

Dual-Fuel Mode of Vehicles – The Roadmap of Approving the Modified Vehicle in Germany



Regulatory Framework for Dual-Fuel Vehicles in Germany

Straßenverkehrszulassungsverordnung (StVZO): none

Verkehrsblattverlautbarungen: none

Others: none

German Approval Procedure for converted Dual-Fuel Vehicles

Issue:

Since Q1/2009 endless discussions on whether or not and how DF Vehicles to be registered in Germany may be approved based on a national regulation

Transition Time up to Q2/2012:

The regional Authorities of each „State“ (Germany is a Federal Republic consisting of 16 State) decided individually requiring different tests, based on §70 StVZO (exceptional single approval)



Awkward and confusing situation for all parties involved like kit manufacturers, conversion workshops, TÜV, etc.

German Approval Procedure for converted Dual-Fuel Vehicles

Present Situation:

In Q2, a number of „States“ followed TÜV's recommendation to officially introduce a test and approval procedure for DF Vehicles (not mandated, however)

Scope:

- still based on §70 StVZO (due to the non-availability of an European Regulation/Directive)
- for all vehicle categories (and the respective emission test procedures as per the ECE R49 or R83)
- for all! emission levels: down to „EURO nothing“
- for CNG or LPG Dual-Fuel mode
- individual DF-vehicle approval still mandatory (§19 / 21 / 41a StVZO)

German Approval Procedure for converted Dual-Fuel Vehicles

Suggested Procedure, to be discussed with regulatory Authorities:

▪Components:

- Approval according to ECE R67 or R110 required
- OEM Diesel ECU as master; DF ECU as slave.

▪Emission report:

- Emission testing based on ECE R49: ESC, ELR and ETC, depending on the requirements for the type-approval of the original OEM engine
- Four measurements:
 - with reference diesel (original engine, kit not installed yet)
 - with reference diesel (original engine, kit installed)
 - with LPG reference fuel A or CNG reference fuel G23
 - with LPG reference fuel B or CNG reference fuel G25

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Procedure (cont.):

-For compensation purposes in case of a deterioration of the emissions recorded compared to the type-approval values, the following is acceptable (a maximum deterioration of x% above limit value may be introduced, however):

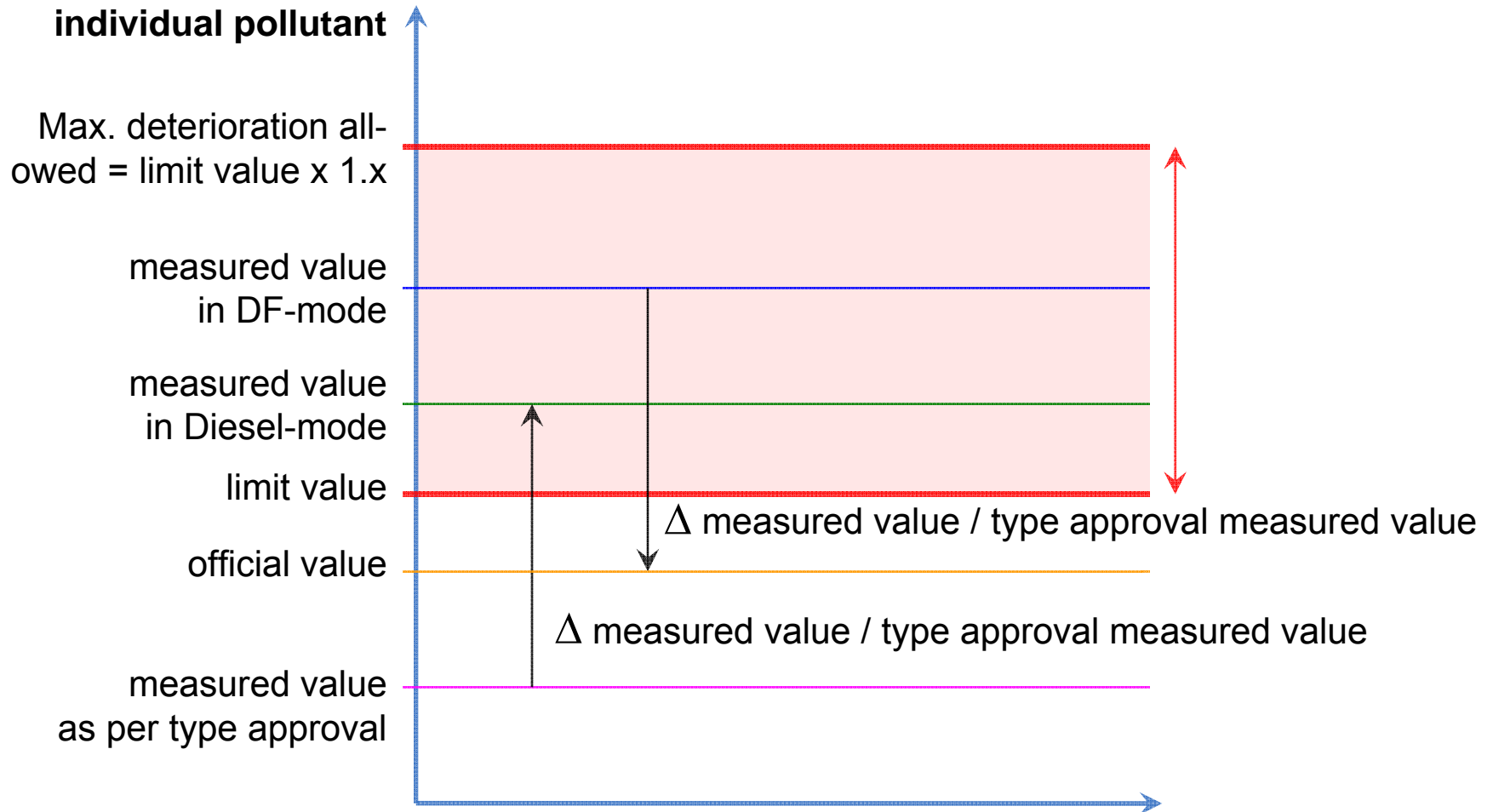
- The recorded values for both reference diesel modes have to be the same.
- Calculation of the difference (delta) of each single recorded emission value in reference diesel mode (w/o kit installed) and the respective type-approval value.
- This calculated value (for each individual limited pollutant) may be deducted from the measured value for this pollutant in reference diesel mode, and the several DF modes.
- The corrected values may not exceed the applicable limit values for the respective pollutant according ECE R49.

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Procedure (cont.):

- To create an engine family, it is essential the measurements to be made using the same engine type as for the former OEM type-approval.
 - Engine family subject to ECE R115, mainly
 - Same engine manufacturer
 - Same means of fuel injection
 - Same pollution aftertreatment
 - Engine power between 70% and 115% of test engine
 - A mix of turbo and naturally aspirated engines is not allowed
 - A mix of engines with and w/o EGR is not allowed
- OBD requirements as per R115 apply.
- Noise emissions: no need for additional measurements, as normally, at full load, the DF engine runs on Diesel only and thus no deterioration is expected

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Vehicle presented : OPEL Meriva 1.7 CDTI-CNG

Technical Details

Engine: A17DT

Transmission: AF40-6, 6 speed automatic transmission

Diesel

Dual-Fuel Diesel / 40% CNG

Max. Power: 74 kW / 100 hp @ 4000 RPM 82 kW / 111 hp @ 4000 RPM

Max. Torque: 260 Nm @ 1700 - 2550 RPM 280 Nm @ 1600 - 2550 RPM

Top Speed: 172 km/h not tested

0-100 km/h: 13,9 sec not tested

FC (MVEG)/ CO2: 6,4 l/100 km / **168 g/km** 3,6 l Diesel + 2,8 kg /100 km / **163 g/km**

Fuel cost 100 km: 8,38 € (1,309€ l) 4,71+2,58 = 7,29 € (1kg CNG @ 0.92 €)

Range combined: 843 km 1500 km (CNG cylinders @ 12 kg capacity)



Questions?