BAUMOT GROUP

BNOX & BLUE STICKER

JUNE 2017

WWW.BNOX.INFO

Design & Engineering

Products & Solutions

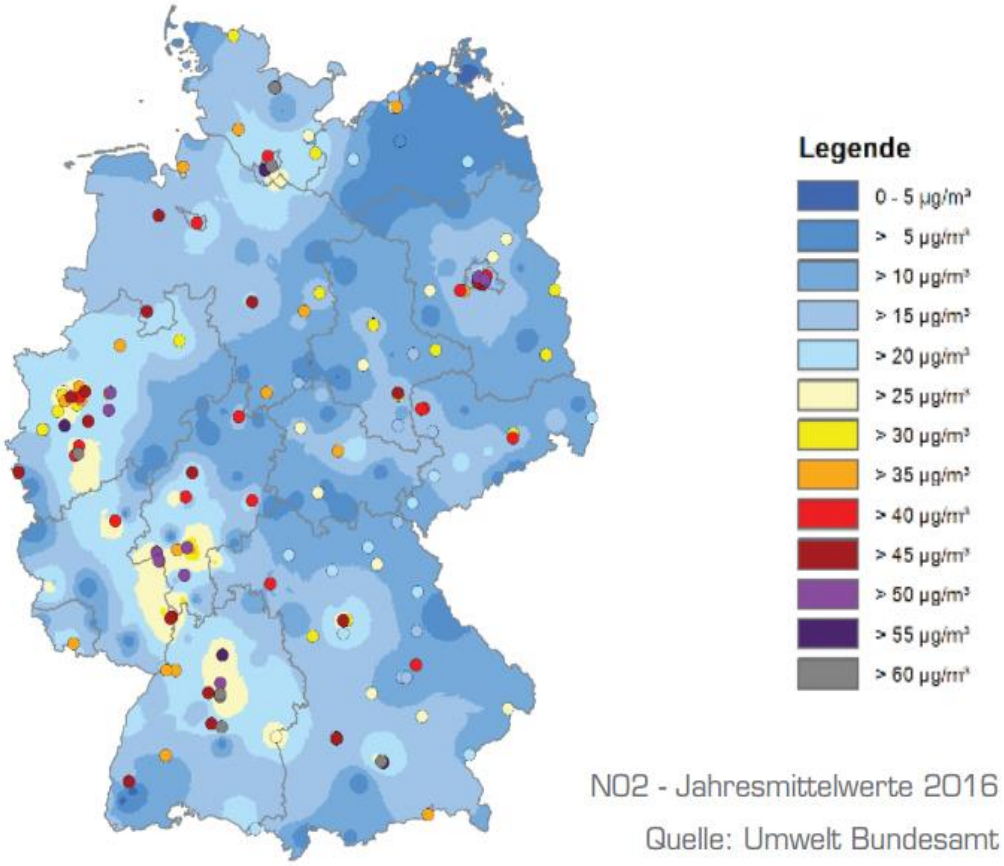
Testing & Validation

OVERVIEW **BLUE STICKER**

- **Problem:** Excessive nitrogen oxide emissions in 28 major german cities
- **Health**: Recent study* estimates the number of annual deaths due to excessive nitrogen oxide emissions under real conditions at 38,000
- **Driving bans:** Stuttgart and Hamburg already have driving bans, with more cities such as Munich, Düsseldorf and Berlin to follow
- **Possible Consequences:** 13 million diesel vehicles without the latest Euro 6 emission standard can no longer drive into the LEZ. This creates the threat of massive value losses and mobility restrictions
- **Blue Sticker:** Vehicles that do not meet the Euro 6 emission standard are to be retrofitted to the Euro 6 level in order to obtain the Blue Sticker needed to access the driving ban zones
- **Technical solution:** By retrofitting with the patented BNOx system, older vehicles can be upgraded to Euro 6 limits under real driving conditions
- **Test results:** Independent tests by ADAC/ZDF and DUH confirm the high efficiency of the BNOx system
- **Costs:** The price of BNOx conversion is usually EUR 1,500 to 2,000 per vehicle, some of the costs being covered by the automotive industry
- **Competition:** BNOx is the only system that allows efficient and effective SCR retrofitting to achieve Euro 6 emissions under real driving conditions
- **Software retrofit:** The proposed software “retrofit” leads to a reduction of nitrogen oxide emissions of 20 to 60% but does not fulfill the Euro 6 emission standard

*Source: Journal Nature, 2017, Environmental Health Analytics

EXCESSIVE NITROGEN OXIDE EMISSIONS IN BIG CITIES



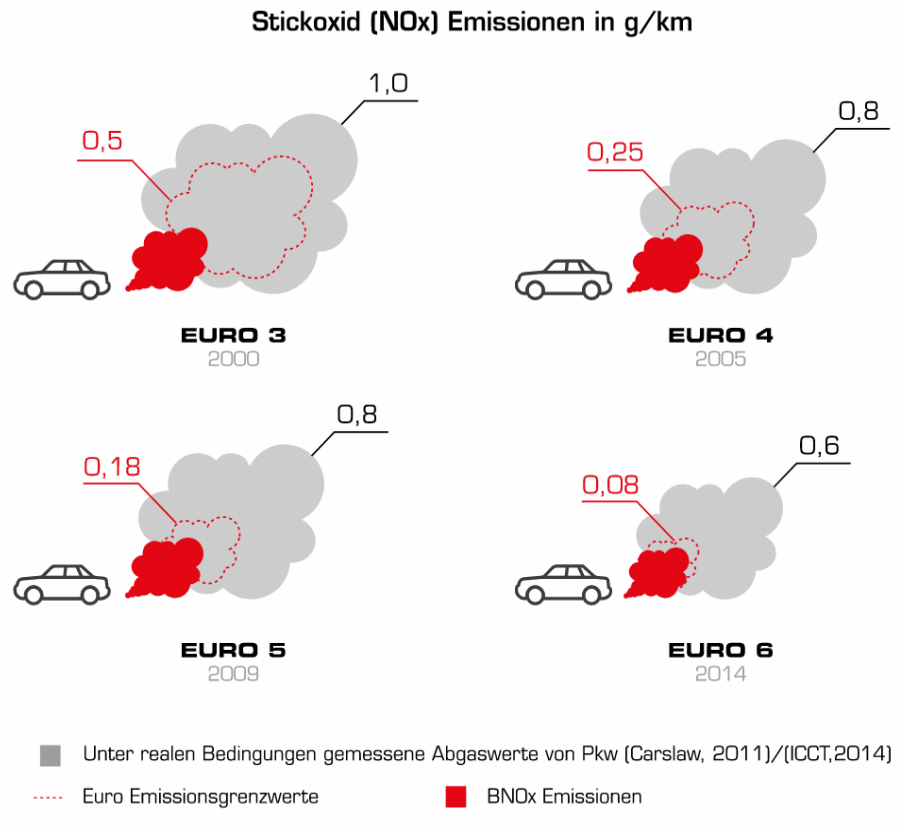
NO2 - Jahresmittelwerte 2016

Quelle: Umwelt Bundesamt

- **28 German cities** and regions, including major cities such as Munich, Cologne, Hamburg and Berlin, violated statutory limits on nitrogen oxides in 2016
- The government must act or risks **harsh penalties**
- Therefore at the state level, initial **driving bans** have been issued **on diesel vehicles** that do not at least meet the Euro 6 emission standards
- According to ADAC, potential driving bans would **affect around 13 million owners of diesel cars**
- As a **solution**, the government is currently discussing the introduction of an **Blue Sticker** for vehicles whose nitrogen oxide emissions comply with Euro 6 limits

To comply with nitrogen oxide emission limits, major cities must introduce air pollution measures. One such measure is driving bans on diesel vehicles.

EMISSION LIMITS ARE **NOT BEING MET**



- Numerous studies show that emission limits are being exceeded by several times under real driving conditions
- Euro 5 vehicle emissions exceed the limit by an average of 4 times
- Even new Euro 6 diesel engines exceed the emission limit under real operating conditions many times over
- **BNOx** has repeatedly and independently demonstrated that **Euro 5 vehicles and achieve better emission results than Euro 6 under real conditions**

Most diesel vehicles emit many times more NOx than permitted. A BNOx retrofit can ensure that limits are met even under real driving conditions.

BLUE STICKER INSTEAD OF DRIVING BANS – THANKS TO BNOx

- To **avoid driving bans on diesel vehicles**, a **Blue Sticker** is to be introduced
- Vehicles that comply with **Euro 6 emission limits** are to receive **the Blue Sticker**
- **Transportation ministers** are demanding a **retrofit solution** to avoid a driving ban on older diesel vehicles that do not comply with the Euro 6 standard
- Euro 6 emission limits have been shown to be achievable through **BNOx system retrofitting**
- **The Federal Transportation Minister** is currently **examining** the possibility of introducing a **Blue Sticker** in connection with the retrofit solution

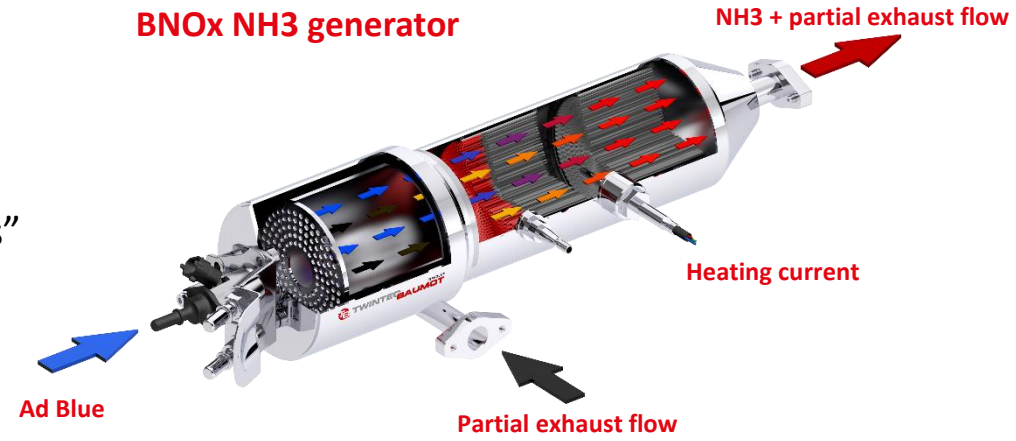
The Blue Sticker is to be introduced to avoid a general driving ban on diesel vehicles. Diesel vehicles would need to at least comply with the Euro 6 emission standard to qualify.

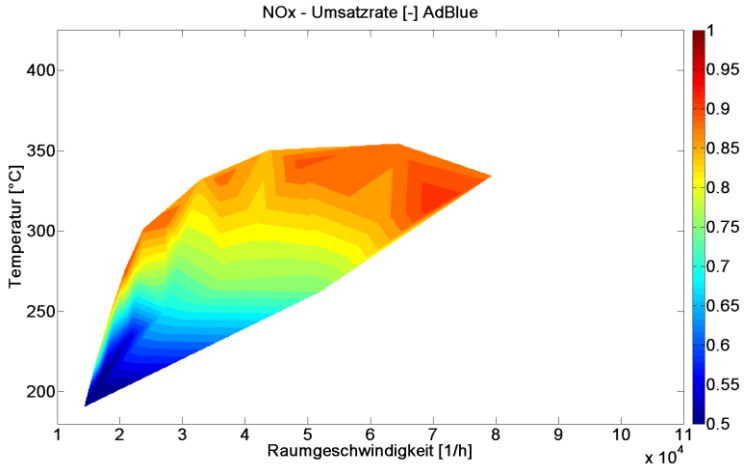
THE SOLUTION: THE BNOx SYSTEM

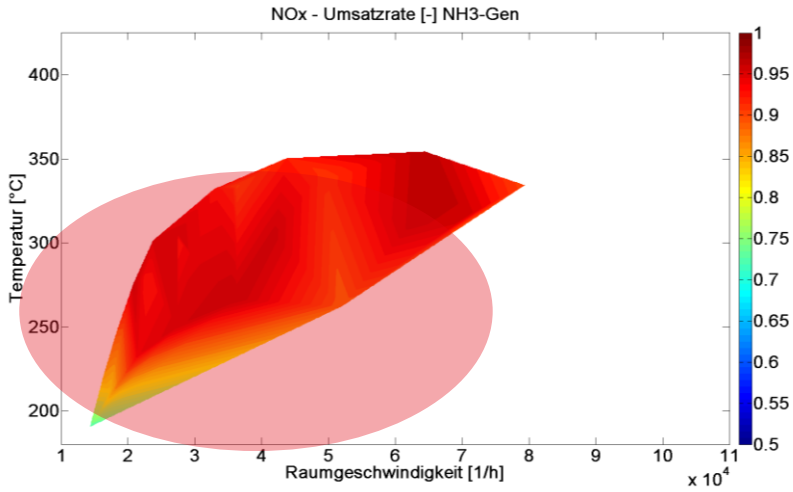
The BNOx system offers the following advantages:

- Highly efficient nitrogen oxide reduction under “real conditions”
- Already meets future requirements for “real-drive emissions” (Euro 6c)
- Space-saving system that can be used in all passenger cars
- Low system integration costs through modular design

The core:
BNOx NH3 generator

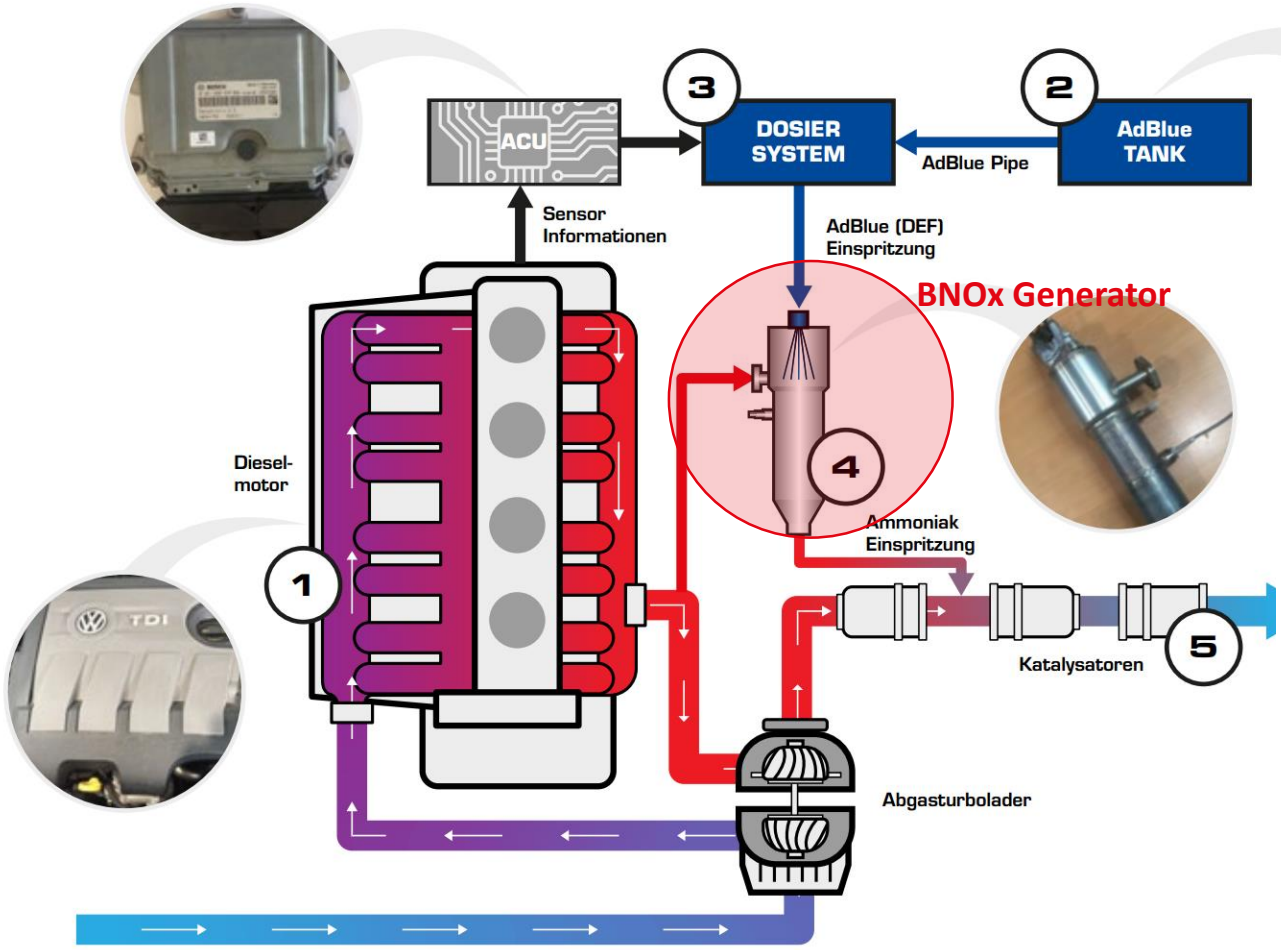






Unlike other systems, the BNOx system already meets Euro 6c limits: very high NOx conversion rate at low temperatures, applicable in real driving conditions

BNOx PRINCIPLE FUNCTION



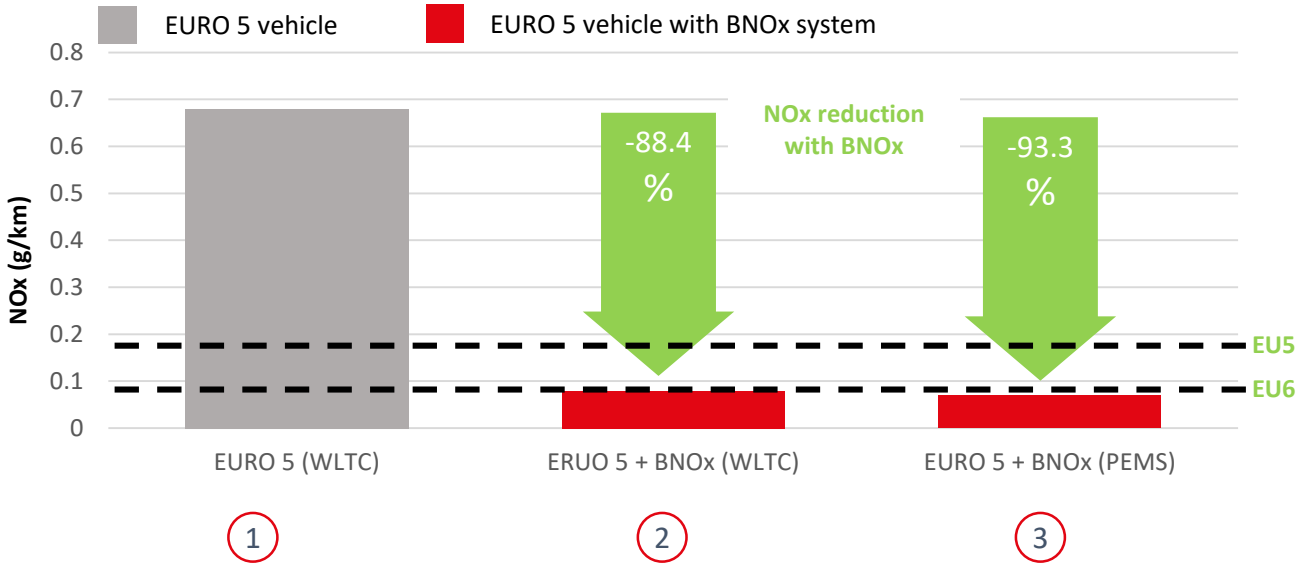
The illustration shows a diesel engine (1) which is retrofitted with an exhaust after treatment system for combined particulate and nitrogen oxide reduction. The liquid urea (AdBlue) will be taken out of the AdBlue tank (2) and will be injected into the BNOx generator (4) by means of a freely available dosing system (3). For the thermal reaction of the urea both the exhaust and for low temperature operation electrical energy will be used. This ammonia gas will be produced and injected into the exhaust which leads to the hydrogen nitrogen reductions

Euro 5 cars have no problem with BNOx retrofitting.

The BNOx generator comes with existing series components.

CASE STUDY DUH[3] EXHAUST TESTS

Emissions under real conditions



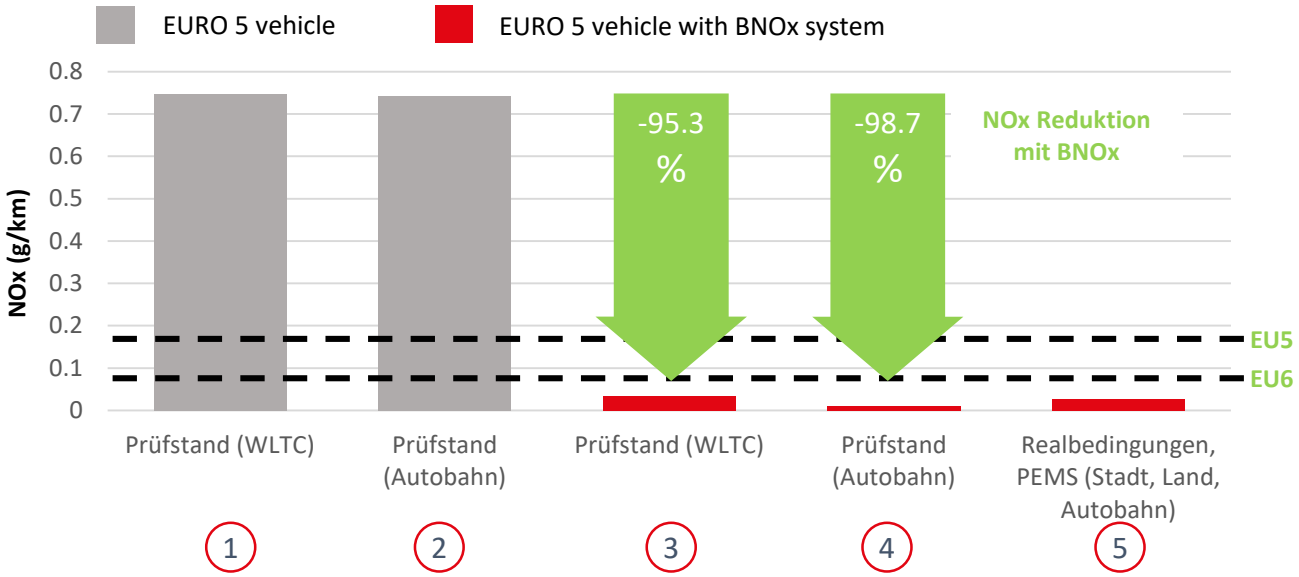
	Emissions class	Limit [g/km]	Test cycle	NOx emissions [g/km]	NOx emissions without BNOx [g/km]	NOx reduction with BNOx
1	EURO 5	0.18	WLTC[1]	0.68	-	-
2	EURO 5	0.18	WLTC[1] with BNOx	0.079	0.68	-88.4 %
3	EURO 5	0.18	PEMS[2] with BNOx	0.069	1.03	-93.3 %

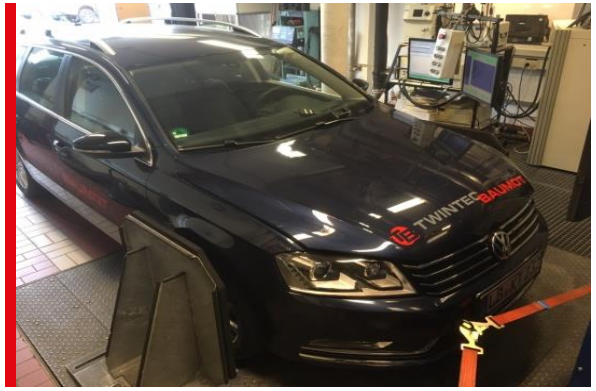
1 **WLTC**: World Light-Duty Test Cycle
2 **PEMS:** Portable Emissions Measurement System
3 **DUH:** Deutsche Umwelthilfe

- The BNOx system is the leading retrofit system for achieving Euro 6 emissions under real driving conditions
- A Euro 5 diesel vehicle retrofitted with a BNOx system achieves better emission levels under real driving conditions than a Euro 6 vehicle

CASE STUDY ZDF ADAC EXHAUST TESTS PROVE BNOx EFFECTIVENESS

Emissions under real driving conditions





	Test methods	Test cycle	NOx emissions [g/km]	NOx emissions without BNOx [g/km]	NOx reduction with BNOx
1	Test facility	WLTC[1]	0.748	-	-
2	Test facility	Autobahn	0.742	-	-
3	Test facility	WLTC[1] with BNOx	0.035	0.748	-95.3 %
4	Test facility	Autobahn with BNOx	0.01	0.742	-98.7 %
5	Real conditions	PEMS[2] with BNOx	0.027	-	-

EURO 6 emissions
were proven with a retrofitted BNOx system

- Real conditions (RDE)
- WLTC1
- Highway tests

1 **WLTC**: World Light-Duty Test Cycle
2 **PEMS:** Portable Emissions Measurement System

BNOx IN THE NEWS

PRINT

[Autobild](#)

[auto-motor-sport](#)

[Autozeitung](#)

TV

[SWR](#)
[ZDF WISO](#)
[ZDF Zoom](#)

There will be more reports on ZDF Frontal21, ZDF zoom, ARD Exclusive and VOX Automobil in late May and June 2017

Strong media interest in BNOx indicates the importance of diesel vehicle retrofitting.
More TV and print coverage is expected in the coming weeks.

THANK YOU.

BAUMOT GROUP AG

MORE INFORMATION AT WWW.BNOX.INFO