

*Welcome to the  
FSD Testing Laboratory Radeberg!*



## Who is who



**Jürgen Bönninger**  
managing director



**Dietmar Bönninger**  
predevelopment  
testing technologies



**Ralph Schröder**  
division manager  
testing specifications



# **Manipulations of exhaust-gas after-treatment systems**

## Manipulation B1

# Reducing the EGR rate with a diagnostic device

- Changing the EGR rate using commercially available diagnostic devices
- Purpose: Reducing carbon deposits in the intake tract
- Modification is recommended by the OEM as repair method in exceptional cases (see example)

### Translation:

#### Note:

In cases of severe or repeat complaints, reducing the EGR rate can help reduce the intensity of carbon deposition.

However, this method should only be used in exceptional cases!

AIR - Maßnahme https://myair-bdr.bmw-group.com/air/faces/xdmml/puma/PumaSingleView.xhtml?id=4c301d49-0aff-28b...

**Wichtig:**  
Im Anschluss müssen die Null-Mengen-Korrektur-Werte (NWK) der Injektoren zurückgesetzt werden.  
Dazu das folgende Testmodul manuell auswählen:  
Servicefunktionen – 01 Antrieb – Diesel Elektronik – Abgleichprogramme – Injektormengenabgleich.

**Zum Ablauf:**  
- Aktuelle Mengengleichwerte (IMA-Werte) der Injektoren auslesen, vergleichen und notieren  
- Alle IMA-Werte der einzelnen Zylinder mit dem universellen IMA - Rücksetzcode ersetzen und programmieren:  
Piezo - Injektor AAAAA5G  
Magnetventil - Injektor AAAAAEA  
(Hintergrund: Rücksetzen der Injektoradaptionen aller Zylinder)  
- Ursprüngliche IMA-Werte wieder programmieren/Eingeben und danach Fahrzeug einschalten lassen

**Achtung:**  
• Der Piezo-Injektor ist am Anschluss der Hochdruckleitung erkennbar. Diese ist am Kopf des Injektors verschraubt, siehe Anhang - Bild 1.  
• Beim Magnetventil-Injektor ist der Anschluss der Hochdruckleitung seitlich schräg am Injektor verschraubt, siehe Anhang - Bild 2.

Fehlerspeicher löschen und Fahrzeug neu bewerten.

**Hinweis:**  
In starken Beanspruchungsfällen oder bei Wiederholfällen kann eine Reduzierung der AGR-Rate helfen, die Verkokungsintensität zu reduzieren.  
Dies sollte allerdings nur in Ausnahmefällen angewandt werden!

**Abrechnungshinweis:**  
Im Gewährleistungsfall kann das Wagnisgranulat mit dem Nettopreis unter Fremdstellungsschlüssel 04 abgerechnet werden.

**Gültigkeitsinformation**

Baureihe: [E71, E70, R61, R60, F01, F02, F25, E65, E66, E63, E64, E45, F22, F21, E61, F20, F11, E88, F12, E87, E82, E81, F10, E84, E83, E60, F15, F13, F36, R56, R55, R58, R57, R59, E90, E91, E92, F30, E93, E93, F31, F34, E39, E38]  
Motorbaureihe: [M57Y, M47DU1, M57X, M47TU, N57, N57Z, M47T2, N47DK0, M47, N57X, N47T, M57T2, N57T, N47S, M47DO2, M57TU, M57, N67S, N47C, M47DO1]  
Karosserieform: [ALL]  
Fehlercodes: [24C300, 279000, 24CE00, 290B00, 4A45, 24C200, 4B25, 4E09, 4B05, 2AB500, 279100, 3FF0, 3FF1, 24CF00, 4DFF, 4868, 278F00, 4E0E, 4AD6, 4E0F, 4AF6, 41A8, 4B16, 24C100, 24C400, 24C500, 253400, 24C500]  
Produktionszeitraum: -

**Instandsetzungen**

11/12/00/113452, Zylinderkopf, Nicht VFC-codiert, Verschmutzung, Sonstige Tätigkeit

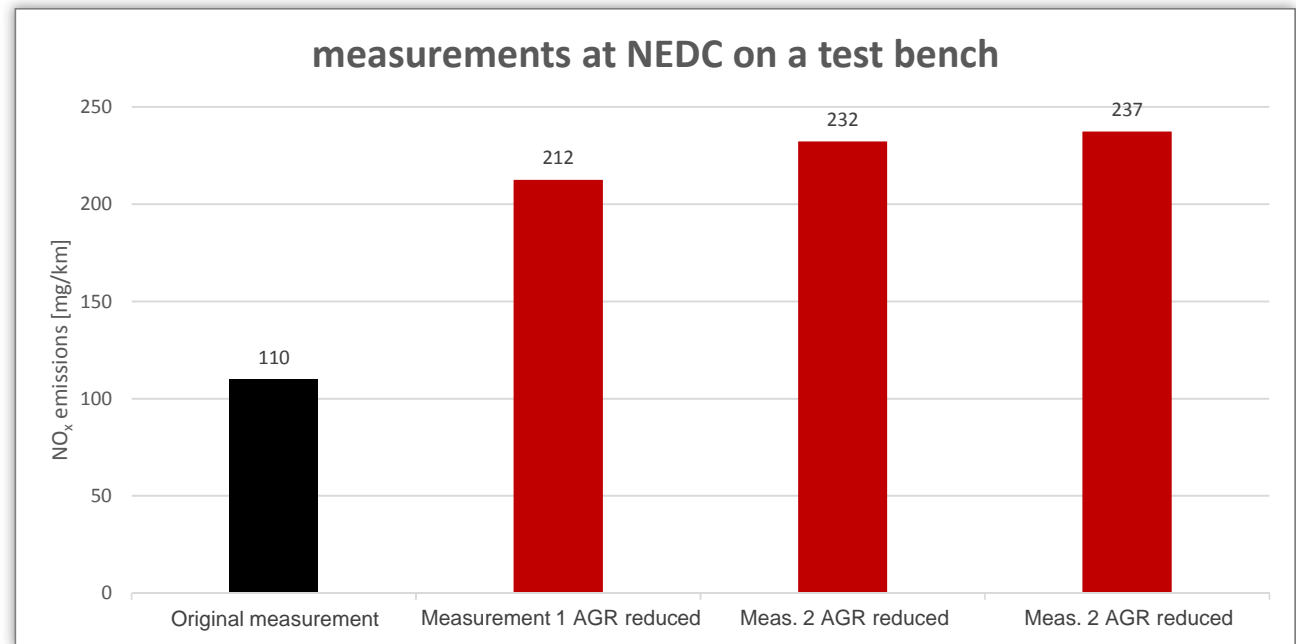
3 von 4 25.05.2016 07:47

## Manipulation B1

### Reducing the EGR rate with a diagnostic device

- Possibility of modifying the EGR rate in **sample vehicles** (in this case BMW models) with diesel engines **from 9/1998 (1,453,903 vehicles)**
- Central Agency tests revealed a significant increase in NO<sub>x</sub> emissions

**According to experts, this type of maintenance must be classified as a technical change that is not permissible and results in the termination of the operating license approval of the respective vehicle.**



## Manipulation B1

# Modifying the EGR rate with a diagnostic device

### Detecting this manipulation as part of the PTI:

- By reading out the set calibration value using the PTI adapter
  - If calibration value = 0 → Original condition
  - If calibration value > 0 → Reduction in EGR rate
  - If calibration value < 0 → Increase in EGR rate



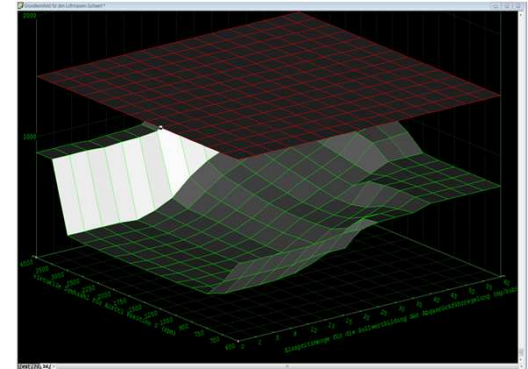
Abfrage Anpassungswert AGR-Rate	
WERT SOLL	WERT IST
<input type="text" value="0.0"/>	<input type="text" value="0.7"/>
<input type="checkbox"/> Diese Messung als ungültig markieren	

Manipulation B2/B3

## Software-based deactivation of exhaust-gas recirculation (EGR)

- By modifying the hysteresis values (e.g., intake air temperature) for the activation of the exhaust-gas recirculation or by modifying the characteristic map for the target air mass, for example
- Often in combination with a performance increase (tuning) with simultaneous deactivation and removal of the diesel particulate filter (DPF)
- Modifying the activation conditions (intake air temperature or target air mass) so that no EGR occurs in the normal driving mode
- **Consequence:** Deactivation of EGR  
→ Significant increase in  $\text{NO}_x$  emissions

**According to experts, this type of technical change that is not permissible and results in the termination of the operating license approval of the respective vehicle.**



## Manipulation B2/B3

# Software-based deactivation of exhaust-gas recirculation (EGR)

## Detecting this manipulation as part of the PTI:

- By reading out the software identification parameters via standardised OBD protocols using the PTI adapter:
  - Calibration Identifier (CALID) – OBDII Mode 9 PID 0x04
  - Calibration Verification Number (CVN) – OBDII Mode 9 PID 0x06
- Comparing the values with target values of a permissible data record
- Optionally: Reading out the value of current fresh-air mass using the PTI adapter and comparing it with reference values





## Manipulation B4

# Manipulation of the EGR position sensor

## Simulation of an intact EGR valve by installation of an additional device

- Original EGR valve is no longer powered and remains closed
- Engine control unit does not “detect” the defect, as it continues to receive signals from the simulator
- **Consequence:** Deactivation of exhaust-gas recirculation  
→ Significant increase in NO<sub>x</sub> emissions

**According to experts, this type of technical change that is not permissible and results in the termination of the operating license approval of the respective vehicle.**



## Manipulation B4

# Manipulation of the EGR position sensor

### Detecting this manipulation as part of the PTI:

- Reading out vehicle self-diagnosis data (e.g., current fresh-air mass) using the PTI adapter and comparing it with reference values
- Optionally: Visual inspection in the area of the exhaust-gas recirculation actuator



Manipulation B5/B6

## Mechanical deactivation of exhaust-gas recirculation

- By installing a mechanical baffle between the exhaust-gas and fresh-air paths of the engine
- Or by sealing the hose to the vacuum actuator in pressure-controlled systems
- **Consequence:** Deactivation of exhaust-gas recirculation  
→ Significant increase in NO<sub>x</sub> emissions

**According to experts, this type of maintenance must be classified as a technical change that is not permissible and results in the termination of the operating license approval of the respective vehicle.**



Manipulation **B5/B6**

## **Mechanical deactivation of exhaust-gas recirculation (EGR)**

**Detecting this manipulation as part of the PTI:**

- Reading out the value for current fresh-air mass using the PTI adapter and comparing it with reference values
- Optionally: Visual inspection of the exhaust-gas path for abnormalities



## Manipulation B7

# Removal of the NO<sub>x</sub> adsorber and/or SCR catalyst

- Often in combination with removal of the diesel particulate filter
- Removal of components and installation of replacement hoses or destruction of the monoliths and installation of “empty housings”
- Then: Deprogramming the corresponding functions from the engine management
- **Consequence:** Complete disabling of the exhaust-gas post-treatment functions  
→ Significant increase in exhaust-gas emissions

**According to experts, this type of maintenance must be classified as a technical change that is not permissible and results in the termination of the operating license approval of the respective vehicle.**



## Manipulation B7

# Removal of the NO<sub>x</sub> adsorber or SCR catalyst

### Detecting this manipulation as part of the PTI:

- By reading out the software identification parameters via standardised OBD protocols using the PTI adapter:
  - Calibration Identifier (CALID) – OBDII Mode 9 PID 0x04
  - Calibration Verification Number (CVN) – OBDII Mode 9 PID 0x06
- Comparing the values with target values of a permissible data set
- Reading out the differential/back pressure across/before the DPF using the PTI adapter and comparing it with reference values
- Reading out the NO<sub>x</sub> concentration in the exhaust gas using the PTI adapter and comparing it with reference values



## Manipulations B8

# Reduction or deactivation of AdBlue injection

By

- a) Making corresponding changes to characteristic maps in the engine control unit or
- b) Installing special simulators (emulators)
  - Purpose: Reducing AdBlue consumption (often in commercial vehicles)
  - **Consequence:** Insufficient or no AdBlue injection  
→ Significant increase in NO<sub>x</sub> emissions



**According to experts, this type of maintenance must be classified as a technical change that is not permissible and results in the termination of the operating license approval of the respective vehicle.**

## Manipulations B8

# Reduction or deactivation of AdBlue injection

### Detecting manipulation case as part of the PTI:

- By reading out the software identification parameters via standardised OBD protocols using the PTI adapter:
  - Calibration Identifier (CALID) – OBDII Mode 9 PID 0x04
  - Calibration Verification Number (CVN) – OBDII Mode 9 PID 0x06
- Comparing the values with target values of a permissible data record
- Reading out the in-vehicle value for NO<sub>x</sub> concentration in the exhaust gas using the PTI adapter and comparing it with reference values





## Development of testing technologies

### Overview

**Development of a concept for five testing technologies (P1–P5) to detect these manipulations (B1–B8):**

- Testing technology **P1**: Querying the software status (CALID/CVN comparison)
- Testing technology **P2**: Querying the exhaust-gas recirculation calibration value
- Testing technology **P3**: Querying the value for differential or back pressure at the diesel particulate filter
- Testing technology **P4**: Querying the NO<sub>x</sub> sensor signals
- Testing technology **P5**: Querying the value for air mass

## Development of testing technologies

# Overview matrix of testing technologies

Chart of manipulation methods and the testing technologies for detecting them

			Manipulation method								
			B1	B2	B3	B4	B5	B6	B7	B8	
			Modification of EGR rate	Deactivated EGR (software)	Deactivated EGR (software)	Mechanical deactivation with simulator	Mechanical deactivation	Mechanical deactivation	Removal of NSC/SCR/DPF	Deactivation/reduction of AdBlue	
Testing technology	P1	Software status		X	X					X	X
	P2	EGR calibration value	X								
	P3	Differential/back pressure								X	
	P4	NOx sensors								X	X
	P5	Air mass	X	X	X	X	X	X	X		