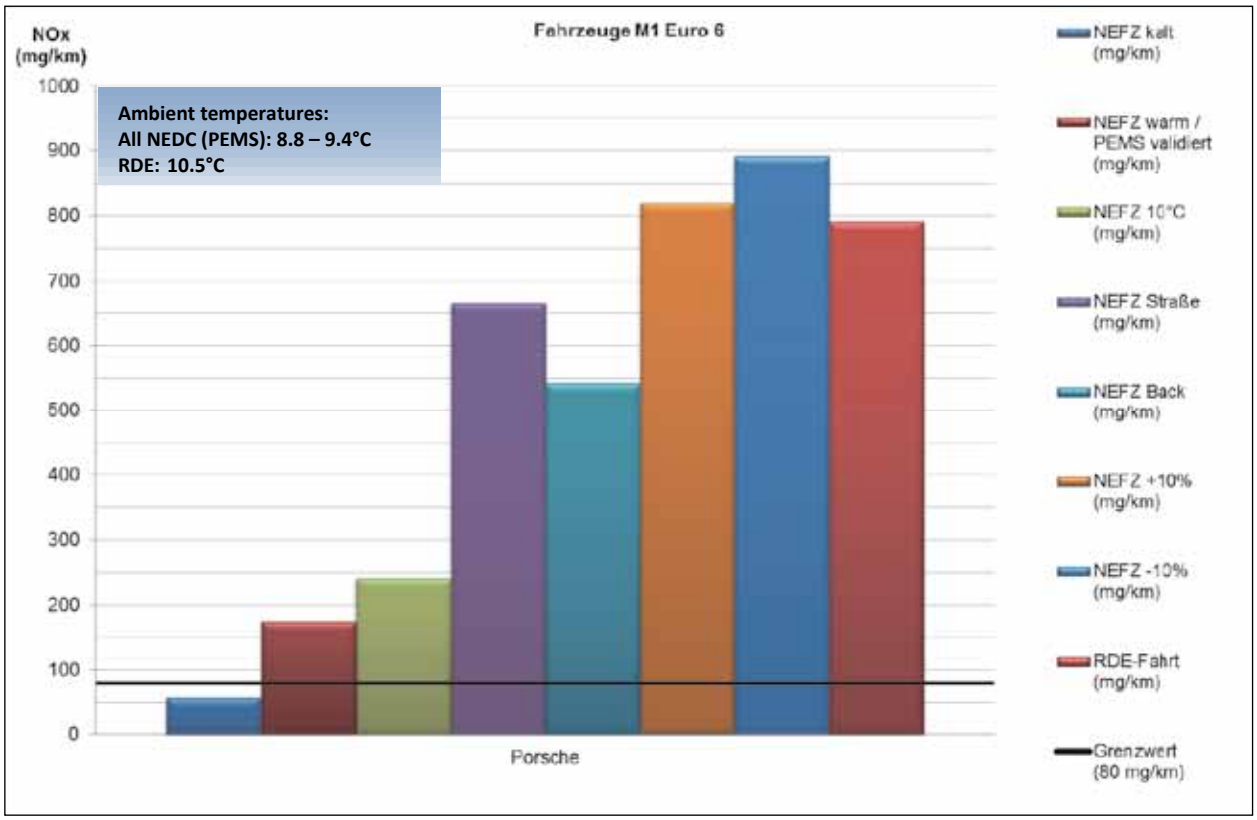
The Macan complies with the Type 1 threshold values. In the hot NEDC test, NOx emissions double. The manufacturer explains this inter alia with the warming up strategy no longer being active as the warming up has already been concluded prior to the test. It is explained that, given the low engine load in the NEDC "low load cycle", the exhaust gas temperatures necessary for the effective operation of the SCR catalyst are achieved at a late stage. The NEDC 10 °C test produces NOx values amounting to 3 times the threshold value. The NOx values measured with PEMS on the road are all above six times the threshold value. In principle, the manufacturer confirms the elevated measurement results.

According to the manufacturer, different temperatures are assessed and included in the strategy, such as the cooling water, exhaust, intake air, and ambient air temperatures. By ramping out the EGR rates below an ambient temperature of 17 °C towards declining temperatures, NOx emissions increase. According to the regulation this can be considered as a change of the emission behaviour of the exhaust gas system. The manufacturer cites component protection in the spirit of article 5(2) of the Regulation (EC) No. 715/2007 as an argument for the lawfulness. Sooting of the EGR system and poor engine operation are given as reasons.

The system has an SCR catalyst, the effectiveness of which is limited by the system, particularly in the lower temperature range where an exhaust temperature of about 200 °C cannot be achieved. Following initial findings, a first proposal made by the manufacturer to reduce the required component protection approach leads to lower NOx emissions on the road, also at lower outside temperatures. Higher EGR rates in lower ambient temperature ranges (up to 5 °C) would also ensure a better heating of the exhaust tract; this could also promote an SCR-based reduction in NOx.

The manufacturer has agreed to introduce the extended temperature range with the planned software update for the model year 2017, starting in calendar week 22 in 2016. Then, this will be made available for all vehicles in the field as part of a service campaign. If the manufacturer takes these measures as planned, and the KBA verifies their effectiveness, doubts regarding the lawfulness of the defeat device for reasons of engine protection would cease to exist.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Porsche	Macan 3.0l	57.95	174.84	241.24	665.47	541.82	820.01	890.95	791.06



Manufacturer:		Porsche
Trade name:		Macan
Vehicle category:		M1
Capacity (cm^3):		2967
Emission standard:		Euro 6
Approval number:		e13*2007/46*1165*04
Type / model / version:		95B / JG22 / 09
Engine performance (kW):		190
Mileage status (km):		3100
Condition (new / used):		used
First registration:		12 October 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	x
Inertia class	**[kg]**	1930
Coast down times	**[s]**	
120 km/h		5.70
100 km/h		7.43
80 km/h		9.91
60 km/h		13.42
40 km/h		18.08
20 km/h		23.13

Renault Kadjar 1.6 l und 1.5 l Euro 6
The Renault Kadjar complies with the threshold values of the Type 1 test. The measurement values of the hot NEDC test show no anomalies.

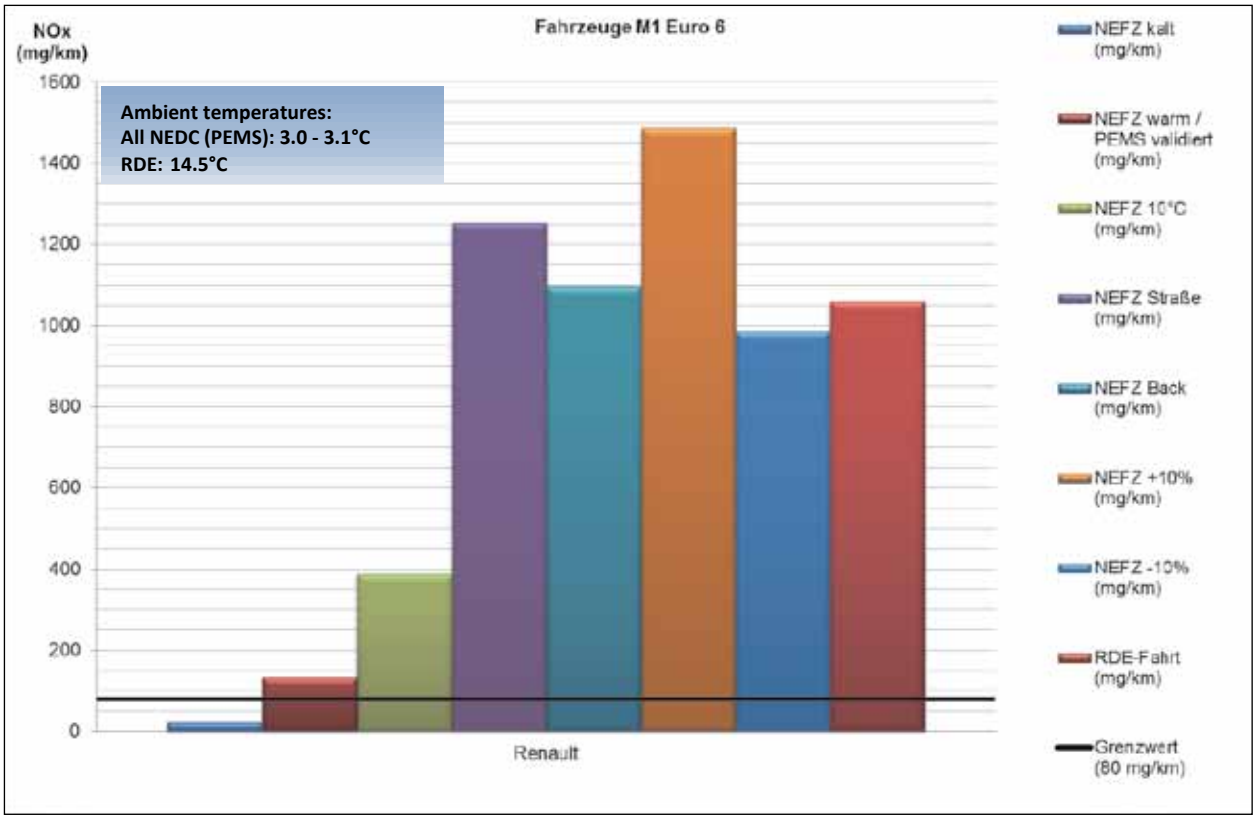
The NEDC 10 °C tests yield clear increases in the NOx values. The PEMS on-the-road measurements in the NEDC test cycles were conducted at low outside temperatures. They show particularly striking elevations of more than 10 times the threshold value. This indicates a temperature-dependent ramping function to reduce EGR rates. This was confirmed by the manufacturer in a statement. This constitutes a defeat device in the spirit of the regulation. The manufacturer explains the lawfulness with engine protection measures due to sootiness and lacquer formation of the EGR components, as well as the icing-up of the engine airpath and the sooting of engine oil.

This emission reduction strategy, which is dependent on the outside temperature, reduces the efficiency of the emission control system under conditions which are to be expected in normal vehicle operation and use. Concerning the lawfulness of the broad interpretation of the temperature range used to protect the engine, the manufacturer says, and substantiates, that this is necessary to protect the engine from damage.

The RDE tests yield elevations amounting to 14 times the NOx threshold value.

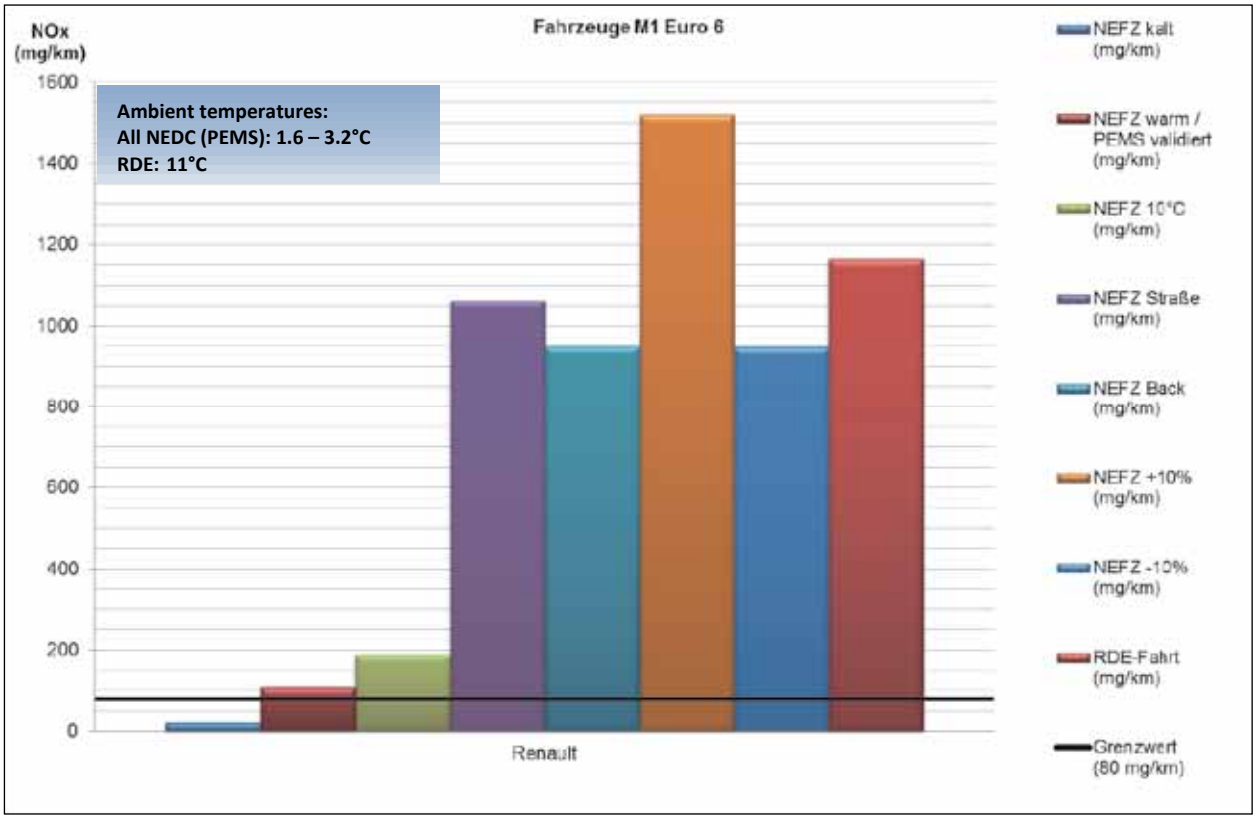
The manufacturer has already announced improvements in its emission reduction strategy both in talks with the KBA and in a press release.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Renault	Kadjar 1,6l	23.90	132.56	387.55	1252.99	1097.29	1487.17	985.69	1060.82



Manufacturer:		Renault
Trade name:		Kadjar
Vehicle category:		M1
Capacity (cm^3):		1598
Emission standard:		Euro 6
Approval number:		e2*2007/46*0475*01
Type / model / version:		RFE / RFEHH4 / RFEHH4A46ABB005000
Engine performance (kW):		96
Mileage status (km):		2600
Condition (new / used):		used
First registration:		13 October 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	x
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1590
Coast down times	**[s]**	
120 km/h		5.77
100 km/h		7.53
80 km/h		10.12
60 km/h		13.93
40 km/h		19.69
20 km/h		28.83

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Renault	Kadjar 1,5l	21.20	109.46	187.54	1062.47	951.34	1520.95	949.51	1164.19



Manufacturer:		Renault
Trade name:		Kadjar
Vehicle category:		M1
Capacity (cm^3):		1461
Emission standard:		Euro 6
Approval number:		e2*2007/46*0475*01
Type / model / version:		RFE / RFEHH2 / RFEHH2A3AABB005000
Engine performance (kW):		81
Mileage status (km):		2300
Condition (new / used):		used
First registration:		13 October 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	x
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1470
Coast down times	**[s]**	
120 km/h		5.95
100 km/h		7.92
80 km/h		10.85
60 km/h		15.32
40 km/h		22.13
20 km/h		31.80

Suzuki Vitara 1.6 l Euro 6

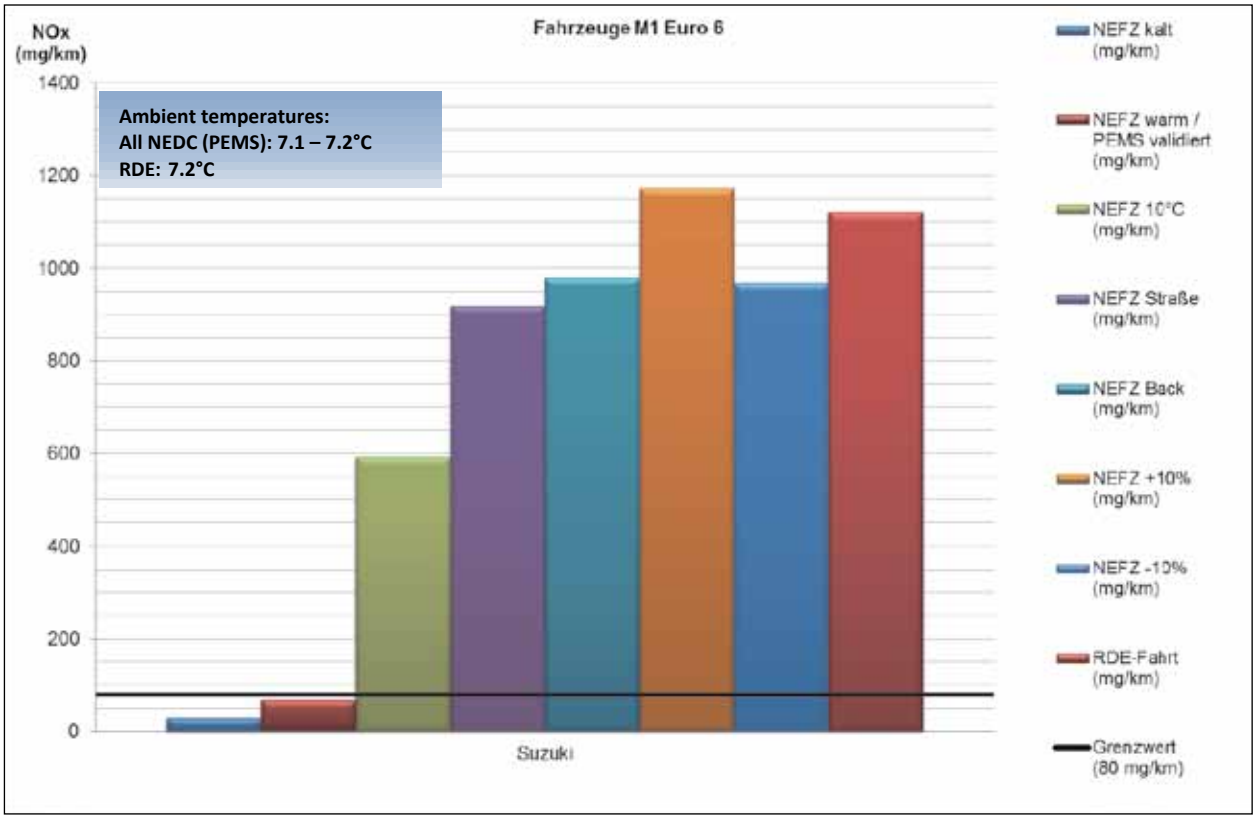
This Suzuki complies with the threshold values during the cold and hot NEDC tests. The NOx value of the NEDC 10 °C test is 7.4 times the threshold value. All PEMS on-the-road measurements in the NEDC test cycles and the RDE test are more than 11 times the threshold value. The measurements took place at an outside temperature of approximately 7 °C.

All in all, this implies a large dependence of the EGR rate on the outside temperature. Although the manufacturer FCA (Suzuki uses a powertrain produced by FCA) explains that the EGR rate was reduced less on the basis of the ambient temperature compared to its Euro 5 engines, the EGR rate is still reduced by about two-thirds at a temperature of approximately 7 °C in order to prevent the possible generation of shocks due to humid soot deposits in the diesel particulate filter and the destruction of the LNT due to the concentration and burning of hydrocarbon accumulations, and to avoid misfires and permanent damage to the EGR components and the LNT/DOC.

This emission reduction strategy, which is largely dependent on the outside temperature, reduces the efficiency of the emission control system under conditions which are to be expected in normal vehicle operation and use. Concerning the lawfulness of the broad interpretation of the temperature range used to protect the engine, the manufacturer says, and substantiates, that this is necessary to protect the engine from damage.

Nevertheless, the manufacturer agrees to improve the respective Suzuki vehicles in view of their emission behaviour under real-life driving conditions as part of a service campaign. It was said that this would take place as part of an update for the Euro 6 calibrations of all FCA engines, which is intended to be available as of April 2016 and was announced in a press release issued by FCA on 2 February 2016.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
Suzuki	Vitara 1.6l	30.00	68.00	593.61	919.13	979.20	1173.00	967.87	1122.00



Manufacturer:		Suzuki
Trade name:		Vitara
Vehicle category:		M1
Capacity (cm^3):		1598
Emission standard:		Euro 6
Approval number:		e4*2007/46*0928*01
Type / model / version:		LY / E81S / MT2
Engine performance (kW):		88
Mileage status (km):		4072
Condition (new / used):		used
First registration:		21 April 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	x
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1360
F0	**[N]**	79.775
F1	**[N/(km/h)]**	0.8714
F2	**[$N/(km/h)^2$]**	0.0353

VW Amarok 2.0 l N1 Euro 5

The tested vehicle with the engine EA 189, EU 5, 2nd Generation, complies with the NOx threshold value during the cold NEDC test. For the heavy group of N1 light-duty vehicles this value is 280 mg/km and thus 100 mg/km higher than for Euro 5 passenger cars. The results of the hot NEDC were more than twice the threshold value. During the PEMS on-the-road measurements at temperatures of around 12 °C and on the dynamometer at 10 °C, very high NOx emissions (up to more than 2,000 mg/km) are measured. The unlawful defeat device, disclosed in other EA 189 engines, has not been installed in this vehicle concept according to the manufacturer.

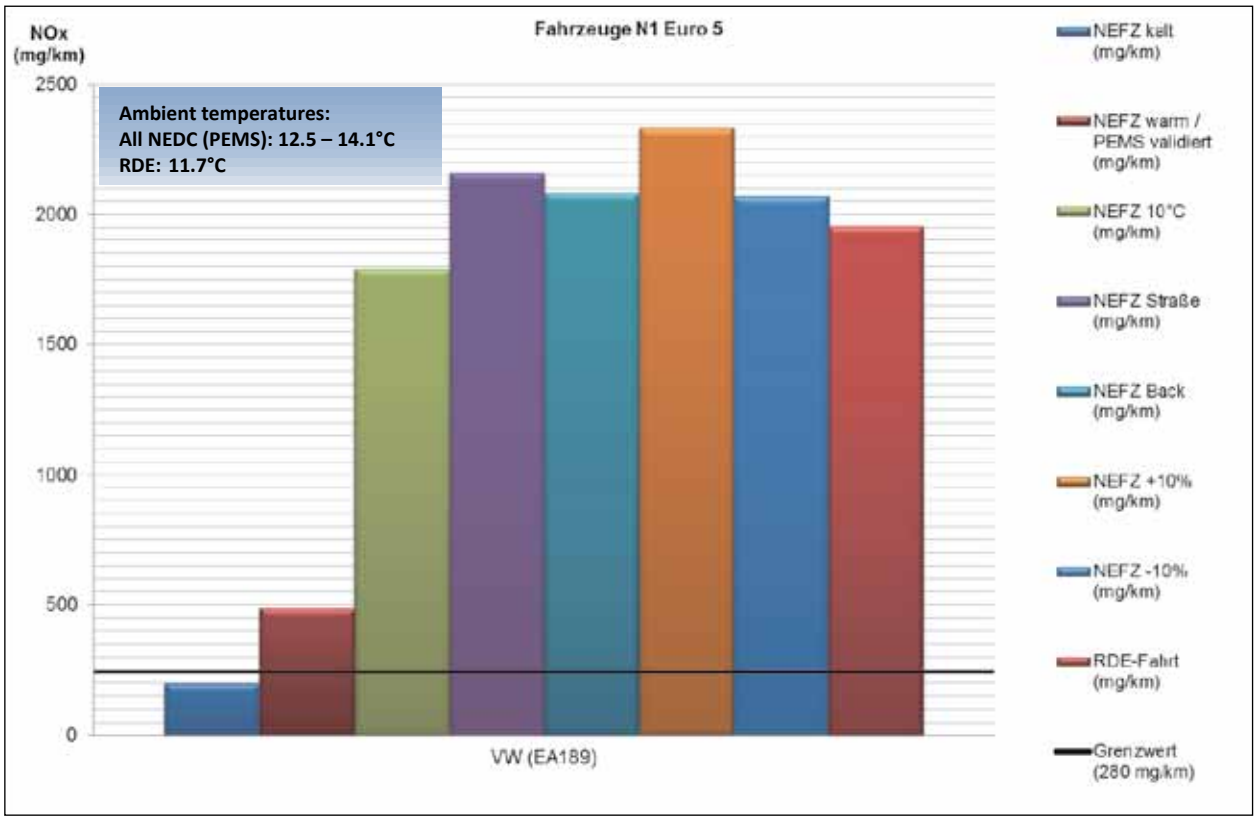
The manufacturer explained that for this vehicle concept a correction of the EGR rates takes place via these input parameters: ambient temperature, cooling water temperature and ambient pressure. Given the high number of component failures experienced in the field, the outside temperature range, in which the full EGR rate is used, was set to 15 °C- 30 °C, and the cooling water temperature to 15 °C- 98 °C. Beyond these temperature ranges the EGR rate is reduced drastically; at an outside temperature starting at 10 °C and a cooling water temperature exceeding 103 °C, for example, the EGR rate is only 5 %.

This emission reduction strategy, which is dependent on the outside temperature, reduces the efficiency of the emission control system under conditions which are to be expected in normal vehicle operation and use. Concerning the lawfulness of the broad interpretation of the temperature range used to protect the engine, the manufacturer says, and substantiates, that this is necessary to protect the engine from damage.

VW has decided on adjusting its strategy to control EGR in view of an extended temperature range for the production and for vehicles already on the road. Work is underway on a flatter "ramping out" of the EGR rate up to an outside temperature of approximately 0 °C. A trade-off of the risk of component failure in the area of the EGR cooler and the EGR valve needs to be considered. This measure is intended to be available for the series in mid-2016, and later on for vehicles in the field as part of a service campaign. Initial measurements conducted by the manufacturer show a clear reduction of the NOx emissions at low temperatures.

If the manufacturer takes these measures as planned, and the KBA verifies their effectiveness, doubts regarding the lawfulness of the defeat device for reasons of engine protection would cease to exist.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
VW (EA189)	Amarok 2.0l	197.24	486.83	1790.94	2158.68	2082.12	2334.02	2068.50	1955.68



Manufacturer:		VW
Trade name:		Amarok
Vehicle category:		N1G
Capacity (cm^3):		1968
Emission standard:		Euro 5
Approval number:		e1*2007/46*0750*08
Type / model / version:		2HS2 / DCCSHAX1V2B / AA8AA8CM003304NCR7MJ5UVR
Engine performance (kW):		132
Mileage status (km):		22948
Condition (new / used):		used
First registration:		27 April 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	2270
F0	**[N]**	228.000
F1	**[N/(km/h)]**	0.900
F2	**[$N/(km/h)^2$]**	0.065

VW Crafter 2.0 l N1 Euro 5

As a heavy N1 vehicle, the tested vehicle complies with the NOx threshold value of 280 mg/kg during the hot and cold NEDC tests. During the PEMS on-the-road measurements at temperatures of around 9 °C and on the dynamometer at 12 °C very high NOx emissions (up to more than 2,000 mg/km) are measured. The unlawful defeat device already disclosed has not been installed in this vehicle concept according to the manufacturer.

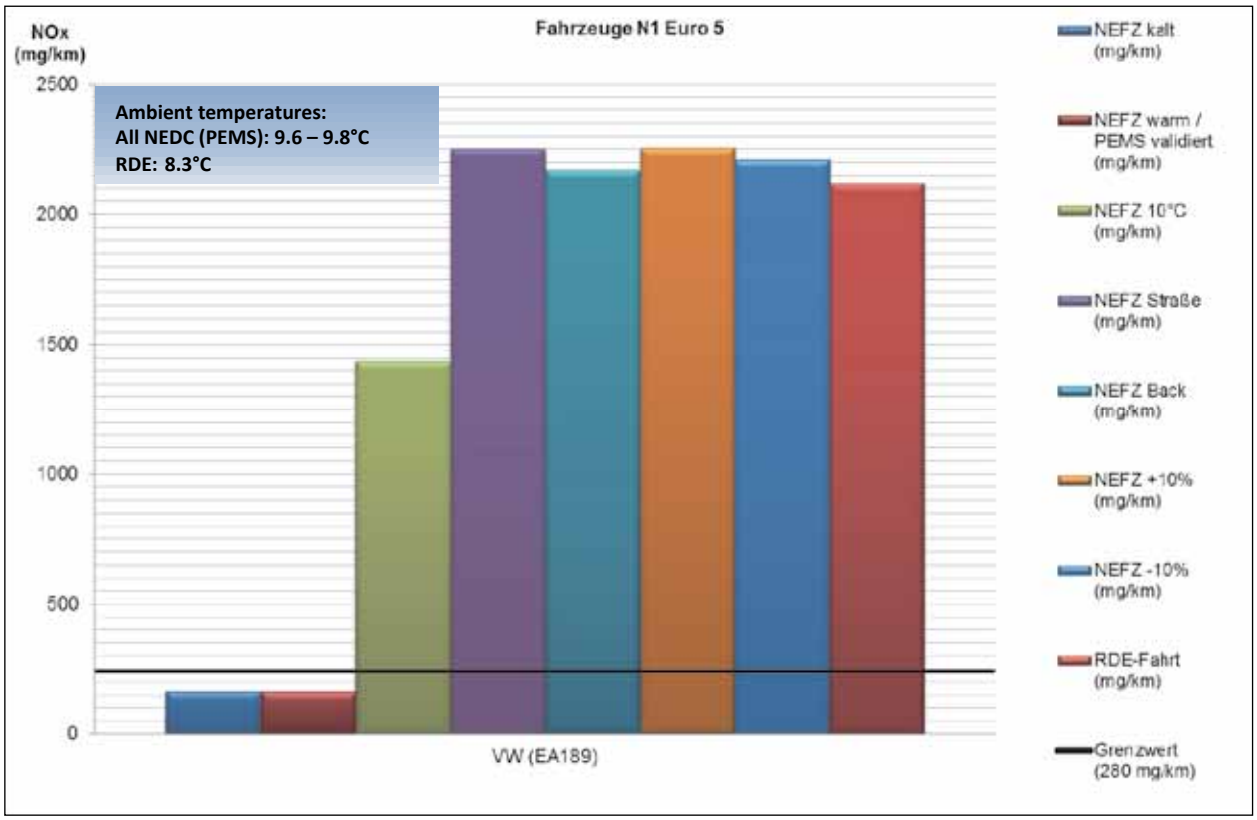
The manufacturer explained that for this vehicle concept a correction of the EGR rates takes place via these input parameters: ambient temperature, cooling water temperature and ambient pressure. Given the high number of component failures experienced in the field, the outside temperature range, in which the full EGR rate is used, was set to 15 °C- 30 °C, and the cooling water temperature to 15 °C- 98 °C. Beyond these temperature ranges the EGR rate is reduced drastically; e.g. at an outside temperature starting at 10 °C and a cooling water temperature exceeding 103 °C, the EGR rate is only 5 %.

This emission reduction strategy, which is dependent on the outside temperature, reduces the effectiveness of the emission control system under conditions which are to be expected in normal vehicle operation and use. Concerning the lawfulness of the broad interpretation of the temperature range used to protect the engine, the manufacturer says, and substantiates, that this is necessary to protect the engine from damage.

VW has decided on adjusting its strategy to control EGR in view of an extended temperature range for the production and for vehicles already on the road. Work is underway on a flatter "ramping out" of the EGR rate up to an outside temperature of about 0 °C. A trade-off of the risk of component failure in the area of the EGR cooler and the EGR valve needs to be considered. This measure is intended to be available for the series in mid-2016, and later on for vehicles in the field as part of a service campaign. Initial measurements conducted by the manufacturer show a clear reduction of the NOx emissions at low temperatures.

If the manufacturer takes these measures as planned, and the KBA verifies their effectiveness, doubts regarding the lawfulness of the defeat device for reasons of engine protection would cease to exist.

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
VW (EA189)	Crafter 2.0l	163.85	163.66	1435.57	2250.76	2171.13	2255.56	2210.74	2120.35



Manufacturer:		VW
Trade name:		Crafter
Vehicle category:		N1
Capacity (cm^3):		1968
Emission standard:		Euro 5
Approval number:		e1*2007/46*0514*09
Type / model / version:		2EKE2 / LM4C1350C / ED24VA3
Engine performance (kW):		100
Mileage status (km):		5827
Condition (new / used):		used
First registration:		17 September 2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	2270
F0	**[N]**	12.350*
F1	**[N/(km/h)]**	0.000*
F2	**[N/(km/h)²]**	0.084*

* according to table ECE-R83

(3) Group III Vehicles

VW Beetle 2.0 l EA 189 Euro 5
VW Golf Plus 1.6 l EA 189 Euro 5
VW Passat 2.0 l EA 189 Euro 5
VW Polo 1.2 l EA 189 Euro 5

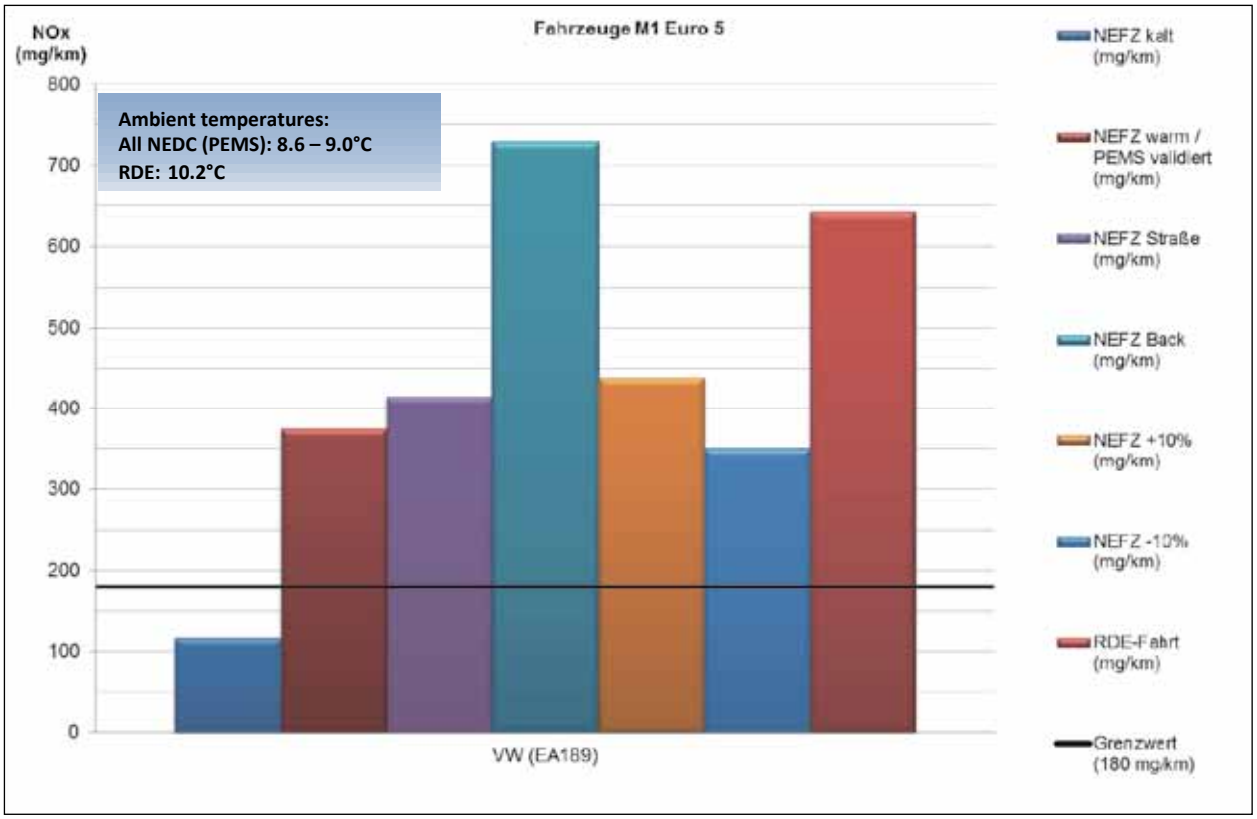
In their engine control device, the EA 189 diesel engines feature the unlawful defeat device, which was disclosed to the KBA by VW. By comparing the distance covered within a period of time, the defeat device recognises the NEDC and runs or starts the NOx-optimised mode. Furthermore, input parameters from the assessment of environmental conditions apply (so-called acoustic function). Only if these two preconditions are given will the engine be started and run in the low-NOx mode.

This strategy was illustrated with the VW Beetle 2.0 l with the help of several separate measurements conducted on the dynamometer. As soon as the vehicle was no longer in the distance/time corridor, NOx values deteriorated significantly and immediately. Apart from the defeat strategies described above, VW uses strategies to protect the engine at high and low temperatures. Any dependencies on ambient, cooling water and exhaust gas temperatures are summarised into complex strategies. In general, respective reductions in the EGR rates are realised by temperature-dependent ramp functions depending on the respective model. For some vehicle concepts these already start at 15 °C and they reduce the EGR rate to zero at 10 °C. The manufacturer confirms the test results obtained.

According to the manufacturer, sootiness and the formation of lacquer in the EGR valves occurred in the field. Depending on the failure rates, limit temperatures are parameterised and EGR rates are reduced by means of a ramp function.

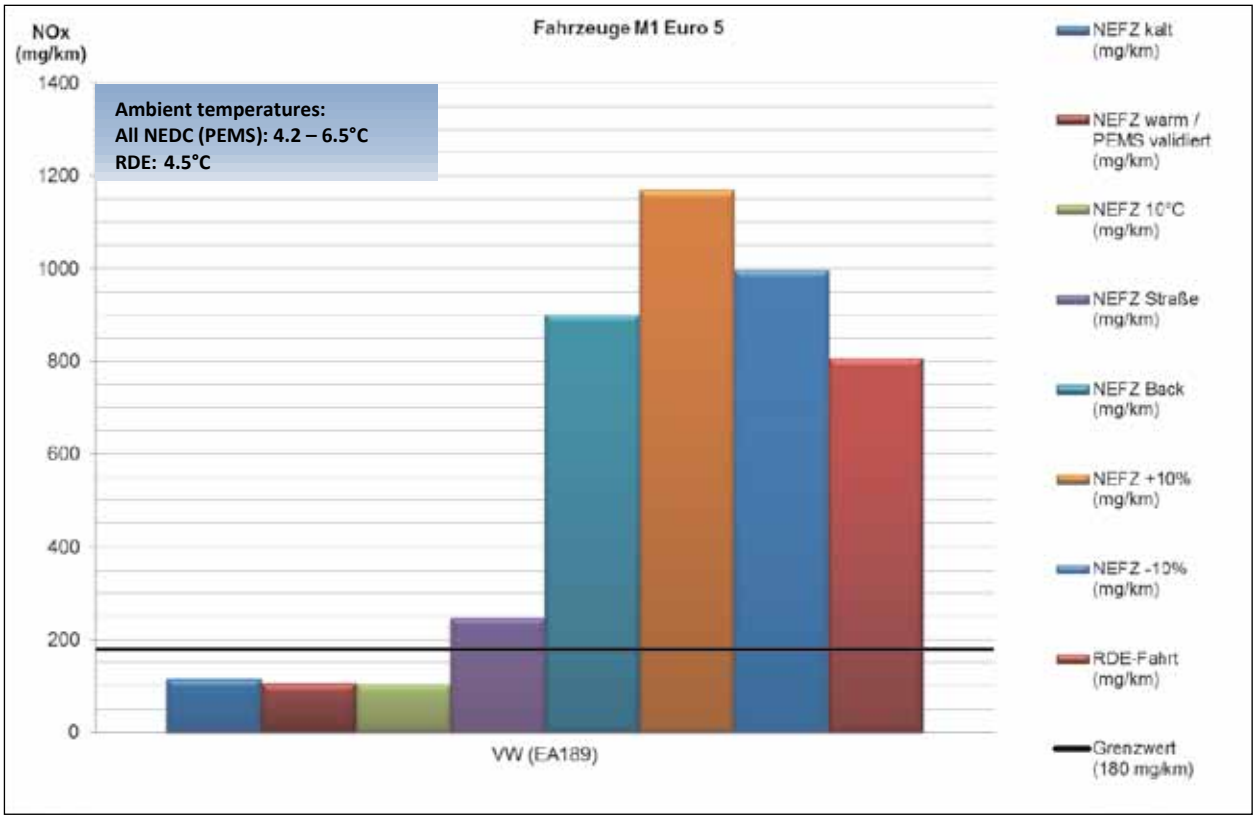
After concluding the actions mandated by the KBA to remove the unlawful defeat devices, the KBA will use similar measurements as described in this field investigation in order to retest all emission-, consumer- and performance-relevant features after the successful update.

		Chassis dynamometer		Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
VW (EA189)	Beetle 2.0l	116.21	374.67	414.34	727.99	437.84	350.51	641.65



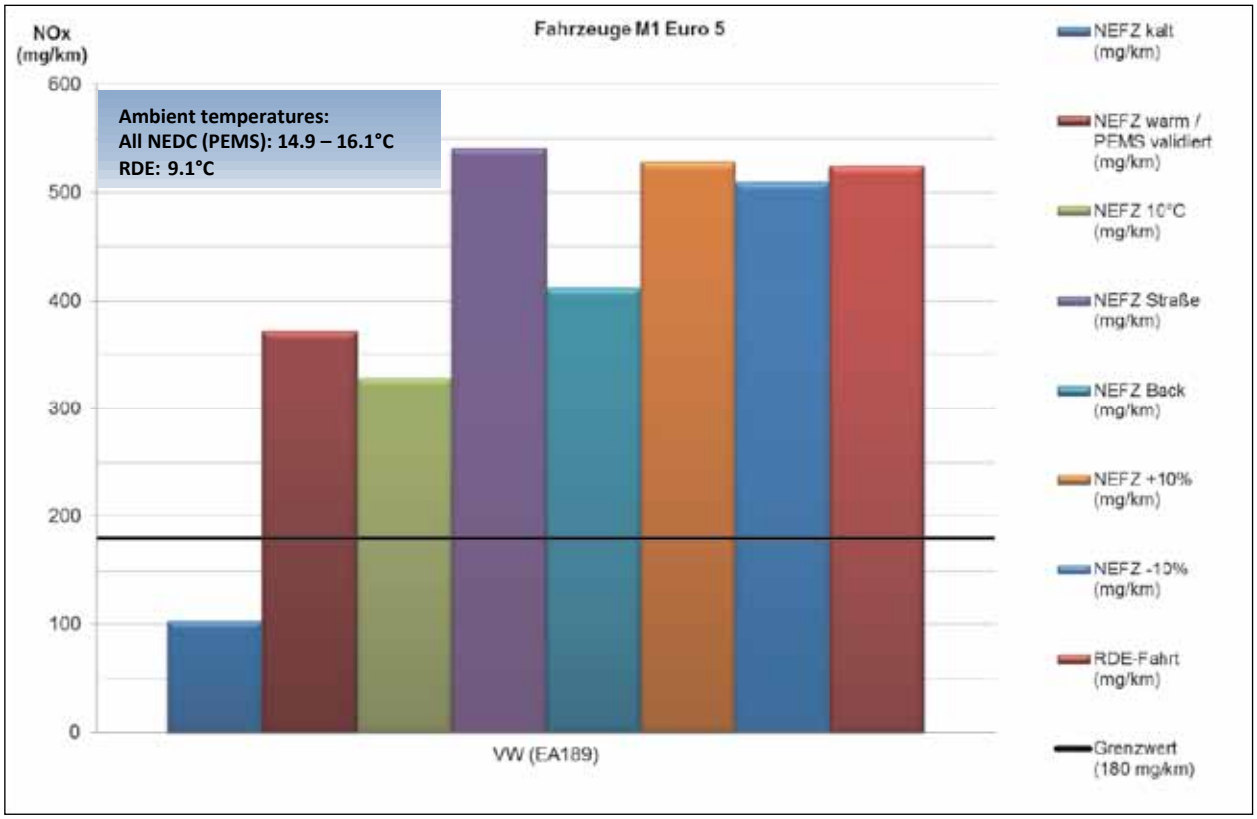
Manufacturer:		VW
Trade name:		Beetle EA189
Vehicle category:		M1
Capacity (cm^3):		1968
Emission standard:		Euro 5
Approval number:		e1*2007/46*0539
Type / model / version:		16 / ABCFFBX0 / FD6FD62E018N7MQN1VR0
Engine performance (kW):		103
Mileage status (km):		6939
Condition (new / used):		used
First registration:		2015
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1470
F0	**[N]**	98.000
F1	**[N/(km/h)]**	0.700
F2	**[N/(km/h)^2]**	0.037

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
VW (EA189)	Golf Plus 1.6l	114.29	106.07	103.57	246.36	900.67	1169.97	997.86	805.98



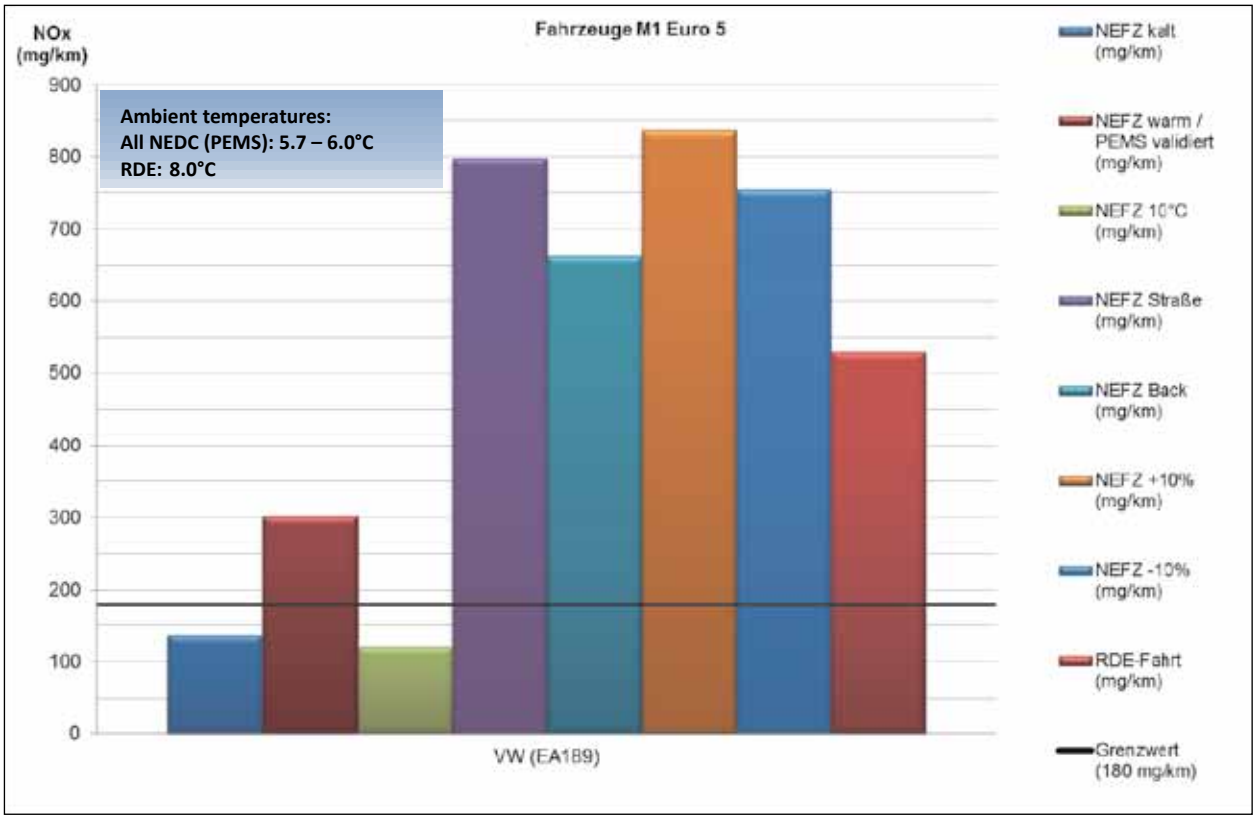
Manufacturer:		VW
Trade name:		Golf Plus EA189
Vehicle category:		M1
Capacity (cm^3):		1598
Emission standard:		Euro 5
Approval number:		e1*2001/116*0304*29
Type / model / version:		1KP / ACCAYCX0 / FD7FD7AM014N7MGN1
Engine performance (kW):		77
Mileage status (km):		42,428
Condition (new / used):		used
First registration:		15 July 2013
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1700
F0	**[N]**	119.21000
F1	**[N/(km/h)]**	0.79170
F2	**[N/(km/h)²]**	0.03196

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
VW (EA189)	Passat 2.0 TDI	103.00	372.00	329.00	539.93	411.95	528.40	509.83	524.47



Manufacturer:		VW
Trade name:		Passat EA189
Vehicle category:		M1
Capacity (cm^3):		1968
Emission standard:		Euro 5
Approval number:		e1*2001/116*0307*29
Type / model / version:		3C / ACCFFBX0 / FM6FM62Q025STP17MQSNVR2O
Engine performance (kW):		103
Mileage status (km):		72795
Condition (new / used):		used
First registration:		14 December 2011
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1810
F0	**[N]**	119.8
F1	**[N/(km/h)]**	0.3793
F2	**[N/(km/h)²]**	0.02852

		Chassis dynamometer			Portable Emission Measurement System (PEMS)				
Manufacturer	Trade name	NEDC cold (mg/km)	NEDC hot/ PEMS validated (mg/km)	NEDC 10°C (mg/km)	NEDC road (mg/km)	NEDC back (mg/km)	NEDC +10% (mg/km)	NEDC -10% (mg/km)	RDE run (mg/km)
VW (EA189)	Polo 1.2 TDI	136.00	302.00	121.00	797.35	662.57	836.64	754.23	530.42



Manufacturer:		VW
Trade name:		Polo EA189
Vehicle category:		M1
Capacity (cm^3):		1199
Emission standard:		Euro 5
Approval number:		e1*2001/116*0510*18
Type / model / version:		6R / ABCFWA / FM5FM52R031LLNVR07MJ
Engine performance (kW):		55
Mileage status (km):		30962
Condition (new / used):		used
First registration:		21 May 2014
After treatment of exhaust gases	**Oxi cat**	x
	EGR	x
	LNT	--
	Particulate filter	x
	SCR cat	--
Inertia class	**[kg]**	1360
F0	**[N]**	93.91
F1	**[N/(km/h)]**	0.374
F2	**[N/(km/h)²]**	0.02946

4. Assessment

a. VW Group Vehicles Equipped with Unlawful Defeat Devices

Measurements conducted on VW Group vehicles with Euro 5 concepts (EA 189 engines) were able to show the effect of the unlawful defeat device. The unlawful defeat device recognises the statutory dynamometer test and ensures that the test is run in an emission reduction mode which leads to a significant reduction in NOx emissions. A switch to a different mode takes place on the road under comparable conditions so that NOx emissions increase.

b. All Other Vehicles

Until the publication of this report, no unlawful defeat device was found in any other vehicle than in certain VW Group vehicles.

The allegation of the use of illegal defeat devices in some 3.0-litre engine models, brought forward in the US, has not been confirmed in this form within an independent investigation conducted by the KBA into the vehicle types Audi A6 and VW Touareg for the European market.

All manufacturers use defeat devices as per the definition set forth in Article 3 of the Regulation (EC) No. 715/2007. In the case of some vehicles (Group II), measurements conducted slightly outside the statutory NEDC yield significantly higher NOx values. The manufacturers justify the lawfulness of the increase in emissions based on defeat devices mainly on the basis of the exemption set forth in Article 5(2) of the Regulation (EC) No. 715/2007, i.e. with measures aimed at protecting the engine and ensuring safe operation. The respective approval authorities need to clarify whether these increases indicate an unlawful defeat device or whether they can be explained in a plausible manner on the basis of applicable regulations and are thus to be accepted.

(1) Vehicle Approvals and Emission Permits Issued by the KBA

Intensive talks were held with the manufacturers of vehicles with critical emission reduction concepts (Group II) in order to find out more about the increases.

Notwithstanding the lawfulness of their defeat devices, several manufacturers agreed to make voluntary technical improvements, also in vehicles in the field. The KBA will review these enhanced emission reduction concepts with regard to their effectiveness prior to their implementation.

(2) Approvals Issued by Other European Approval Authorities

The KBA will inform the competent European approval authorities about all the findings, and in particular about anomalies (Group II vehicles), and ask for another assessment.

D. Conclusions

I. Legal Assessment

1. Varying Interpretations of the Regulations

The Regulation (EC) No. 715/2007 contains two specifications which are unclear and, therefore allow varying interpretations in terms of the application of the regulation:

a. The Concept of "normal use"

The concept of "normal use". This is relevant because Article 5(1) of the Regulation (EC) No. 715/2007 obliges the manufacturer to equip the respective vehicle so that the components likely to affect emissions are designed, constructed and assembled so as to enable the vehicle, in normal use, to comply with this Regulation and its implementing measures.

b. Rules Governing Defeat Devices

Rules governing the lawfulness of defeat devices by way of exception. While Article 5(2), sentence 1 of the Regulation (EC) No. 715/2007 formulates as a principle that the use of defeat devices that reduce the effectiveness of emission control systems shall be prohibited, Article 5(2), sentence 2 of the Regulation (EC) No. 715/2007 allows for three exceptions to the general prohibition of the use of defeat devices. If one of these three exceptions applies, then according to the will of the European legislature the use of a defeat device is to be considered lawful. It is of particular relevance that the need for such a device is justified in terms of protecting the engine against damage or accident and for safe operation of the vehicle (Article 5(2) sentence 2 lit. a of the Regulation (EC) No. 715/2007.

2. Legal Appraisal

a. The Concept of "normal use"

In view of the concept of "normal use", the strongest arguments are in favour of this constituent element, set forth in Article 5(1) of the Regulation (EC) No. 715/2007, having to be interpreted as to mean "real-life operating conditions" as found in Europe, the regulatory reference framework of the provision. In light of the diverse nature of such real-life operating conditions it is not possible to simulate them entirely in the laboratory on the basis of the test cycles currently available.

At the same time, a different view can be taken as to the interpretation of the constituent element of "normal use". The fact that the constituent element of "normal use" is linguistically very vague allows room for interpretation, and the realisation that there is no defined test pattern for such "normal use" might allow for the objection that to establish this constituent element by way of interpretation, one may resort to the NEDC in the absence of other testing criteria according to Regulation (EC) No. 715/2007.

It would have been advisable that the European legislature had specified and explained the constituent element of "normal use" at the time of the entry into force of Regulation (EC) No. 715/2007, with regard to what it entails and how such "normal use" is to be simulated. It would have seemed reasonable then to describe and specify the framework conditions of "normal use" in greater detail in order to enable approval authorities - this being the KBA in Germany - to apply this norm in a practical way. In particular, this concerns rules regarding which engine operating range is to be considered as normal and under which external conditions this operation has to take place, as well as specifications of whether and to which degree unusual operating conditions have to be understood as being part of "normal use", e.g. cold starts, driving in winter temperatures, or driving at high altitudes. However, relevant implementing rules have not been adopted on the European level.

b. Rules Governing Defeat Devices

In view of the protection of the engine constituting an exemption, it is to be noted that this provision lacks sufficient clarification and legal certainty.

Within an administrative procedure aimed at clarifying the preconditions for the use of defeat devices, manufacturers are obliged to contribute to establishing the facts according to the applicable law, e.g. by providing information or documents. This obligation to cooperate is based on the power of the authority, set out in § 24 of the German Administrative Procedure Act, to examine the facts that are of relevance to the decision ex officio and to consider all the relevant circumstances of the case, and thus also circumstances that are favourable to the participants (§ 24(2) Administrative Procedure Act). The authority shall determine the type and scope of the investigation. These possibilities were made use of in the course of the investigations conducted by the KBA by requesting explanations both on the technology used and on the reasons for the use of defeat devices from all of the manufacturers. However, manufacturers cannot be forced to cooperate to establish the facts that are of relevance to the case, for no one is bound to accuse himself based on the principle "nemo tenetur se ipsum accusare" under constitutional law; thus, the duty to assist in ascertaining the facts as per § 26(2) German Administrative Procedure Act is designed as a directory provision. Furthermore, the

broad interpretation by the automotive manufacturers as well as the use of defeat devices on the grounds that such a disconnection is necessary to protect the engine against damage and for the safe operation of the vehicle may possibly not violate Regulation (EC) No. 715/2007 given the vagueness of the provision, which also allows for broad interpretations.

A consequence of the vagueness of this European regulation could be that the use of defeat devices could ultimately always be justified by quoting the protection of the engine if the manufacturer explains in a comprehensible manner that without such a device there is the risk of damage to the engine, however small it may be.

II. Changes to the Regulation Already Adopted

Different European examinations have shown that real-world emissions, especially those of diesel vehicles, in some cases significantly exceed the emission threshold values of the values obtained in laboratories. A more effective control of the real-world emissions produced by passenger cars and light-duty vehicles in the future is therefore considered a crucial measure to improve air quality. To this end, the European Commission set up a working group in 2011, which is developing an additional test procedure with a Portable Measurement Emission System (PEMS); this system is to control and record the emissions of passenger cars and light-duty vehicles in real use (Real Driving Emissions, RDE) as part of the type approval, i.e. in normal use on the road. In 2015, two regulations specifying the test procedure and separate factors of conformity were adopted within the comitology procedure; they are to be applied for new type approvals as of September 2017.

With the introduction of these RDE regulations, the legal uncertainties named in section D.I. regarding Regulation (EC) No. 715/2007, which have existed from the start, are partially taken into account. At the same time, the European Commission conceded that the measurement conditions in the laboratory on a dynamometer differ fundamentally from "normal use" in the sense of Article 5(1) of the Regulation (EC) No. 715/2007. With RDE, "normal use" will be specified via marginal conditions for a valid RDE measurement, inter alia in view of the distance covered, driving style or environmental conditions.

The future RDE requirements will make it much harder to use unlawful defeat devices. Furthermore, the emission increases due to defeat devices, which are allowed according to the exceptions set forth in Article 5(2) of the Regulation (EC) No. 715/2007, will be reduced significantly.

III. Proposed Measures

As set out in section D.II. of the report, important regulatory changes have been introduced which are aimed at reducing the real-world emissions of vehicles and to prevent unlawful defeat devices. The prospective RDE regulation is an important building block of a possible solution.

The experience the Commission of Inquiry has gained from its work tells us that more action is required to come to a comprehensive solution. In order to better ensure the recognition and avoidance of unlawful defeat devices in the future, the vehicle type approval processes and separate exhaust gas provisions on the international, European and national level need to be improved and adjusted.

1. Prospective Measures on the International Level

Right after the allegations brought forward by the US authorities against VW became known, the Commission of Inquiry initiated an information exchange with the EPA. A telephone conference and numerous bilateral meetings with the EPA took place. The possibilities of a detailed exchange of information were limited because proceedings are ongoing on both sides.

On 06 - 07 April 2016, the EPA hosted an international conference on the conformity of vehicles in view of exhaust gas emissions. It was agreed to launch a regular exchange of experience on the international level in order to detect and treat vehicles that do not comply with applicable emission rules.

The World Forum for Harmonization of Vehicle Regulations (WP.29) under the auspices of the United Nations Economic Commission for Europe (UNECE) is the body which harmonises international motor vehicle regulations. All the countries that are important with regard to the global automotive sector, e.g. the US, Canada, Japan, China, India, and South Korea, are all part of the WP.29. The international exchange of information in connection with the experience gained in the VW case should be intensified within the WP.29 as well. The respective harmonised rules should be adjusted and developed further in order to ensure the greatest conformity of regulations for vehicles possible.

2. Measures on the European Level

Since September 2015, the BMVI has been reporting regularly to the European bodies and has been informing the EU Commission and the Member States as well. Additionally, the KBA has been reporting on its activities

in meetings of the Technical Committee Motor Vehicles (TCMV) and the Type Approval Authorities Expert Group (TAAEG), and has been informing the other European type approval authorities about the formal steps taken in the administrative procedure in the VW case as the competent type approval authority in line with the requirements of the Type Approval Directive 2007/46/EC.

The European Commission is coordinating an information exchange in the TCMV and in the TAAEG. In this context the Joint Research Center (JRC) of the European Commission is developing a test procedure in conjunction with the Member States with which manipulations, including the use of unlawful defeat devices, can be detected. At the outset of this endeavour, the Member States conducting re-examinations informed about the test methods used. It is not possible to give legally certain proof of the use of unlawful defeat devices, as in the VW case, with the test procedures used in the type approval processes so far; this also includes conformity tests of the series and vehicles in the field. Having drawn its conclusions from the VW case, the European Commission has proposed to amend the type approval regulations (Revision of the Framework Directive 2007/46/EC).

The Commission of Inquiry believes that it is not necessary to introduce new European authorities and to create new competencies; however, the following measures are required on the European level regarding regulations governing vehicle technology.

a. Software Disclosure

The type approval regulations need to provide for a compulsory incident-related disclosure of the software by the manufacturer towards the type approval authority and Technical Services. The individual regulations need to describe the applicable test procedure and their scope in detail.

b. Re-examinations and Monitoring

Re-examinations have to be intensified during production (CoP), on the market (market surveillance) and for vehicles in the field (ISC) to ensure the vehicles' conformity with emission regulations. In this context, Germany has been making the case for strengthening the role of national monitoring programmes, i.e. field monitoring, in European type approval regulations so that apart from the vehicle conformity reviews, which are already specified in the regulations, independent re-examinations can be conducted and taken into consideration. Currently, Germany is only one of four Member States that have carried out regular and voluntary research projects on vehicle emissions in the past. Germany and other Member States call for the introduction of rules governing the effective market surveillance of passenger vehicles and commercial vehicles in the European type approval regulations.

European regulations need to be improved so that they provide for a qualitative and quantitative framework which allows uniform re-examinations throughout Europe and prevents competition between the type approval authorities. The scope of the tests and the tools needs to be incorporated into the individual regulations to enable a consistent application. Suitable test procedures with measurements conducted in the laboratory and with portable measuring systems to be used on the road need to be developed and introduced so that the use of unlawful defeat devices can be detected and verified with as much legal certainty as possible. For CoP and ISC, the Type 1 test in the NEDC has been carried out on a dynamometer according to the regulations applicable up to now. This explains why the manipulation of exhaust emissions, as in the case of VW, and the use of other defeat devices have not been recognised within the conformity tests conducted so far. Moreover, the re-examination of the consumption and CO2 values is intended to be introduced in the European regulations regarding the conformity tests of vehicles in the field, just as it is the case for pollutants.

c. Type Approval Regulations

The type approval regulations for passenger vehicles need to be clearer and more precise to ensure a safe and high quality type approval process. As far as emission regulations are concerned, it should be examined whether a rotation of the Technical Services can be accepted and realised on the European level. Furthermore, the individual provisions should be adjusted so that in principle, Technical Services have to conduct tests on their own testing stations.

d. Applicability of the Regulations

A more precise wording of the European regulations is necessary so that they can be applied and monitored without any further ado. The regulations governing defeat devices which have been applicable so far cause legal uncertainties among manufacturers and are not a sufficient basis to help type approval authorities to distinguish between lawful and unlawful defeat devices and to take legal action against the latter. In terms of exemptions for lawful defeat devices, at least the application of the latest state of technology has to be defined, and the necessary explanation has to be provided by the manufacturer relying on the exemptions; additionally, the relevant scope of

testing and decision-making criteria need to be specified in the regulations.

3. Measures at National Level

In principle, the European type approval regulations are to be applied. In addition, the following national scope of action should be used, too, e.g. in anticipation of future regulations that are further developed.

a. Emission Re-examinations by the KBA

The KBA will no longer leave the re-examinations of the exhaust emissions solely up to a Technical Service once a type approval has been issued, but it will conduct random reviews itself. To this end, the KBA will regularly take vehicles from the market and check them for regularity. The KBA will also carry out random follow-up inspections on vehicles for which other authorities have issued type approvals.

b. State-backed Test Facilities for Re-examinations

Additional and independent checks conducted by the KBA at its own test stations are intended to become part of an independent inspection process. Thus, the KBA will have suitable testing facilities available, such as a dynamometer for laboratory measurements and portable measurement systems. As such, the KBA should be able to conduct the tests stipulated in the type approval regulations independently and autonomously as well as additional tests to recognise manipulations, such as the use of unlawful defeat devices. This will help the KBA to take vehicles from the market regularly and independently and to review them for regularity.

c. Disclosure of Software and Emission Strategy

In anticipation of the expected further development of the European regulations, the KBA, as the competent type approval authority, is to make it a condition for the issuance of a type approval that the vehicle manufacturers disclose their software and accept an incident-driven review of the software and their emission strategies.

d. Independence of Technical Services

In anticipation of a possible further development of the European regulations, the KBA, as the competent type approval authority, is to plan a rotation of Technical Services for the emission certificates which manufacturers apply for. The goal should be that Technical Services conduct tests on their own testing stations in the future.

E. Summary

The Commission of Inquiry of the BMVI has come to the following conclusions:

The effect of the unlawful defeat device was demonstrated by the measurements conducted on vehicles of the VW Group with Euro 5 concepts (EA 189 engines). In a notice dated 15 October 2015, the KBA called upon the VW Group to restore the regularity of the vehicles concerned. Thus, VW is prompted to recall the vehicles in order to remove the unlawful defeat device.

Until the publication of this report, no other unlawful defeat device was detected in any other vehicles than the certain vehicles belonging to the VW Group within the field investigation carried out by the KBA.

However, there was a broad range of the NOx emission values measured in the laboratory and on the road. All the manufacturers of Group II vehicles adjust the efficiency of their emission control system to driving conditions and environmental conditions. This corresponds to a defeat device according to the definition set forth in Article 3 of the Regulation (EC) No. 715/2007. The manufacturers justify the lawfulness mainly on the basis of the exemption clause in Article 5(2) of the Regulation (EC) No. 715/2007 with measures aimed at protecting the engine or ensuring safe operation. For some vehicle types, however, the Commission of Inquiry of the BMVI has doubts regarding the lawfulness of the defeat device used.

With regard to FCA there is a measurement result available for another vehicle which requires further investigations. The KBA is tasked with conducting specific measurements and submitting a report.

In the interest of environmental protection, several manufacturers were encouraged to make improvements in view of their current production and partly even with regard to their vehicles in the field, regardless of the lawfulness of the engine protection devices used. If the manufacturer takes these measures as planned, and the KBA, as the competent approval authority, verifies their effectiveness, doubts regarding the lawfulness of the defeat device for reasons of engine protection would cease to exist. As the competent approval authority, the KBA will hold further talks with those manufacturers that do not see any chance yet to improve their emission reduction strategy for technical reasons; the objective is to bring about improvements in the vehicles' emission behaviour. In the other cases the KBA will inform the respective competent European approval authorities about all the results, in particular about the anomalies, and ask for a further assessment.

On the one hand, Regulation (EC) No. 715/2007 contains the undefined concept of "normal use", and on the other hand, it contains possibilities for exemption for defeat devices that are open to interpretation and concern the protection of the engine in particular. Especially the exemption for reasons of engine protection gives manufacturers some leeway in view of the use of defeat devices.

Against this backdrop, the prospective RDE regulation is an important building block of a possible solution. On the one hand, real driving emissions on the road will be examined and limited, and on the other hand the concept of "normal use" will be specified further. To make it even more difficult to use unlawful defeat devices in the future, there is an urgent need for action to comprehensively improve and adjust the European regulations regarding both the type approval process and individual regulations regarding exhaust emissions.

Current loopholes are intended to be closed by e.g. a mandatory disclosure and an incident-related test of the control software which have to take place during the examination of the manufacturer's emission strategies. Additionally, in terms of exemptions for lawful defeat devices, at least the application of the latest state of technology has to be defined. The explanations to be provided by the manufacturer as well as relevant scopes of testing and decision-making criteria need to be specified in the regulations.

In principle, re-examinations have to be intensified during production, on the market and for vehicles in the field to ensure the vehicles' conformity. To this effect, European regulations should provide for a qualitative and quantitative framework. For the purpose of better independent monitoring, the KBA should have suitable testing facilities in order to conduct the tests stipulated in the type approval regulations, as well as additional tests to recognise manipulations independently and autonomously. No new authorities or competencies are needed for this.

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