Application for Certification

Model Year:	2016
Manufacturer Name:	BMW
Test Group:	GBMXT03.0N57
Test Group Description:	In-Line 6-Cylinder, 4-Stroke, 3.0 Liter, Diesel
Durability Group:	GBMXDPDNNV5A
Durabilty Group Description:	4-stroke Diesel Cycle diesel direct fuel injection ceramic, monolith, unheated Palladium, Platinum, Rhodium Diesel Particulate Filter Exhaust Gas Recirculation NOx Absorber Catalyst Selective Catalytic Reduction
Vehicle Class:	LDT3 / MDV2
Applicable Standards:	LEV II - ULEV / Tier 2 - Bin 5
Carlines Covered:	X5 xDrive35d

Vehicles Tested:	VID	Conf.	Test	Test Number
Exhaust:	0C06535	02	FTP75	GBMX10038552
			HWY	GBMX10038553
			US06 (LVW)	GBMX10038602
			SC03 (LVW)	GBMX10038601
			Cold CO	GBMX10038600
		04	US06 (ALVW)	GBMX10038605
			SC03 (ALVW)	GBMX10038604

For questions, Contact: Thomas Hofmann, 201 / 571 - 5195

Table of Contents

1. Correspondence and Communications

1.1. Authorized Persons — Refer to Common Section, Section 1, Item 1.1

1.2. Certificate Information — Refer to Common Section, Section 1, Item 1.2

1.3. Primary certification contact:

Name: Thomas Hofmann
Phone Number: 201 / 571 - 5195
Fax Number: 201 / 571 - 5479
E-Mail-Address: Thomas.Hofmann@bmwna.com

2. Durability Group Description

2.1.	Durability Group Name	GBMXDPDNNV5A
2.2.	Combustion Cycle	4-stroke Diesel Cycle
2.3.	Engine type	piston, water cooled
2.4.	Fuel used	diesel
2.5.	Basic fuel metering system	direct fuel injection
2.6.	Catalyst construction	ceramic monolith unheated, closed coupled
2.7.	Precious Metals in Catalyst	Palladium Platinum Rhodium
2.8.	Soot filter Construction	ceramic, monolith, unheated
2.9.	Precious Metals in Soot filter	Palladium Platinum
2.10.	Precious Metal Loading	Refer to Section 16, Confidential Information
2.11.	Range of Catalyst Grouping Statistics	3.9 - 2.9

3. Evaporative / Refueling Family Description

not applicable

4. Durability Procedure Description

4.1. Description of used durability process

4.1.1. Durability Program for Exhaust Emissions:

The durability data vehicle was aged according to the aging process described in §86.1823-08.

Following deterioration factors were determined after the aging process:

	NOx	CO	NMHC	PM
50k	1.194	1.755	1.119	1.013
120k	1.489	2.905	1.301	0.000
UAF	0.003	0.009	0.000	0.000
DAF	0.000	0.000	0.009	0.000

Statement:

Based on BMW`s good engineering judgment, all the vehicles described in this Application for Certification comply with all applicable intermediate and full useful life standards.

4.1.2. Durability Program for Evaporative/Refueling Emissions:

not applicable

4.2. Determination of certification Levels

4.2.1. Exhaust Emissions:

multiplicative deterioration factor:

For Deterioration Factors refer to Summary Sheet enclosed in Chapter 7 of this application.

4.2.2. Evaporative/Refueling Emissions:

ORVR Testing Waiver per CFR § 86.1810-01 (k) + (m)
Due to the low vapor pressure of diesel fuel and the vehicle tank temperatures, hydrocarbon vapor concentrations are low and the vehicle meets the 0.20 grams/gallon refueling emission standard without a control system.

5. Test Group Description

5.1.	Test Group Name	GBMXT03.0N57	
5.2.	Engine information		
5.2.1.	Engine displacement	2993 cm³	
5.2.2.	Arrangement of cylinders	in line	
5.2.3.	Number of cylinders	6	
5.3.	Vehicle class	CARB: EPA:	MDV 2 LDT 3
5.4.	Participation in NLEV	not applicable	
5.5.	Emission standards class	CARB: EPA:	LEV II - ULEV Tier 2 - Bin 5
5.6.	Applicable emission standards	Refer to Summary Sheet enclosed in Section 7 of this application.	

6. Test Vehicle Description

Test vehicle number	Conf.	Model	ETW	Transmission	Type	ESS activated / deactivated	Tires standard sport
0C06535	02	X5 xDrive35d	5250	semi-automatic - 8-speed	EDV	activated	sport = standard
0C06535	04	X5 xDrive35d "test weight basis" = ALVW	5500	semi-automatic - 8-speed	EDV	activated	sport = standard
0C06535	03	X5 xDrive35d	5250	semi-automatic - 8-speed	FEDV	deactivated	sport = standard
H006238	00	X5 xDrive35d	5250	semi-automatic - 8-speed	DDV	--	--

For complete vehicle description, refer to Certification Summary Information Report Sheet, enclosed in Section 7 of this application.
Selection of vehicles carried out according to 40 CFR §86.1828-01(a).

7. Test results (Cover page)

For requested information refer to attached Certification Summary Information Report submitted to Verify:

Certification Summary Information Report Date: 09/22/2015

Certification Summary Information Report

Manufacturer	BMW	**Manufacturer Code**	BMX
Test Group	GBMXT03.0N57	**Evaporative/Refueling Family**	N/A
Certificate Number	N/A	**CARB Executive Order #**	N/A
Certificate Issue Date	N/A	**Certificate Revision Date**	N/A
Certificate Effective Date	N/A	**Conditional Certificate**	--
CSI Revision #	N/A	**CSI Submission/Revision Date**	09/22/2015
Model Year	2016		

Test Group Information

CSI Type	Update for Correction	**Running Change Reference Number**	N/A
GHG Exempt Status	Not Exempt		

Drive Sources and Fuel(s)

Drive Source #1: Combustion Engine

Fuel	Basic Fuel Metering System	Lean Burn Strategy Indicator
Diesel	Common Rail Direct Diesel Injection	--

Hybrid Indicator	No		
Multiple Fuel Storage	--	**Rechargeable Energy Storage System Indicator**	--
Multiple Fuel Combustion	--	**Off-board Charge Capable Indicator**	--
Fuel Cell Indicator	--	**EPA Vehicle Class**	LDT3
Federal Clean Fuel Vehicle	No	**Federal Clean Fuel Vehicle Standard**	--
Federal Clean Fuel Vehicle ILEV	No	**California Partial Zero Emissions Vehicle Indicator**	--
Durability Group Name	GBMXDPDNNV5A	**Durability Group Equivalency Factor**	1
Reduced Fee Test Group	No	**Certification Region Code(s)**	FA, CA
Complies with HD GHG 2b/3 regulations?	No		
Introduction into Commerce Date	--	**CAP2000 Conditional Certificate?**	N/A
Independent Commercial Importer?	--	**Alternative Fuel Converter Certificate?**	--
SFTP Federal Composite Compliance Identifier	Tier 2	**SFTP Tier 2 Composite CO Option**	No
SFTP LEV-III Composite Compliance Indicator	No		
OBD Compliance Type	CARB	**OBD Demonstration Vehicle Test Group**	GBMXT03.0N57
Mfr Test Group Comments	--		
Mfr Exhaust / Evap Standards Comments	--		

Models Covered by this Certificate

Carline Manufacturer	Division	Carline	Certification Region Code(s)	Drive System	Trans - Type	- # of Gears	Trans - Lockup
BMW	1 - BMW	147 - X5 xDrive 35d	Federal	All Wheel Drive	Semi-Automatic	8	Yes
BMW	1 - BMW	147 - X5 xDrive 35d	California + CAA Section 177 states	All Wheel Drive	Semi-Automatic	8	Yes

Certification Summary Information Report

Test Group	GBMXT03.0N57	**Evaporative/Refueling Family**	N/A

Engine Description

Hybrid Type	--	**Hybrid Description**	--
Engine Type	4-Stroke Compression Ignition	**Mfr Engine Description**	--
Engine Block Arrangement	Inline	**Mfr Engine Block Arrangement Description**	--
Camless Valvetrain Indicator	No	**Oil Viscosity/Classification**	0W30
Number of Cylinders/Rotors	6		

After Treatment Device(s) (ATD)

ATD Number	ATD Type	ATD Precious Metal	Substrate Material	Substrate Construction
1	NOx Adsorber	Platinum + Paladium + Rhodium	Ceramic	Monolith
2	Diesel Particulate Filter	Platinum + Paladium	Ceramic	Monolith
3	Selective Catalytic Reduction	no precious metal	Metal	Monolith

Mfr After Treatment Device (ATD) Comments	--
Direct Ozone Reduction (DOR) Device	Not Equipped
Mfr Emission Control Device Comments	--

Engine Configuration Number 1

Engine Displacement (liters)	3.0	**Engine Rated Horsepower**	255
Number of Inlet Valves Per Cylinder	2	**Number of Exhaust Valves Per Cylinder**	2
Air Aspiration Method	Turbocharged	**Number of Air Aspiration Devices**	1
Air Aspiration Device Configuration	Single	**Charge Air Cooler Type**	Air
Cylinder Deactivation Description	N/A		
Variable Valve Timing System Description	N/A	**Variable Valve Lift System**	N/A
Number of Knock Sensors	0		
Air/Fuel Sensor # 1 Type	Heated oxygen	**Air/Fuel Sensor # 1 Description**	N/A
Air/Fuel Sensor # 2 Type	Heated oxygen	**Air/Fuel Sensor # 2 Description**	N/A
Air/Fuel Sensor # 3 Type	Nitrogen oxide	**Air/Fuel Sensor # 3 Description**	N/A
Air/Fuel Sensor # 4 Type	Nitrogen oxide	**Air/Fuel Sensor # 4 Description**	N/A
Mfr Air/Fuel Sensor Comments	--		
Exhaust Gas Recirculation	Yes	**EGR Type**	Electronic/Electric
Cooled Exhaust Gas Recirculation	Yes		
Closed Loop Air Injection System	No	**Air Injection Type**	--
Mfr Engine Configuration Comments	--		

Official Test Numbers

Test Group Fuel	FTP	US06	SC03	Cold CO	Highway	EPA City Litmus Value	EPA City Litmus Threshold	EPA Highway Litmus Value	EPA Highway Litmus Threshold	CREE Weighting Factor
Diesel	GBMX10038552	GBMX10038602	GBMX10038601	GBMX10038600	GBMX10038553	24.1	22.7	28.9	28.1	N/A

Certification Summary Information Report

Test Group	GBMXT03.0N57	**Evaporative/Refueling Family**	N/A

Emission Data Vehicle Information

Vehicle ID / Configuration 0C06535 / 2

Vehicle Model

Represented Test Vehicle Make	BMW	**Represented Test Vehicle Model**	X5 xDrive35d

Leak Family Details

Leak Family Identifier	--	**Leak Family Name**	--

Drive Sources and Fuel System Details

Drive Source and Fuel#	Drive Source	Fuel
1	Combustion Engine	Diesel

Hybrid Indicator	N		
Multiple Fuel Storage	--	**Multiple Fuel Combustion**	--
Fuel Cell Indicator	--	**Rechargeable Energy Storage System Indicator**	--
Rechargeable Energy Storage System	--	**Rechargeable Energy Storage System, if 'Other'**	--
Off-board charge Capable Indicator	--		
Transmission Type	Semi-Automatic	**# of Transmission Gears**	8
Engine Code	3.0-N57-F15X	**Axle Ratio**	3.15
Displacement (liters)	3	**Rated Horsepower**	255
Equivalent Test Weight (pounds)	5250	**Air Aspiration Method**	Turbocharged
Drive Mode While Testing	2-Wheel Drive, Rear	**SIL Usage**	Not eqipped
Aged Emission Components	4,000 (mi)		

Dynamometer Coefficients:

Coefficient Category	Target Coefficients A (lbf)	Target Coefficients B (lbf/mph)	Target Coefficients C (lbf/mph**2)	Set Coefficients A (lbf)	Set Coefficients B (lbf/mph)	Set Coefficients C (lbf/mph**2)	EPA Calculated Total Road Load Horse Power for City/Highway/Evap Coefficients
City/Highway/Evap	58.6	-0.446	0.03632	24.2	-0.131	0.03222	16.9
Cold CO	65.1	-0.496	0.04036	20.3	-0.149	0.03532	N/A
US06	58.6	-0.446	0.03632	24.2	-0.131	0.03222	N/A

Manufacturer Test Vehicle Comments EDV X5 xDrive35d, AT, ESS activated

Certification Summary Information Report

Test Group	GBMXT03.0N57	**Evaporative/Refueling Family**	N/A
Test #	**GBMX10038552**	**Test Procedure**	**2 - CVS 75 and later (w/o can. load)**
Exhaust Test # for this Evap Test	N/A	**Test Fuel Type**	19 - Federal Cert Diesel 7-15 PPM Sulfur
Test Date	09/01/2015	**Fuel**	Diesel
Vehicle Class	LDT3 (ALVW 3751-5750, LVW 0-3750, GVW > 6000)	**DF Type**	Mfr. Determined
Verify Test Lab ID	ATZ		
E10 Evaporative Test Measurement Method	--		

Test Results

Test Result Name	Unrounded Test Result	Verify Calculated FE MPG Equivalent Value
Bag 1 Carbon Dioxide	336.08	--
Bag 1 Fuel Economy	30.3	30.3
Bag 2 Carbon Dioxide	347.75	--
Bag 2 Fuel Economy	29.2	29.2
Bag 3 Carbon Dioxide	317.34	--
Bag 3 Fuel Economy	32.1	32.1
CH4 - Methane	0.03622	--
Carbon Monoxide	0.0535	--
Drive Trace Absolute Speed Change Rating	-0.337	--
Drive Trace Energy Economy Rating	-0.937	--
Drive Trace Inertia Work Ratio Rating	-0.521	--
Manufacturer Fuel Economy	30.2	30.2
Nitrogen Oxide	0.013	--
Nitrous Oxide	0.02641	--
Non-methane Hydrocarbon	0.00659	--
Particulate Matter	0.00064	--
Total Hydrocarbon	0.04747	--

Test Result Name	Unrounded Test Result	Verify Calculated CREE/OPT-CREE
Carbon-Related Exhaust Emissions	337	337

Test Result Name	Unrounded Test Result	Verify Calculated CO2
Carbon dioxide	336.98	--

Manufacturer Test Comments EDV, FTP, X5 xDrive35d, AT, ESS activated

Certification Summary Information Report

Test Group GBMXT03.0N57 **Evaporative/Refueling Family** N/A

Certification Region	Useful Life	Standard Level	Emission Name	Rounded Result	RAF	NMOG/NM HC Ratio	Diesel Adjustment Factor	Add DF	Mult DF	Certification Level	Standard	Pass/Fail
Fed	50,000 miles	Federal Tier 2 Bin 5	CO	0.05	--	--	0.009 UP	--	1.755	0.1	3.4	Pass
Fed	50,000 miles	Federal Tier 2 Bin 5	HC-NM	0.0066	--	--	0.000 UP	--	1.119	0.007	0.075	Pass
Fed	50,000 miles	Federal Tier 2 Bin 5	NOX	0.013	--	--	0.003 UP	--	1.194	0.02	0.05	Pass
Fed	120,000 miles	Federal Tier 2 Bin 5	CO	0.05	--	--	0.009 UP	--	2.905	0.2	4.2	Pass
Fed	120,000 miles	Federal Tier 2 Bin 5	CREE	337	--	--	0.000 UP	--	1.000	337	--	--
Fed	120,000 miles	Federal Tier 2 Bin 5	HC-NM	0.0066	--	--	0.000 UP	--	1.301	0.009	0.090	Pass
Fed	120,000 miles	Federal Tier 2 Bin 5	HC-NM+NOX-COMP	0.032	--	--	0.000 UP	--	1.000	0.03	0.99	Pass
Fed	120,000 miles	Federal Tier 2 Bin 5	METHANE	0.0362	--	--	0.002 UP	--	1.000	0.038	0.090	Pass
Fed	120,000 miles	Federal Tier 2 Bin 5	N2O	0.0264	--	--	0.003 UP	--	1.175	0.034	0.050	Pass
Fed	120,000 miles	Federal Tier 2 Bin 5	NOX	0.013	--	--	0.003 UP	--	1.489	0.02	0.07	Pass
Fed	120,000 miles	Federal Tier 2 Bin 5	PM	0.001	--	--	0.000 UP	--	1.034	0.00	0.01	Pass
Fed	120,000 miles	Federal Tier 2 Bin 5	PM-COMP	0.001	--	--	0.000 UP	--	1.000	0.00	0.07	Pass
CA	50,000 miles	California LEV-II ULEV	CO	0.05	--	--	0.009 UP	--	1.755	0.1	1.7	Pass
CA	50,000 miles	California LEV-II ULEV	HC-NM	0.0066	--	--	0.000 UP	--	1.119	0.007	0.040	Pass
CA	50,000 miles	California LEV-II ULEV	NOX	0.013	--	--	0.003 UP	--	1.194	0.02	0.05	Pass
CA	120,000 miles	California LEV-II ULEV	CO	0.05	--	--	0.009 UP	--	2.905	0.2	2.1	Pass
CA	120,000 miles	California LEV-II ULEV	HC-NM	0.0066	--	--	0.000 UP	--	1.301	0.009	0.055	Pass
CA	120,000 miles	California LEV-II ULEV	NOX	0.013	--	--	0.003 UP	--	1.489	0.02	0.07	Pass
CA	120,000 miles	California LEV-II ULEV	PM	0.001	--	--	0.000 UP	--	1.034	0.00	0.01	Pass

NOTE: For Non-charge depleting tests, the Rounded Result for CREE/OPT-CREE Emission names are Verify-calculated values.

Certification Summary Information Report

Test Group	GBMXT03.0N57	**Evaporative/Refueling Family**	N/A
Test #	**GBMX10038600**	**Test Procedure**	**11 - Cold CO**
Exhaust Test # for this Evap Test	N/A	**Test Fuel Type**	19 - Federal Cert Diesel 7-15 PPM Sulfur
Test Date	08/14/2015	**Fuel**	N/A
Vehicle Class	N/A	**DF Type**	Mfr. Determined
Verify Test Lab ID	BMW Engineering and Emission Test Center		
E10 Evaporative Test Measurement Method	--		

Test Results

Test Result Name	Unrounded Test Result	Verify Calculated FE MPG Equivalent Value
Bag 1 Carbon Dioxide	461.47	--
Bag 1 Fuel Economy	22	22
Bag 2 Carbon Dioxide	389.27	--
Bag 2 Fuel Economy	26.1	26.1
Bag 3 Carbon Dioxide	329.75	--
Bag 3 Fuel Economy	30.8	30.8
Carbon Monoxide	0.2562	--
Drive Trace Absolute Speed Change Rating	-1.114	--
Drive Trace Energy Economy Rating	-1.512	--
Drive Trace Inertia Work Ratio Rating	-1.853	--
Manufacturer Fuel Economy	26.2	26.2
Total Hydrocarbon	0.10952	--

Test Result Name	Unrounded Test Result	Verify Calculated CO2
Carbon dioxide	387.94	--

Manufacturer Test Comments EDV, ColdCO, X5 xDrive35d, AT, ESS activated

Certification Summary Information Report

Test Group	GBMXT03.0N57	**Evaporative/Refueling Family**	N/A

Test #	**GBMX10038553**	**Test Procedure**	**3 - HWFE**
Exhaust Test # for this Evap Test	N/A	**Test Fuel Type**	19 - Federal Cert Diesel 7-15 PPM Sulfur
Test Date	09/01/2015	**Fuel**	Diesel
Vehicle Class	LDT3 (ALVW 3751-5750, LVW 0-3750, GVW > 6000)	**DF Type**	Mfr. Determined
Verify Test Lab ID	ATZ		
E10 Evaporative Test Measurement Method	--		

Test Results

Test Result Name	Unrounded Test Result	Verify Calculated FE MPG Equivalent Value
Carbon Monoxide	0.0264	--
Drive Trace Absolute Speed Change Rating	-2.316	--
Drive Trace Energy Economy Rating	-0.787	--
Drive Trace Inertia Work Ratio Rating	-2.858	--
Manufacturer Fuel Economy	41.5	41.5
Nitrogen Oxide	0.0005	--
Total Hydrocarbon	0.01497	--

Test Result Name	Unrounded Test Result	Verify Calculated CREE/OPT-CREE
Carbon-Related Exhaust Emissions	245	245

Test Result Name	Unrounded Test Result	Verify Calculated CO2
Carbon dioxide	245.24	--

Manufacturer Test Comments EDV, HWY, X5 xDrive35d, AT, ESS activated

Certification Region	Useful Life	Standard Level	Emission Name	Rounded Result	RAF	NMOG/NM HC Ratio	Diesel Adjustment Factor	Add DF	Mult DF	Certification Level	Standard	Pass/Fail
Fed	50,000 miles	Federal Tier 2 Bin 5	NOX	0.000	--	--	0.003 UP	--	1.194	0.00	0.07	Pass
Fed	120,000 miles	Federal Tier 2 Bin 5	CREE	245	--	--	0.000 UP	--	1.000	245	--	--
Fed	120,000 miles	Federal Tier 2 Bin 5	NOX	0.000	--	--	0.003 UP	--	1.489	0.00	0.09	Pass
CA	50,000 miles	California LEV-II ULEV	NOX	0.000	--	--	0.003 UP	--	1.194	0.00	0.07	Pass
CA	120,000 miles	California LEV-II ULEV	NOX	0.000	--	--	0.003 UP	--	1.489	0.00	0.09	Pass

NOTE: For Non-charge depleting tests, the Rounded Result for CREE/OPT-CREE Emission names are Verify-calculated values.

Certification Summary Information Report

Test Group	GBMXT03.0N57	**Evaporative/Refueling Family**	N/A
Test #	**GBMX10038602**	**Test Procedure**	**90 - US06**
Exhaust Test # for this Evap Test	N/A	**Test Fuel Type**	19 - Federal Cert Diesel 7-15 PPM Sulfur
Test Date	08/20/2015	**Fuel**	Diesel
Vehicle Class	LDT3 (ALVW 3751-5750, LVW 0-3750, GVW > 6000)	**DF Type**	Mfr. Determined
Verify Test Lab ID	ATZ		
E10 Evaporative Test Measurement Method	--		

Test Results

Test Result Name	Unrounded Test Result	Verify Calculated FE MPG Equivalent Value
Bag 1 Carbon Dioxide	557.82	--
Bag 1 Fuel Economy	18.2	18.2
Bag 2 Carbon Dioxide	329.89	--
Bag 2 Fuel Economy	30.8	30.8
CH4 - Methane	0.00118	--
Carbon Monoxide	0.0224	--
Drive Trace Absolute Speed Change Rating	-7.379	--
Drive Trace Energy Economy Rating	-3.747	--
Drive Trace Inertia Work Ratio Rating	-12.363	--
Manufacturer Fuel Economy	26.8	26.8
Nitrogen Oxide	0.0235	--
Non-methane Hydrocarbon	0	--
Particulate Matter	0.00069	--
Total Hydrocarbon	0.0003	--

Test Result Name	Unrounded Test Result	Verify Calculated CO2
Carbon dioxide	380.44	--

Manufacturer Test Comments EDV, US06, X5 xDrive35d, AT, ESS activated

Certification Summary Information Report

Test Group GBMXT03.0N57 **Evaporative/Refueling Family** N/A

Certification Region	Useful Life	Standard Level	Emission Name	Rounded Result	RAF	NMOG/NM HC Ratio	Diesel Adjustment Factor	Add DF	Mult DF	Certification Level	Standard	Pass/Fail
Fed	4,000 miles	Federal Tier 2 Bin 5	CO	0.02	--	--	0.000 UP	--	1.000	0.0	10.5	Pass
Fed	4,000 miles	Federal Tier 2 Bin 5	HC-NM+NOX	0.024	--	--	0.000 UP	--	1.000	0.02	0.40	Pass
Fed	120,000 miles	Federal Tier 2 Bin 5	CO	0.02	--	--	0.009 UP	--	2.905	0.1	16.9	Pass
CA	4,000 miles	California LEV-II ULEV	CO	0.02	--	--	0.000 UP	--	1.000	0.0	10.5	Pass
CA	4,000 miles	California LEV-II ULEV	HC-NM+NOX	0.024	--	--	0.000 UP	--	1.000	0.02	0.40	Pass

Certification Summary Information Report

Test Group	GBMXT03.0N57	**Evaporative/Refueling Family**	N/A
Test #	**GBMX10038601**	**Test Procedure**	**95 - SC03**
Exhaust Test # for this Evap Test	N/A	**Test Fuel Type**	19 - Federal Cert Diesel 7-15 PPM Sulfur
Test Date	09/04/2015	**Fuel**	Diesel
Vehicle Class	LDT3 (ALVW 3751-5750, LVW 0-3750, GVW > 6000)	**DF Type**	Mfr. Determined
Verify Test Lab ID	ATZ		
E10 Evaporative Test Measurement Method	--		

Test Results

Test Result Name	Unrounded Test Result	Verify Calculated FE MPG Equivalent Value
CH4 - Methane	0.0085	--
Carbon Monoxide	0.0236	--
Drive Trace Absolute Speed Change Rating	-1.953	--
Drive Trace Energy Economy Rating	-2.239	--
Drive Trace Inertia Work Ratio Rating	-2.336	--
Manufacturer Fuel Economy	25.4	25.4
Nitrogen Oxide	0.0211	--
Non-methane Hydrocarbon	0	--
Particulate Matter	0.0004	--
Total Hydrocarbon	0.00899	--

Test Result Name	Unrounded Test Result	Verify Calculated CO2
Carbon dioxide	401.2	--

Manufacturer Test Comments EDV, SC03, X5 xDrive35d, AT, ESS activated

Certification Region	Useful Life	Standard Level	Emission Name	Rounded Result	RAF	NMOG/NM HC Ratio	Diesel Adjustment Factor	Add DF	Mult DF	Certification Level	Standard	Pass/Fail
Fed	4,000 miles	Federal Tier 2 Bin 5	CO	0.02	--	--	0.000 UP	--	1.000	0.0	3.5	Pass
Fed	4,000 miles	Federal Tier 2 Bin 5	HC-NM+NOX	0.021	--	--	0.000 UP	--	1.000	0.02	0.31	Pass
Fed	120,000 miles	Federal Tier 2 Bin 5	CO	0.02	--	--	0.009 UP	--	2.905	0.1	5.6	Pass
CA	4,000 miles	California LEV-II ULEV	CO	0.02	--	--	0.000 UP	--	1.000	0.0	3.5	Pass
CA	4,000 miles	California LEV-II ULEV	HC-NM+NOX	0.021	--	--	0.000 UP	--	1.000	0.02	0.31	Pass

Certification Summary Information Report

Test Group	GBMXT03.0N57	**Evaporative/Refueling Family**	N/A

Emission Data Vehicle Information

Vehicle ID / Configuration 0C06535 / 4

Vehicle Model

Represented Test Vehicle Make	BMW	**Represented Test Vehicle Model**	X5 xDrive35d

Leak Family Details

Leak Family Identifier	--	**Leak Family Name**	--

Drive Sources and Fuel System Details

Drive Source and Fuel#	Drive Source	Fuel
1	Combustion Engine	Diesel

Hybrid Indicator	N		
Multiple Fuel Storage	--	**Multiple Fuel Combustion**	--
Fuel Cell Indicator	--	**Rechargeable Energy Storage System Indicator**	--
Rechargeable Energy Storage System	--	**Rechargeable Energy Storage System, if 'Other'**	--
Off-board charge Capable Indicator	--		
Transmission Type	Semi-Automatic	**# of Transmission Gears**	8
Engine Code	3.0-N57-F15X	**Axle Ratio**	3.15
Displacement (liters)	3	**Rated Horsepower**	255
Equivalent Test Weight (pounds)	5500	**Air Aspiration Method**	Turbocharged
Drive Mode While Testing	2-Wheel Drive, Rear	**SIL Usage**	Not eqipped
Aged Emission Components	4,000 (mi)		

Dynamometer Coefficients:

	Target Coefficients			Set Coefficients			
Coefficient Category	**A (lbf)**	**B (lbf/mph)**	**C (lbf/mph**2)**	**A (lbf)**	**B (lbf/mph)**	**C (lbf/mph**2)**	**EPA Calculated Total Road Load Horse Power for City/Highway/Evap Coefficients**
City/Highway/Evap	59.9	-0.446	0.03632	25.3	-0.132	0.0321	17.1
US06	59.9	-0.446	0.03632	25.3	-0.132	0.0321	N/A

Manufacturer Test Vehicle Comments EDV X5 xDrive35d, AT, ESS activated, "test weight basis" = ALVW

Certification Summary Information Report

Test Group	GBMXT03.0N57	**Evaporative/Refueling Family**	N/A
Test #	**GBMX10038605**	**Test Procedure**	**90 - US06**
Exhaust Test # for this Evap Test	N/A	**Test Fuel Type**	19 - Federal Cert Diesel 7-15 PPM Sulfur
Test Date	08/20/2015	**Fuel**	Diesel
Vehicle Class	LDT3 (ALVW 3751-5750, LVW 0-3750, GVW > 6000)	**DF Type**	Mfr. Determined
Verify Test Lab ID	ATZ		
E10 Evaporative Test Measurement Method	--		

Test Results

Test Result Name	Unrounded Test Result	Verify Calculated FE MPG Equivalent Value
Bag 1 Carbon Dioxide	574.85	--
Bag 1 Fuel Economy	17.7	17.7
Bag 2 Carbon Dioxide	330.78	--
Bag 2 Fuel Economy	30.7	30.7
CH4 - Methane	0.0009	--
Carbon Monoxide	0.0206	--
Drive Trace Absolute Speed Change Rating	-7.073	--
Drive Trace Energy Economy Rating	-4.694	--
Drive Trace Inertia Work Ratio Rating	-11.547	--
Manufacturer Fuel Economy	26.4	26.4
Nitrogen Oxide	0.1305	--
Non-methane Hydrocarbon	0	--
Particulate Matter	0.00061	--
Total Hydrocarbon	0.00002	--

Test Result Name	Unrounded Test Result	Verify Calculated CO2
Carbon dioxide	384.73	--

Manufacturer Test Comments EDV, US06, X5 xDrive35d, AT, "test weight basis" = ALVW

Certification Summary Information Report

Test Group GBMXT03.0N57 **Evaporative/Refueling Family** N/A

Certification Region	Useful Life	Standard Level	Emission Name	Rounded Result	RAF	NMOG/NM HC Ratio	Diesel Adjustment Factor	Add DF	Mult DF	Certification Level	Standard	Pass/Fail
Fed	4,000 miles	Federal Tier 2 Bin 5	CO	0.02	--	--	0.000 UP	--	1.000	0.0	10.5	Pass
Fed	4,000 miles	Federal Tier 2 Bin 5	HC-NM+NOX	0.130	--	--	0.000 UP	--	1.000	0.13	0.40	Pass
Fed	120,000 miles	Federal Tier 2 Bin 5	CO	0.02	--	--	0.009 UP	--	2.905	0.1	16.9	Pass
CA	4,000 miles	California LEV-II ULEV	CO	0.02	--	--	0.000 UP	--	1.000	0.0	10.5	Pass
CA	4,000 miles	California LEV-II ULEV	HC-NM+NOX	0.130	--	--	0.000 UP	--	1.000	0.13	0.40	Pass

Certification Summary Information Report

Test Group	GBMXT03.0N57	**Evaporative/Refueling Family**	N/A
Test #	**GBMX10038604**	**Test Procedure**	**95 - SC03**
Exhaust Test # for this Evap Test	N/A	**Test Fuel Type**	19 - Federal Cert Diesel 7-15 PPM Sulfur
Test Date	09/04/2015	**Fuel**	Diesel
Vehicle Class	LDT3 (ALVW 3751-5750, LVW 0-3750, GVW > 6000)	**DF Type**	Mfr. Determined
Verify Test Lab ID	ATZ		
E10 Evaporative Test Measurement Method	--		

Test Results

Test Result Name	Unrounded Test Result	Verify Calculated FE MPG Equivalent Value
CH4 - Methane	0.00738	--
Carbon Monoxide	0.0263	--
Drive Trace Absolute Speed Change Rating	-1.67	--
Drive Trace Energy Economy Rating	-1.801	--
Drive Trace Inertia Work Ratio Rating	-1.762	--
Manufacturer Fuel Economy	23.5	23.5
Nitrogen Oxide	0.0512	--
Non-methane Hydrocarbon	0	--
Particulate Matter	0.00098	--
Total Hydrocarbon	0.00759	--

Test Result Name	Unrounded Test Result	Verify Calculated CO2
Carbon dioxide	432.82	--

Manufacturer Test Comments EDV, SC03, X5 xDrive35d, AT, "test weight basis" = ALVW

Certification Region	Useful Life	Standard Level	Emission Name	Rounded Result	RAF	NMOG/NM HC Ratio	Diesel Adjustment Factor	Add DF	Mult DF	Certification Level	Standard	Pass/Fail
Fed	4,000 miles	Federal Tier 2 Bin 5	CO	0.03	--	--	0.000 UP	--	1.000	0.0	3.5	Pass
Fed	4,000 miles	Federal Tier 2 Bin 5	HC-NM+NOX	0.051	--	--	0.000 UP	--	1.000	0.05	0.31	Pass
Fed	120,000 miles	Federal Tier 2 Bin 5	CO	0.03	--	--	0.009 UP	--	2.905	0.1	5.6	Pass
CA	4,000 miles	California LEV-II ULEV	CO	0.03	--	--	0.000 UP	--	1.000	0.0	3.5	Pass
CA	4,000 miles	California LEV-II ULEV	HC-NM+NOX	0.051	--	--	0.000 UP	--	1.000	0.05	0.31	Pass

Certification Summary Information Report

Test Group	GBMXT03.0N57	**Evaporative/Refueling Family**	N/A

Consolidated List of Standards

Exhaust Standards

Cert Region	California + CAA Section 177 states	**Cert/In-Use Code**	Cert
Vehicle Class	LDT3 (ALVW 3751-5750, LVW 0-3750, GVW > 6000)	**Standard Level**	California LEV-II ULEV
Fuel	Diesel	**Test Procedure**	CVS 75 and later (w/o can. load)

Useful Life	Emission Name	Rounded Result	RAF	NMOG / NMHC	Upward Diesel Adjustment Factor	Downward Diesel Adjustment Factor	Mult DF	Add DF	Std
50,000 miles	CO	--	--	--	0.009	0.000	1.755	--	1.7
50,000 miles	HC-NM	--	--	--	0.000	0.009	1.119	--	0.040
50,000 miles	HCHO	--	--	--	0.000	0.000	1.000	--	0.008
50,000 miles	NOX	--	--	--	0.003	0.000	1.194	--	0.05
120,000 miles	CO	--	--	--	0.009	0.000	2.905	--	2.1
120,000 miles	HC-NM	--	--	--	0.000	0.009	1.301	--	0.055
120,000 miles	HCHO	--	--	--	0.000	0.000	1.000	--	0.011
120,000 miles	NOX	--	--	--	0.003	0.000	1.489	--	0.07
120,000 miles	PM	--	--	--	0.000	0.000	1.034	--	0.01

Cert Region	California + CAA Section 177 states	**Cert/In-Use Code**	Cert
Vehicle Class	LDT3 (ALVW 3751-5750, LVW 0-3750, GVW > 6000)	**Standard Level**	California LEV-II ULEV
Fuel	Diesel	**Test Procedure**	HWFE

Useful Life	Emission Name	Rounded Result	RAF	NMOG / NMHC	Upward Diesel Adjustment Factor	Downward Diesel Adjustment Factor	Mult DF	Add DF	Std
50,000 miles	NOX	--	--	--	0.003	0.000	1.194	--	0.07
120,000 miles	NOX	--	--	--	0.003	0.000	1.489	--	0.09

Certification Summary Information Report

Test Group	GBMXT03.0N57	**Evaporative/Refueling Family**	N/A
Cert Region	Federal	**Cert/In-Use Code**	Cert
Vehicle Class	LDT3 (ALVW 3751-5750, LVW 0-3750, GVW > 6000)	**Standard Level**	Federal Tier 2 Bin 5
Fuel	Diesel	**Test Procedure**	CVS 75 and later (w/o can. load)

Useful Life	Emission Name	Rounded Result	RAF	NMOG / NMHC	Upward Diesel Adjustment Factor	Downward Diesel Adjustment Factor	Mult DF	Add DF	Std
50,000 miles	CO	--	--	--	0.009	0.000	1.755	--	3.4
50,000 miles	HC-NM	--	--	--	0.000	0.009	1.119	--	0.075
50,000 miles	HCHO	--	--	--	0.000	0.000	1.000	--	0.015
50,000 miles	NOX	--	--	--	0.003	0.000	1.194	--	0.05
120,000 miles	CO	--	--	--	0.009	0.000	2.905	--	4.2
120,000 miles	CREE	--	--	--	0.000	0.000	1.000	--	999.999
120,000 miles	HC-NM	--	--	--	0.000	0.009	1.301	--	0.090
120,000 miles	HC-NM+NOX-COMP	--	--	--	0.000	0.000	1.000	--	0.99
120,000 miles	HCHO	--	--	--	0.000	0.000	1.000	--	0.018
120,000 miles	METHANE	--	--	--	0.002	0.000	1.000	--	0.090
120,000 miles	N2O	--	--	--	0.003	0.005	1.175	--	0.050
120,000 miles	NOX	--	--	--	0.003	0.000	1.489	--	0.07
120,000 miles	PM	--	--	--	0.000	0.000	1.034	--	0.01
120,000 miles	PM-COMP	--	--	--	0.000	0.000	1.000	--	0.07

Cert Region	Federal	**Cert/In-Use Code**	Cert
Vehicle Class	LDT3 (ALVW 3751-5750, LVW 0-3750, GVW > 6000)	**Standard Level**	Federal Tier 2 Bin 5
Fuel	Diesel	**Test Procedure**	US06

Useful Life	Emission Name	Rounded Result	RAF	NMOG / NMHC	Upward Diesel Adjustment Factor	Downward Diesel Adjustment Factor	Mult DF	Add DF	Std
4,000 miles	CO	--	--	--	0.000	0.000	1.000	--	10.5
4,000 miles	HC-NM+NOX	--	--	--	0.000	0.000	1.000	--	0.40
120,000 miles	CO	--	--	--	0.009	0.000	2.905	--	16.9

Certification Summary Information Report

Test Group	GBMXT03.0N57	**Evaporative/Refueling Family**	N/A
Cert Region	California + CAA Section 177 states	**Cert/In-Use Code**	Cert
Vehicle Class	LDT3 (ALVW 3751-5750, LVW 0-3750, GVW > 6000)	**Standard Level**	California LEV-II ULEV
Fuel	Diesel	**Test Procedure**	US06

Useful Life	Emission Name	Rounded Result	RAF	NMOG / NMHC	Upward Diesel Adjustment Factor	Downward Diesel Adjustment Factor	Mult DF	Add DF	Std
4,000 miles	CO	--	--	--	0.000	0.000	1.000	--	10.5
4,000 miles	HC-NM+NOX	--	--	--	0.000	0.000	1.000	--	0.40

Cert Region	Federal	**Cert/In-Use Code**	Cert
Vehicle Class	LDT3 (ALVW 3751-5750, LVW 0-3750, GVW > 6000)	**Standard Level**	Federal Tier 2 Bin 5
Fuel	Diesel	**Test Procedure**	SC03

Useful Life	Emission Name	Rounded Result	RAF	NMOG / NMHC	Upward Diesel Adjustment Factor	Downward Diesel Adjustment Factor	Mult DF	Add DF	Std
4,000 miles	CO	--	--	--	0.000	0.000	1.000	--	3.5
4,000 miles	HC-NM+NOX	--	--	--	0.000	0.000	1.000	--	0.31
120,000 miles	CO	--	--	--	0.009	0.000	2.905	--	5.6

Cert Region	Federal	**Cert/In-Use Code**	Cert
Vehicle Class	LDT3 (ALVW 3751-5750, LVW 0-3750, GVW > 6000)	**Standard Level**	Federal Tier 2 Bin 5
Fuel	Diesel	**Test Procedure**	HWFE

Useful Life	Emission Name	Rounded Result	RAF	NMOG / NMHC	Upward Diesel Adjustment Factor	Downward Diesel Adjustment Factor	Mult DF	Add DF	Std
50,000 miles	NOX	--	--	--	0.003	0.000	1.194	--	0.07
120,000 miles	CREE	--	--	--	0.000	0.000	1.000	--	999.999
120,000 miles	NOX	--	--	--	0.003	0.000	1.489	--	0.09

Certification Summary Information Report

Test Group	GBMXT03.0N57	**Evaporative/Refueling Family**	N/A
Cert Region	California + CAA Section 177 states	**Cert/In-Use Code**	Cert
Vehicle Class	LDT3 (ALVW 3751-5750, LVW 0-3750, GVW > 6000)	**Standard Level**	California LEV-II ULEV
Fuel	Diesel	**Test Procedure**	SC03

Useful Life	Emission Name	Rounded Result	RAF	NMOG / NMHC	Upward Diesel Adjustment Factor	Downward Diesel Adjustment Factor	Mult DF	Add DF	Std
4,000 miles	CO	--	--	--	0.000	0.000	1.000	--	3.5
4,000 miles	HC-NM+NOX	--	--	--	0.000	0.000	1.000	--	0.31

Certification Summary Information Report

Test Group	GBMXT03.0N57	**Evaporative/Refueling Family**	N/A

Glossary

Useful Life			
4	4,000 miles	120	120,000 miles
50	50,000 miles	150	150,000 miles
100	100,000 miles		

Emission Name			
HC-TOTAL	Total Hydrocarbon	METHANOL	CH3OH - Methanol
CO	Carbon Monoxide	N2O	Nitrous Oxide
CO2	Carbon dioxide	SPITBACK	Spitback Hydrocarbon in grams
CREE	Carbon-Related Exhaust Emissions	AMP-HRS	Integrated Amp-hours
OPT-CREE	Optional Carbon-Related Exhaust Emissions	START-SOC	System Start State of Charge Watt-hours
NOX	Nitrogen Oxide	END-SOC	System End State of Charge Watt-hours
PM	Particulate Matter	ACT-DISTANCE	Actual Distance Driven (miles)
PM-COMP	SFTP Composite Particulate Matter	AS-VOLT	Average System Voltage
HC-NM	Non-methane Hydrocarbon	CO2 BAG 1	Bag 1 Carbon Dioxide
OMHCE	Organic material Hydrocarbon Equivalent	CO2 BAG 2	Bag 2 Carbon Dioxide
OMNMHCE	Organic material non-methane HC equivalent	CO2 BAG 3	Bag 3 Carbon Dioxide
NMOG	Non-methane organic gas (California)	CO2 BAG 4	Bag 4 Carbon Dioxide
HCHO	Formaldehyde	NMOG+NOX	Non-methane organic gases plus Nitrogen Oxides
H3C2HO	Acetaldehyde	NMOG+NOX-COMP	SFTP Composite Non-methane Organic Gases + Nitrogen Oxides
HC-NM+NOX	SFTP Non-methane Hydrocarbon + Nitrogen Oxides for US06 or SC03	DT-IWRR	Drive Trace Inertia Work Ratio Rating
HC-NM+NOX-COMP	SFTP Composite Non-methane Hydrocarbon + Nitrogen Oxides	DT-ASCR	Drive Trace Absolute Speed Change Rating
CO-COMP	SFTP Composite Carbon Monoxide	DT-EER	Drive Trace Energy Economy Rating
ETHANOL	C2H5OH - Ethanol	COMB-CREE	Combined Carbon-Related Exhaust Emissions
FE BAG 1	Bag 1 Fuel Economy	COMB-OPT-CREE	Combined Optional Carbon-Related Exhaust Emissions
FE BAG 2	Bag 2 Fuel Economy	HC-TOTAL-EQUIV	Total Hydrocarbon equivalent - Evap only
FE BAG 3	Bag 3 Fuel Economy	METHANE-COMB	Combined CH4 for HD 2b/3 vehicles only
FE BAG 4	Bag 4 Fuel Economy	N2O-COMB	Combined Nitrous Oxide for HD 2b/3 vehicles only
MFR FE	Manufacturer Fuel Economy	LEAK-DIA	Effective Leak Diameter (inches)
HC	Hydrocarbon for Running Loss and ORVR	LEAK-GAS CAP	Gas Cap Leakage (cc/min)
METHANE	CH4 - Methane		

Certification Region			
CA	California + CAA Section 177 states	FA	Federal

Exhaust Emission Standard Level			
B1	Federal Tier 2 Bin 1	L3ULEV340	California LEV-III ULEV340
B2	Federal Tier 2 Bin 2	L3ULEV250	California LEV-III ULEV250
B3	Federal Tier 2 Bin 3	L3ULEV200	California LEV-III ULEV200
B4	Federal Tier 2 Bin 4	L3SULEV170	California LEV-III SULEV170
B5	Federal Tier 2 Bin 5	L3SULEV150	California LEV-III SULEV150

Certification Summary Information Report

Test Group	GBMXT03.0N57	**Evaporative/Refueling Family**	N/A
B6	Federal Tier 2 Bin 6	L3LEV630	California LEV-III LEV630
B7	Federal Tier 2 Bin 7	L3ULEV570	California LEV-III ULEV570
B8	Federal Tier 2 Bin 8	L3ULEV400	California LEV-III ULEV400
B9	Federal Tier 2 Bin 9	L3ULEV270	California LEV-III ULEV270
B10	Federal Tier 2 Bin 10	L3SULEV230	California LEV-III SULEV230
B11	Federal Tier 2 Bin 11	L3SULEV200	California LEV-III SULEV200
HDV1	HDV1 (Federal HD chassis Class 2b GVW 8501-10000)	T3B160	Federal Tier 3 Bin 160
HDV2	HDV2 (Federal HD chassis Class 3 GVW 10001-14000)	T3B125	Federal Tier 3 Bin 125
L2	California LEV-II LEV	T3B110	Federal Tier 3 Transitional Bin 110
L2OP	California LEV-II LEV Optional	T3B85	Federal Tier 3 Transitional Bin 85
U2	California LEV-II ULEV	T3SULEV30	Federal Tier 3 Transitional LEV-II SULEV30 Carryover
S2	California LEV-II SULEV	T3B70	Federal Tier 3 Bin 70
ZEV	California ZEV	T3B50	Federal Tier 3 Bin 50
OT	Other	T3B30	Federal Tier 3 Bin 30
T1	Federal Tier 1	T3B20	Federal Tier 3 Bin 20
PZEV	California PZEV	T3B0	Federal Tier 3 Bin 0
L2LEV160	California LEV-II LEV160	HDV2B395	Federal Tier 3 HD Class 2b Transitional Bin 395
L2ULEV125	California LEV-II ULEV125	HDV2B340	Federal Tier 3 HD Class 2b Transitional Bin 340
L2SULEV30	California LEV-II SULEV30	HDV2B250	Federal Tier 3 HD Class 2b Bin 250
L2LEV395	California LEV-II LEV395	HDV2B200	Federal Tier 3 HD Class 2b Bin 200
L2ULEV340	California LEV-II ULEV340	HDV2B170	Federal Tier 3 HD Class 2b Bin 170
L2LEV630	California LEV-II LEV630	HDV2B150	Federal Tier 3 HD Class 2b Bin 150
L2ULEV570	California LEV-II ULEV570	HDV2B0	Federal Tier 3 HD Class 2b Bin 0
L3LEV160	California LEV-III LEV160	HDV3B630	Federal Tier 3 HD Class 3 Transitional Bin 630
L3ULEV125	California LEV-III ULEV125	HDV3B570	Federal Tier 3 HD Class 3 Transitional Bin 570
L3ULEV70	California LEV-III ULEV70	HDV3B400	Federal Tier 3 HD Class 3 Bin 400
L3ULEV50	California LEV-III ULEV50	HDV3B270	Federal Tier 3 HD Class 3 Bin 270
L3SULEV30	California LEV-III SULEV30	HDV3B230	Federal Tier 3 HD Class 3 Bin 230
L3SULEV20	California LEV-III SULEV20	HDV3B200	Federal Tier 3 HD Class 3 Bin 200
L3LEV395	California LEV-III LEV395	HDV3B0	Federal Tier 3 HD Class 3 Bin 0

Transmission Type Code			
AMS	Automated Manual- Selectable (e.g. Automated Manual with paddles)	M	Manual
A	Automatic	OT	Other
AM	Automated Manual	SA	Semi-Automatic
CVT	Continuously Variable	SCV	Selectable Continuously Variable (e.g. CVT with paddles)

Drive System Code			
4	4-Wheel Drive	P	Part-time 4-Wheel Drive
F	2-Wheel Drive, Front	A	All Wheel Drive
R	2-Wheel Drive, Rear		

Certification Summary Information Report

Test Group	GBMXT03.0N57	**Evaporative/Refueling Family**	N/A

Additional Terms and Acronyms

AFC	Alternative Fuel Converter	ICI	Independent Commercial Importer
CSI	Certificate Summary Information	ORVR	Onboard Refueling Vapor Recovery
DF	Deterioration Factor	SIL	Shift Indicator Light
Evap	Evaporation, Evaporative	Trans	Transmission

8. Statements

8.1 Emission Testing Waiver Statements

Refer to Common Section, Section 8.

8.2 Compliance Statements

Corporate Average Fuel Economy Calculation-Statement

Since the 2007 model year and in accordance with Dear Manufacturer letter CISD-09-19, BMW performs customer vehicle surveys that downloaded select-shift transmission usage data during service at authorized BMW dealers.
BMW has determined that the automatic BMW models equipped with select-shift transmissions will be operated predominantly in the economy mode.
Using good engineering judgment, BMW has concluded that it is appropriate to carry-forward and carry-across the results of the earlier surveys.
Accordingly, BMW will use only economy-mode fuel economy test results for calculating fuel economy label values and Corporate Average Fuel Economy (CAFE).

Emission Control System Continuity-Statement

According to 40 CFR §86.1809-12 (e) and based on engineering evaluations of emission testing between 20°F discontinuity in emission performance of NMOG, CO, CO2, NOx, N2O, CH4, HCHO, and in case of diesel vehicles also particulate emissions as measured on the Federal Test Procedure in the temperature range of 20°F to 86°F for vehicles in this test group.

Leak free exhaust system

Based on our engineering analysis of the complete exhaust system we state as the manufacturer, that the exhaust system installed on any vehicles included in this application comply with the requirements of § 86.1844-01(d)(16).
In accordance with this regulation exhaust systems are designed:
- to facilitate leak free assembly, installation and operation for the full useful life of the vehicle and
- facilitate repairs to maintain leak-free operation.

N2O and CH4 Compliance-Statement

For this model year BMW elects to use the option of paragraph §86.1818-12(f)(3) for this Test Group with higher alternative standards.

9. OBD System Description

The OBD System Description of this Test Group, MY 2016 has been uploaded separately to Verify.

10. Description of Alternate-fueled Vehicles

not applicable

11. Auxiliary Emission Control Devices (AECD) descriptions

AECD	Sensed Parameters	Controlled Parameters					
		EGR	DPF Re-generation	SCR	Injection Timing	Injection Quantity	Idle Speed
X01	Air Flow	x	x	x	x	x	
T01	Engine Coolant Temperature	x	x	x	x	x	x
S01	Engine Speed	x	x	x	x	x	
T02	Intake Air Temperature	x	x		x	x	
T03	Charge Air Cooler Temperature Downstream	x					
T04	Ambient Air Temperature	x		x			
X02	Ambient Pressure	x	x	x	x	x	x
X03	Boost Pressure	x	x	x			
X04	DPF Differential Pressure		x				
X05	Fuel Pressure		x	x			
X06	Gear Information		x	x	x	x	
X07	Exhaust Gas Pressure	x					
T05	Exhaust Gas Temperature DOC Upstream		x	x	x	x	
T06	Exhaust Gas Temperature DPF Upstream		x	x	x	x	
T07	Exhaust Gas Temperature SCR Upstream	x		x			
T08	Temperature EGR Cooler Downstream	x					
P01	EGR Valve Position	x					
X08	NOx Concentration SCR Upstream			x			
X09	NOx Concentration SCR Downstream			x			
T09	Urea Tank Temperature			x			
X10	Urea Pump Pressure			x			
S02	Vehicle Speed		x		x	x	

For description and rationale of the respective AECD, refer to Common Section, Section 11.

12. Description of vehicles and test parameters covered by certificate

12.1. Vehicle Parameters

12.1.1. Carline

Carline	Model Name
147	X5 xDrive35d

12.1.2. Model Name — refer to item 12.1.1.

12.1.3. Vehicle Classification — LDT 3 / MDV 2
<5750 ALVW
>6000 GVW

12.1.4. Emission control system description:

12.1.4.1. Catalyst — Type: oxidation and reduction
Number: 1
configuration: NAC, SCRC

12.1.4.2. EGR / EGRC — EGR: yes
EGRC: yes

12.1.4.3. Air pump type — not applicable

12.1.4.4. Fuel system type — Direct injection

12.1.4.5. Intake air aspiration method — Exhaust gas turbo charger with charge pressure control by a variable nozzle turbine geometry (VNT) and intercooler

12.1.4.6. Other — Charged Air Cooler

12.1.5. Engine Code

Model Name	Automatic Transmission	Manual Transmission
X5 xDrive35d	3.0-N57-F15X	

12.1.6. Number of valves per cylinder — 4

12.1.7. Engine displacement — 2993 cm³

12.1.8. Sales area — CA, FA

12.1.9. Transmission — semi-automatic 8

12.1.10. Shift Indicator Light — not applicable

12.1.11. Tire size

Standard Tires

Model Name	Front	Rear
X5 xDrive35d	255/50 R19 255/55 R18	255/50 R19 255/55 R18

Sport Tires

Model Name	Front	Rear
X5 xDrive35d	275/40 R20	315/35 R20

12.1.12. N/V-Ratio

Model Name	Automatic Transmission	Manual Transmission
X5 xDrive35d	24.1-24.4	

12.1.13. Axle-Ratio

Model Name	Automatic Transmission	Manual Transmission
X5 xDrive35d	3.15	

12.1.14. Test Weight

Model Name	Curb Weight [lb.]	Gross Weight [lb.]	ETW [lb.]
X5 xDrive35d	4930	6400	5250

12.1.15. Fuel Tank volume

Model Name	Volume [L]
X5 xDrive35d	85

12.2.2. Test Parameters

12.2.2.1. Engine Starting Procedures — Refer to Common Section, Section 12

12.2.2.2. Shift Shedules — not applicable

12.2.3. Dynamometer loading information

12.2.3.1. Sort of dynamometer single roll

12.2.3.2. Electric Dynamometer Target Coefficients

Automatic Transmission	A [lbf]	B [lbf/mph]	C [lbf/mph²]	Tyre
X5 xDrive35d	58.6	-0.446	0.03632	Basis

12.2.3.3. Electric Dynamometer Set Coefficients

Automatic Transmission	a [lbf]	b [lbf/mph]	c [lbf/mph²]	Tyre
X5 xDrive35d	24.2	-0.131	0.03222	Basis

13. Projected Sales

Refer to Common Section for Model Year 2016, Section 16.

14. Request for certification

We herewith apply for the Federal Certificate of conformity and the ARB Executive Order for the Test Group GBMXT03.0N57.

The mentioned Test Group complies with all applicable regulations contained in 40 Code of Federal Regulations Part 86 and the California Code of Regulations.

Andreas Eder

15. Other Information

15.1. Label according to 40 CFR § 86.1807-01 and according to California Motor Vehicle Emission Control Specifications.

DRAFT - Inverted Representation

Bayerische Motoren Werke AG VEHICLE EMISSION CONTROL INFORMATION		
Conforms to regulations:		2016 MY
U.S. EPA: Tier2 - Bin5 LDT	CA OBD II	Fuel: Diesel
California: LEVII - ULEV LDT	CA OBD II	Fuel: Diesel
No adjustments needed.	DFI, TC, CAC, EGR, EGRC, SCRC, DPF, NOXS(2), HO2S(2), NAC, PMS	
Group: GBMXT03.0N57		8 590 689

Original representation

Base: Black
Characters: Silver

17. California ARB Information

17.1.	Statements	Refer to Common Section, Section 17
17.1.1.	Driveability	Refer to Common Section, Section 17
17.1.2.	Label Durability	Refer to Common Section, Section 17
17.1.3.	Fill Pipe	Refer to Common Section, Section 17
17.1.4.	Production Vehicles versus Test Vehicles	Refer to Common Section, Section 17
17.1.5.	Continuity of Emissions	Refer to Common Section, Section 17
17.1.6.	I/M Test Procedure Statement	Refer to Common Section, Section 17
17.1.7.	High Altitude Requirements	Refer to Common Section, Section 17
17.1.8.	Warranty	Refer to Common Section, Section 17
17.2.	Evaporative Emission Deterioration	not applicable
17.3.	Engine calibration software identification	

Engine Code	Vehicle Model	Trans. Type	Ignition (ECM/PCM) Part No. *) Cal.-ID.	EGR System Part-No.	Diesel Particulate Filter Part No.*	NOx Absorber Catalyst Part No.*
3.0-N57-F15X	X5 xDrive35d	S8	06501192	Valve: 7 810 871 HD-AGR-Cooler: 7 823 210 AGR-additional Cooler: 8 513 693	8571007	
					8571822	8571820

*) Initial part numbers only, for update refer to Part 2 of application.

18. High Priced Parts List

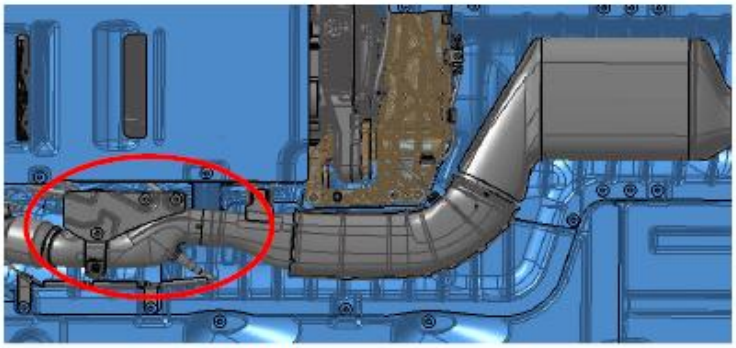
X5 xDrive35d	CHARGE AIR COOLER CONNECTION PIPE (CHARGE AIR) CYLINDER HEAD COVER GASKETS DELIVERY UNIT W/IN-TANK FUEL PUMP DIESEL PARTICULATE FILTER EGR VALVE (CONNECTS TO INTAKE MANIFOLD) ENGINE CONTROL MODULE (DME) EXHAUST COOLER FOR EGR EXHAUST MANIFOLD EXHAUST MANIFOLD GASKET EXHAUST PIPE (BETWEEN DPF AND SCR) EXHAUST PIPE W/ SCR CATALYST FUEL INJECTOR FUEL PRESSURE REGULATING VALVE GASKET, DPF INLET GASKET, TURBO TO EXHAUST MANIFOLD HIGH-PRESSURE FUEL PUMP INTAKE MANIFOLD W/ FLAP CONTROL METERING UNIT, SCR NOX SENSOR PRESSURE ACCUMULATOR (FUEL RAIL) PROCESSING UNIT, SCR PUMP UNIT, SCR SCR FILLER TUBE SCR REAGENT RESERVOIR SUPPLY MODULE, SCR THROTTLE BODY TORQUE CONVERTER TRANSMISSION CONTROL MODULE TURBOCHARGER VACUUM PUMP

Tamper Resistant Design

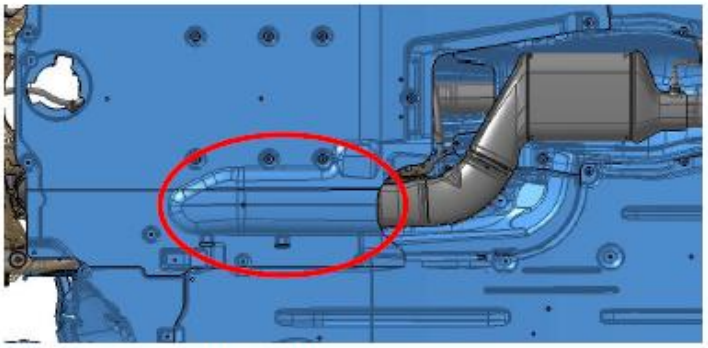
Following measures are taken for the models with N47/N57 Diesel engines to ensure tamper proof design. These measures are taken over from previous certified models with M57 engines produced until MY 2013.

i. Underbody Cover

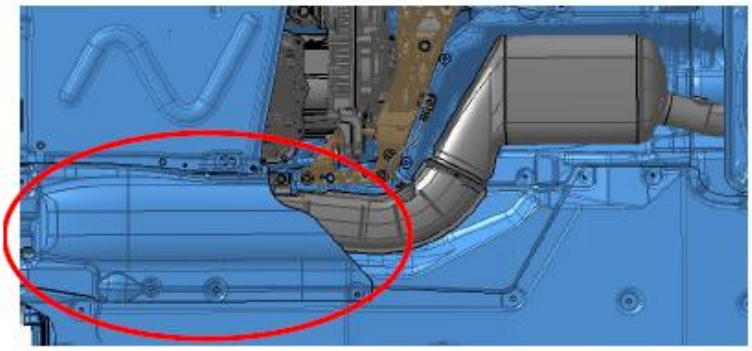
- The models 3-series, 5-series, X3 and X5 are tampering proof equal to the previous models.
- The whole DEF supply system is behind covers.
- The access to the dosing injector is restricted with special screws like the old 3 series.
- The dosing line was changed from rubber hose to a rigid PA tube to avoid tampering of the line.



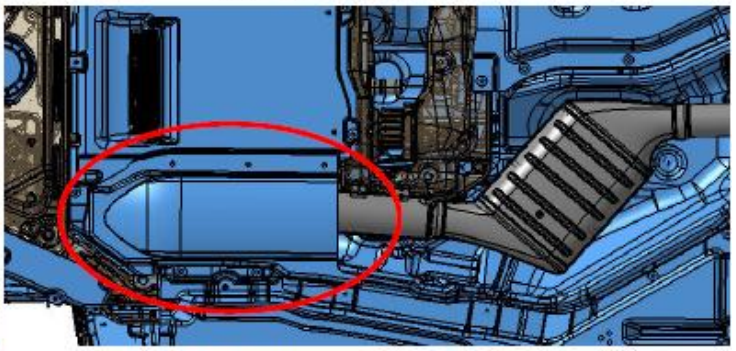
X3 28d with anti-tampering cover with special screws



540d, 740d with underbody cover with special screws



328d with underbody cover with special screws



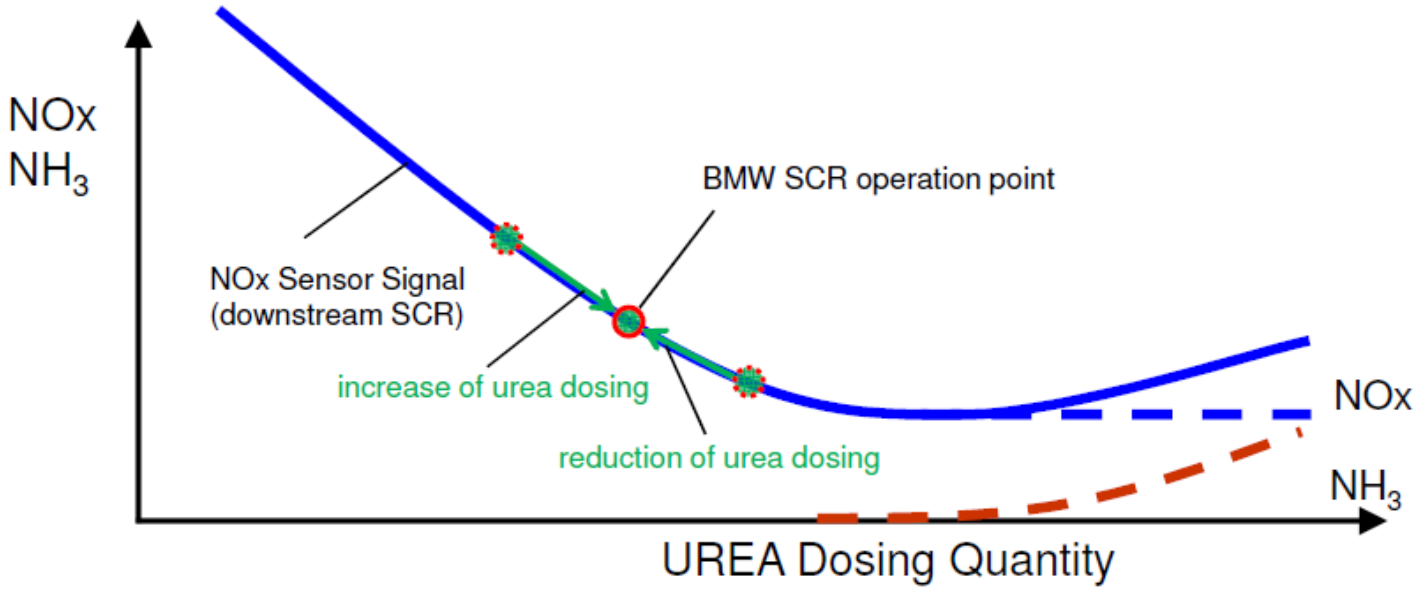
X5 35d with underbody cover with special screws

ii. DEF Incorrect Media Detection
The system involves driver notification for 200 miles, followed by no restart. This concept used for previous certified models with M57 engines is carried over to all models using N47/N57 Diesel engines.

Ammonia Slip

To control ammonia slip the following sensor information and corresponding control strategies are used:

- Based on the BMW SCR dosing strategy, ammonia slip is avoided (SCR operation point).
- BMW uses 2 NOx Sensors, one upstream, the other one downstream of the SCR catalyst.
- With these NOx Sensors ammonia slip is avoided by a continuous efficiency control system (SCR Adaption).



SCR adaption logic N47/N57 Diesel engines

SCR Tank Size MY 2016 Models

Vehicle	DEF tank volume in liter	DEF tank volume in gallon
328d	17.3 l	4.49 gal
535d	16.7 l	4.23 gal
X3 xDrive28d	18.0 l	4.76 gal
X5 xDrive35d	28.2 l	7.40 gal

DEF Consumption Rate And Refill Interval

DEF Consumption
Due to the increased efficiency of the N47, N57 Diesel engines a 15 to 20% reduction of DEF consumption is achieved.

DEF Refill Interval
The expected range before DEF needs to be refilled is about 12,000-17,000 miles (dependent on vehicle type and driving behaviour). The service range is max. 10,000 miles until refill.

DPF Regeneration Strategy

1. General description of the AECD

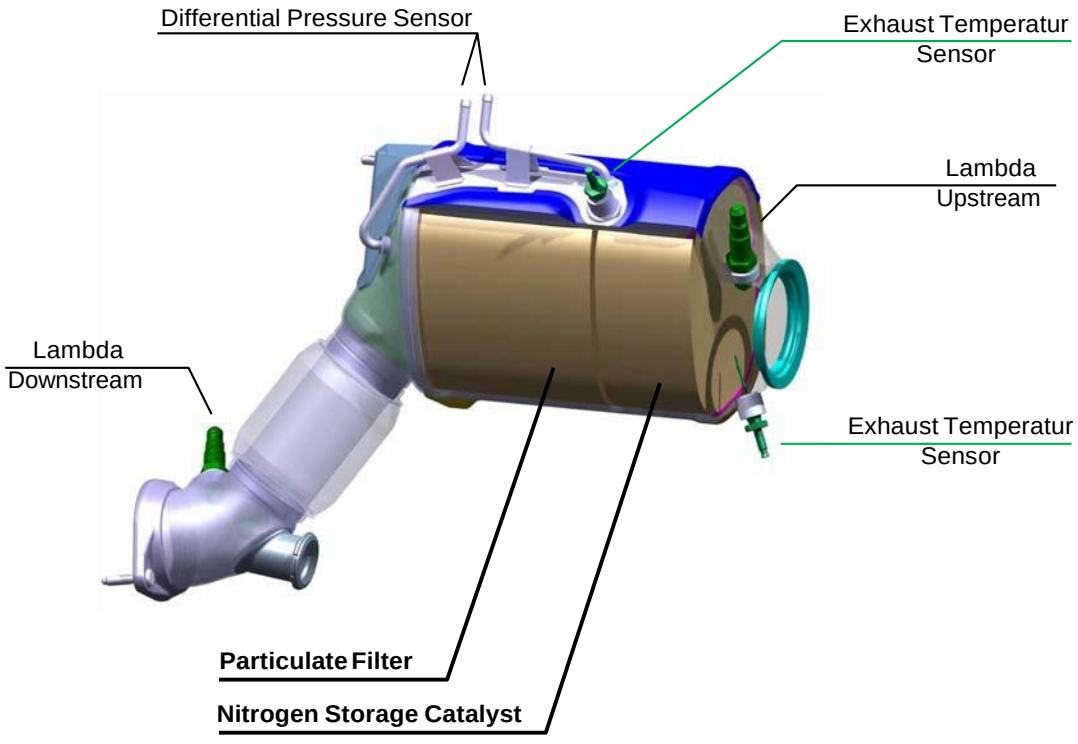
The engine is equipped with a platinum palladium coated diesel particulate filter (DPF). A ceramic wall- flow monolith filter is used. In front of the DPF a ceramic-substrate nitrogen storage catalyst (NSC) is arranged which is also coated with platinum, palladium and rhodium.

DPF Regeneration Strategy:

Since the DPF has a limited soot load capacity it has to be regenerated periodically.
Therefore the ECU analyzes the load level of the DPF and starts the regeneration mode when a certain soot load limit is reached. The activation of regeneration is determined by the following parameters:

Differential pressure of the DPF
Driving conditions since last regeneration

In order to oxidize the collected soot inside the DPF, the exhaust temperature has to be raised above 550°C. To ensure regeneration feasibility under all driving conditions several temperature management measures have to be implemented to increase the exhaust gas temperature.



2. Parameters sensed and controlled

DPF Regeneration	DPF RGN control
Air Flow Sensor	x
Engine Coolant Temperature Sensor	x
Engine Speed Sensor	x
Intake Air Temperature Sensor	x
Ambient Pressure Sensor	x
Boost Pressure Sensor	x
Throttle Valve	x
EGR Valve	x
Swirl Valve	x
DPF Differential Pressure Sensor	x
Fuel Pressure Sensor	x
Gear Information	x
Exhaust Gas Temperature Sensor NSC Upstream	x
Exhaust Gas Temperature Sensor DPF Upstream	x
Vehicle Speed	x
Fuel Quantity	x

3. Base control

3.1 Analyzing differential pressure of the DPF

The DPF is equipped with a pressure sensor which continuously monitors the differential pressure in the DPF. The differential pressure is standardized by the calculated exhaust volume flow. The soot load of the DPF is calculated from the standardized differential pressure.

The input parameters are:

- Exhaust volumetric flow (calculated with air mass flow, EGR mass flow, fuel quantity)
- Exhaust gas temperature sensor upstream DPF
- DPF differential pressure

3.2 Analyzing of driving conditions since last regeneration

The ECU monitors the distance driven since last regeneration with a certain mile limit. The mile-limit is calculated from the driving profile of the vehicle. The input parameters are:

- Average vehicle speed since last regeneration
- Average length of driving cycles since last regeneration

3.3 DPF Regeneration

The DPF Regeneration consists of two steps:

- Light-off mode
- Regeneration mode

Whenever regeneration is activated, the engine operation changes to light-off mode. When the NSC temperature is above light-off and the engine coolant temperature has reached 60°C the regeneration mode is activated. The impact on tailpipe emissions is considered in the additive adjustment factors (AAF).

3.4 Engine operation in Regeneration

3.4.1 Light-Off mode

In light-off mode the engine operation parameters are changed towards lower air mass and delayed combustion to achieve higher exhaust gas temperatures for sufficient exothermic reaction on the NSC. If the temperature upstream of the NSC rises above 400°C the ECU switches from light-off mode to NSC-regeneration mod

In light-off mode the following parameters are modified:

1. Air mass
2. EGR ratio
3. Boost pressure
4. Swirl control
5. Fuel injection timing of main and post injections
6. Fuel injection quantities of main and post injections
7. Injection Pressure

3.4.2 Regeneration mode

In regeneration mode the engine operation parameters are changed towards lower air mass and delayed combustion (more than in light-off mode) to achieve exhaust gas temperatures above 580°C. In regeneration mode the following parameters are modified:

1. - Air mass
2. - EGR ratio
3. - Boost pressure
4. - Swirl control
5. - Fuel injection timing of main and post injections
6. - Fuel injection quantities of main and post injections
7. - Injection Pressure

1. Air mass set-point base value is calculated from engine speed and fuel quantity. Depending on ambient pressure the set-point value is corrected to maintain a stable combustion at high altitude. The set point value is corrected to maintain stable combustion at high altitude and low temperature.

2. The desired EGR ratio is calculated from engine speed and fuel quantity. Depending on ambient pressure and intake air temperature the set point value is corrected to maintain stable combustion at high altitude and low temperature.

3. The boost pressure desired value is calculated from engine speed and fuel quantity. Depending on ambient pressure and intake air temperature the set point value is corrected to ensure the maximum turbo charger speed boundary and
   stable combustion at low temperature.

4. The fuel rail pressure desired value is calculated from engine speed and fuel quantity.

5. The set-point value for the swirl-control actuator is calculated out of engine speed and fuel quantity.

6. The fuel injection timing calculation is based on engine speed and desired injection quantity. At low ambient pressure the fuel injection timings and post injection quantities are modified to ensure exhaust gas temperatures below the turbocharger temperature limit.

4. Restriction Strategy

The regeneration works within a defined range of engine coolant temperature, exhaust gas temperature upstream of the NSC, exhaust gas temperature upstream of the DPF and ambient pressure. Because the DPF is furthermore able to store soot outside these limits there is no impact on tailpipe emissions.

The limits are defined as follows:

1. 60°C ≤ engine coolant temperature ≤ 110°C
2. 220°C ≤ exhaust gas temperature NSC upstream ≤ 750°C
3. ambient pressure > 600hPa

1. The lower engine coolant temperature limit is necessary to ensure stable combustion. The higher limit protects the engine against thermal damage.

2. The lower limit of exhaust gas temperature upstream the catalyst ensures sufficient exothermic reaction inside the NSC and DPF. The upper limit of 750°C is used as thermal protection against damage of the NSC and DPF. This temperature occurs only in case of engine malfunctions.

3. The regeneration mode is disabled below 600hPa ambient pressure due to critical speed of the turbocharger.

Exhaust Gas Recirculation - EGR

1. General description of the AECD

In order to achieve the emission targets for diesel vehicles it is necessary to reduce the emissions of nitrogen oxide (NOx). Diesel engines operate in lean-burn conditions. Therefore standard exhaust gas aftertreatment with a three-way-catalytic converter, as used in standard gasoline applications, will not operate properly. The target is to minimize the raw NO_X emissions by optimizing the combustion process. Cooled exhaust gas, mixed with fresh intake air, is used to fulfil these requirements.

The exhaust gas recirculation (EGR) system consists of EGR valve, EGR cooling devices, pipes and sensors. Activating and rating the EGR is controlled by the ECU and must consider several conditions such as ambient temperature, altitude, engine temperature, boost pressure, engine speed and injection quantity. The required quantity of recirculated exhaust gas is calculated using numerical flow models. The EGR application is vehicle specific and has to be restricted in terms of efficiency, overall emissions and engine protection.

2. Parameters sensed and controlled

EGR Control	Target set value	EGR control	EGR valve control
Air Flow Sensor	x	x	
Intake Air Temperature Sensor	x		
Charge Air Cooler Temperature Downstream		x	
Engine Coolant Temperature Sensor	x	x	
Engine Speed Sensor	x	x	
Ambient Air Temperature Sensor		x	
Ambient Pressure Sensor	x	x	x
Boost Pressure Sensor		x	x
Exhaust Gas Pressure Sensor		x	x
Temperature Sensor EGR Cooler Downstream		x	
Fuel Quantity	x		
Status Regeneration active	x	x	x
Position Sensor EGR Valve		x	x
Position Sensor Throttle Valve		x	x

3. Base control

The exhaust gas recirculation is controlled via the EGR valve and the throttle valve. EGR is predefined as a percentage of EGR related to fresh air. The set value for the EGR valve is a pulse duty factor in the range of 0-100%. The EGR ratio is modulated to an optimum level of NO_X in relation to growing particulate emissions. The configuration of the EGR map reflects a typical diesel application considering this NO_X-particulate trade-off with high rating on part load conditions and a reduced content of exhaust gas on high load condition.

Engine speed and injection quantity are the main parameters for setting the required EGR ratio. Of those, and integrated recorded parameters like back and boost pressure, gas and air temperature in different positions, coolant temperature and ambient conditions (altitude and temperature), the rate is defined from the map and converted into a set value for the valve. The proposed EGR strategy is to control the exhaust emissions over a wide range of environmental and driving conditions.

Unfavorable conditions can result in a change of strategy by reducing or shutting off the AECD due to increasing hydrocarbons, carbon monoxide, NOx, particulate emission. Fuel consumption, driveability and the long term engine protection have to be considered. These possible interventions on the base strategy of using EGR are classified in:

a) Engine start strategy

b) Engine warm up strategy

c) Ambient influence strategy

d) Engine and part protection

4. Restriction strategy

a) Engine start strategy

After engine start the EGR will be turned on with a short delay time which depends on the coolant temperature. To avoid a degradation of starting ability and misfire the lead time for EGR activation is related to the coolant temperature in a linear behaviour.

b) Engine warm up strategy

In engine warm-up conditions, the EGR is activated in relation to point a). During cold conditions the internal heat transfer can delay ignition and as a consequence suboptimal combustion will increase overall emissions. Due to this the EGR ratio is ramped in relation to the coolant temperature.

c) Ambient influence strategy

- Influence on altitude:

With increasing altitude the ambient air density decreases and as a result the amount of oxygen in the cylinder is reduced. The NO_X-PM trade-off is shifted to increased particulate emissions caused by incomplete combustion. This effect is avoided by rating the EGR towards lower ratios at lower barometric pressure.

- Influence on intake air temperatures:

To avoid deterioration of the combustion efficiency under cold ambient temperatures, it is necessary to restrict the EGR ratio in relation to intake air temperature.

d) Engine and part protection

The purpose is to protect the engine against damage resulting from overheating and the collapse of the overall cooling system.

5. Application on restrictions

a) After engine start below 0°C coolant temperature the first 3 sec are w/o EGR After engine start above 5°C coolant temperature the first 0,3 sec are w/o EGR

c) Above an altitude of 800 hPa the EGR is ramped down (=0 below 740hPa)

d) At coolant temperature > 120°C EGR is not active.

6. Reasons for restriction

a) Combustion chamber is too cold for good combustion. Danger of misfire and HC/CO increase.
b) Combustion chamber is too cold for good combustion. Danger of misfire and HC/CO increase.
c) - EGR would lead to too high particle emissions.
   - Bad combustion and therefore HC and CO increase in cold conditions.
d) Part protection. EGR cooler and/or engine could be destroyed due to extensive heat.

Nitrogen Oxide Storage And Reduction Catalyst - NSC

1. General description of the AECD

In order to achieve the emission targets for diesel vehicles it is necessary to reduce the emissions of nitrogen oxide (NOx). Diesel engines operate usually in lean-combustion. Therefore standard exhaust gas aftertreatment with a three-way-catalytic converter, as used in standard gasoline applications, will not operate properly. The target is to minimize the engine out NO_X emissions by using a *nitrogen oxide storage and reduction catalyst* (NSC).

Figure 1 shows the chemical principles of the NSC-System. The NSC is coated with platinum, palladium and rhodium. In lean combustion the NOx is stored in the catalyst. During rich combustion the NOx is reduced to CO_2, N_2 and H_2O. The catalyst also stores sulphur dioxide (SO_2) in the catalyst and reduces the available NOx-storage-capacity. The stored SO_2 must be reduced in periodical intervals (desulfurization). This happens during the particulate filter regeneration in hot rich combustion.

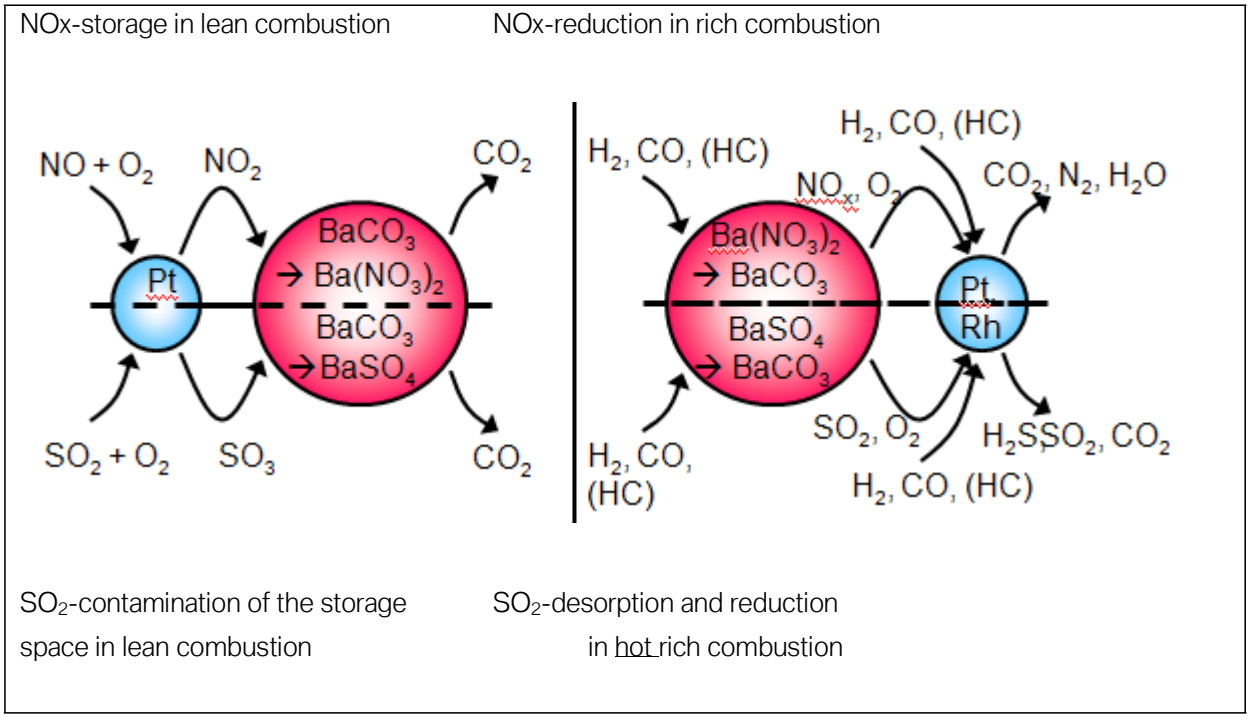


Figure 1

Figure 2 shows the components of the NSC system. The functions and sensors are shown in table 1 (NSC functions and used sensors).

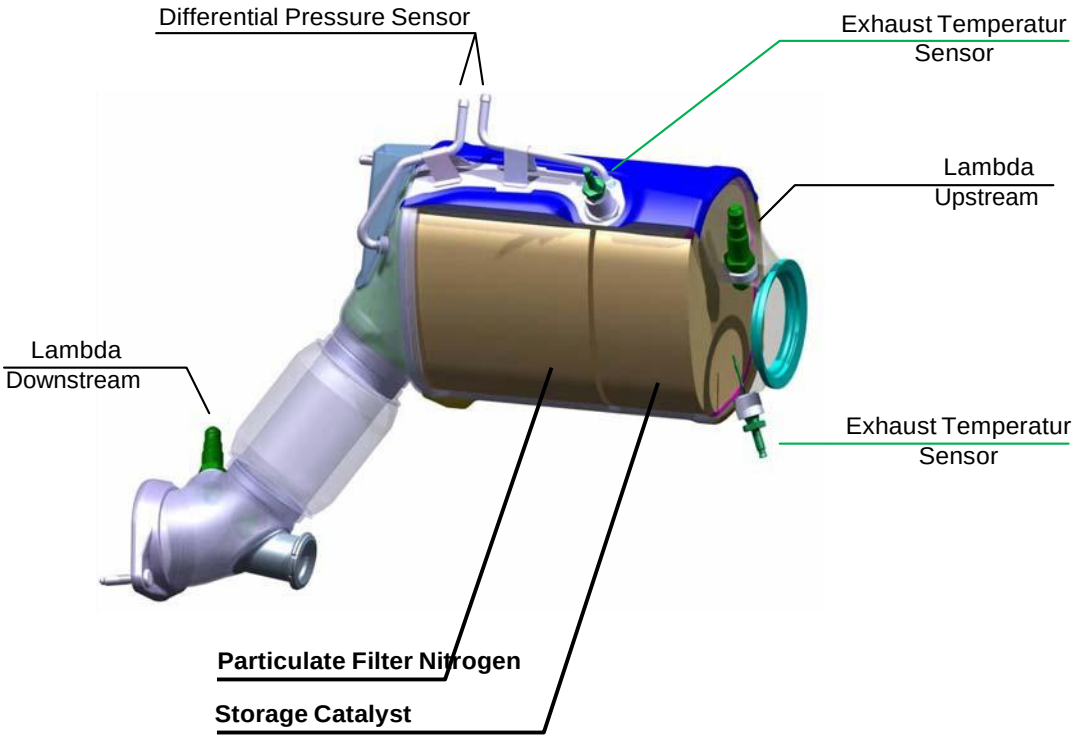


Figure2

2. Parameters sensed and controlled

Table 1

NSC	NSC-Model	NOx-Reduction	SOx-Reduction
Air Flow Sensor		x	x
Intake Air Temperature Sensor		x	x
Charge Air Cooler Temperature Downstream		x	x
Engine Coolant Temperature Sensor		x	x
Engine Speed Sensor		x	x
Ambient Pressure Sensor		x	x
Boost Pressure Sensor		x	x
DPF Differential Pressure Sensor			x
Exhaust Gas Pressure Sensor		x	x
Injection Quantity		x	x
Status DPF-Regeneration active			x
Exhaust Gas Temperature Sensor SCR Upstream		x	
Exhaust Gas Temperature Sensor NSC Upstream	x	x	x
Lambda Oxygen Sensor NSC Upstream	x	x	x
Lambda Oxygen Sensor CSF Downstream	x	x	
Exhaust Gas Mass Flow	x		
Engine out NOx model	x		
Engine Operation Point	x	x	x

3. Base control

3.1. Model of the NOx Trap

The efficiency of the NOx Trap depends on the amount of NOx that is stored in it. In order to determine the state of the NOx Trap, there is a load and an unload model. The load model calculates continuously the NOx mass flow which the NOx Trap caches.

The input variables are:

- Engine out NOx mass flow
- Already stored NOx mass
- Stored sulphur mass
- Temperature of the NOx Trap
- Exhaust gas mass flow
- Aging condition of the NOx Trap

During rich mode the NOx Trap is regenerated and the stored NOx is converted. The amount of stored NOx is reduced continuously, which is mapped with an unload model.

The input variables are:

- Engine operation point
- Temperature of the NOx Trap
- Exhaust gas mass flow
- Lambda pre and post NOx Trap

When a full regeneration is detected by the lambda sensor after the NOx Trap, the stored NOx mass is set to zero.

3.2. NOx- Reduction - Rich Mode

In rich mode the engine operation parameters are changed towards lower air mass and delayed combustion to achieve a low residual oxygen level and to increase the carbon monoxide level. In the rich mode the following parameters are modified:

1. - Air mass
2. - EGR ratio
3. - Boost pressure
4. – Swirl control
5. – Fuel injection timing of main and post injection
6. – Fuel injection quantities of main and post injection
7. – Injection pressure
8. – Operation point

1. Air mass set-point base value is calculated from engine speed and fuel quantity. Depending on intake air temperature the set-point value is corrected to maintain stable combustion at low temperature.

2. The desired EGR ratio is calculated from engine speed and fuel quantity. Depending on intake air temperature the set-point value is corrected to maintain stable combustion at low temperature.

3. The boost pressure desired value is calculated from engine speed and fuel quantity. Depending on ambient pressure and intake air temperature the set-point value is corrected to ensure the maximum turbo charger speed boundary and stable combustion at low temperature.

4. The set-point value for the swirl-control actuator is calculated from engine speed and fuel quantity.

5. The fuel injection timing calculation is based on engine speed and desired injection quantity. Depending on intake air temperature the set-point values are corrected to maintain stable combustion at low temperature.

6. See 5.

7. The fuel pressure desired value is calculated from engine speed and fuel quantity.

   Depending on intake air temperature the set-point value is corrected to maintain stable combustion and an equivalent noise level at low temperature.

8. The enabled operating points are depending on ambient pressure due to critical operation points of the turbo charger and intake air temperature to ensure the required exhaust gas constitution and stable combustion.

3.3. SOx-Reduction

An efficient SOx-Reduction needs a high NSC temperature at rich exhaust gas conditions. To use the high NSC temperatures SOx-Reduction is performed during each DPF-Regeneration and uses the Rich- Mode to provide rich exhaust gas.

The modified parameters are those of the rich-mode (see 3.2.).

4. Restriction strategy

4.1. NOx-Reduction

The NOx-Reduction works within a defined range of engine coolant temperature, a model based NSC temperature, intake air temperature and ambient pressure.

The limits are defined as follows:

1. 50°C ≤ engine coolant temperature ≤ 104°C
2. -30°C ≤ intake air temperature
3. Model based NSC temperature ≤ 630 °C
4. ambient pressure > 700hPa

1. The lower engine coolant temperature limit is necessary to ensure stable combustion. The higher limit protects the engine against thermal damage.

2. The lower limit of intake air temperature is necessary to ensure stable combustion and the required exhaust gas constitution. The higher limit protects the engine against thermal damage.

3. The upper limit of 630°C is due to the reduced storage capability at high temperatures.

4. The regeneration mode is disabled below 700hPa ambient pressure due to critical speed of the turbocharger.

4.2. SOx-Reduction

The SOx-Reduction works within a defined range of engine coolant temperature, a model based NSC temperature, intake air temperature and ambient pressure.

The limits are defined as follows:

1. 50°C ≤ engine coolant temperature ≤ 104°C
2. -30°C ≤ intake air temperature
3. 550°C ≤ Model based NSC temperature ≤ 700°C
4. ambient pressure > 700hPa

4. See 4.1. 1.

5. See 4.1. 2.

6. The lower limit of model based NSC temperature ensures sufficient reaction inside the NSC. The upper limit of 700°C is used as thermal protection against damage of the NSC.

7. See 4.1. 4.

Selective Catalytic Reduction (SCR)

1. General Description of the AECD

The SCR system is used to reduce nitrogen oxides (NOx) by dosing urea into the exhaust gas. Ammonia is a product of a thermolysis and hydrolysis reaction after the injection of urea into the exhaust gas and reacts in the SCR catalyst with NOx to form water and nitrogen.

In order to cope with the dynamic effects the SCR catalyst is able to store ammonia. Dosing of urea (refilling of catalyst) is calculated considering raw NOx emissions, modeled SCR catalyst efficiency and the amount of stored ammonia. Additionally an adaptive function guarantees high efficiency in the long term.

Figure 1 shows the control scheme of the SCR system. The functions and sensors are shown in table 1 (SCR functions and used sensors).

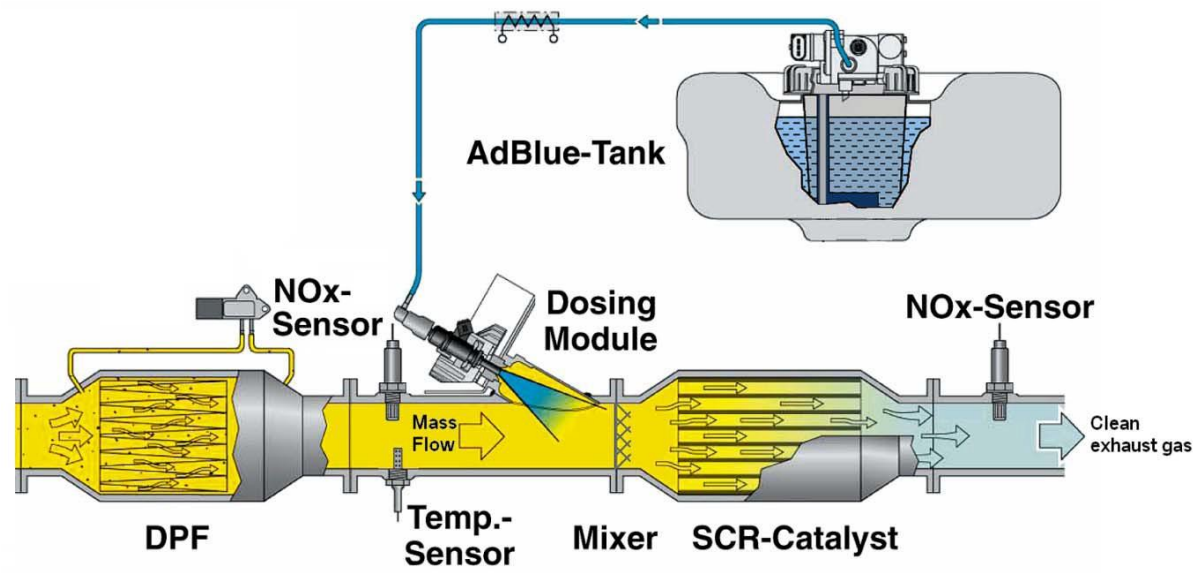


figure 01 Figure 1: Control scheme of the SCR system

2. Parameters sensed and controlled

SCR System				
Engine Speed				x
Ambient Air Temperature Sensor				x
NOx Sensor SCR Upstream	x	x	x	
NOx Sensor SCR Downstream			x	
Exhaust Gas Temperature Sensor SCR Upstream	x	x	x	x
Exhaust Gas Mass Flow	x	x	x	
Urea Tank Temperature				x
Status Dosing Readiness				x
Fuel quantity			x	

figure 01

3. Base Control

a) Dosing strategy SCR – dosing amount

The demand of ammonia in the SCR catalyst is computed continuously in the engine control unit depending on measured raw NOx emission and exhaust gas mass flow. Used ammonia for reduction of NOx to water and nitrogen is calculated with the SCR catalyst efficiency model. Balancing demanded and used ammonia determines the amount of stored ammonia in the SCR catalyst and the amount of dosed urea.

Furthermore the desired amount of ammonia has to be limited at low temperatures in respect to the evaporation heat. Due to high dosing amounts at low temperatures urea can not be evaporated completely and liquid residues in the exhaust pipe may occur. At high exhaust gas mass flows time for vaporization is limited and so the dosing amount has to be limited in order to use the urea most efficiently.

b) Dosing strategy SCR - catalyst efficiency model

Dependent on the measured values of raw NOx, temperature upstream of the SCR catalyst, modelled amount of stored ammonia and exhaust gas mass flow the catalytic efficiency is determined.

c) Dosing strategy SCR – long term adaptation

The adaptation is a function to guarantee long term efficiency. Therefore the NOx-sensor downstream of the SCR catalyst is compared to the calculated value downstream of the SCR catalyst. If deviations occur, the dosing amount is corrected temporarily. The systematic of these corrections are evaluated and an adaptation factor is applied on the dosing amount.

d) Dosing system release conditions

To release pressure build up engine speed has to be above 600 rpm (engine running), the temperature upstream of the SCR catalyst has to exceed 90°C and urea may not be frozen. This depends on measured values of ambient air temperature and urea tank temperature. After pressure build up urea pump pressure has to be 6000hPa to finally release dosing.

4. Restriction strategy

To ensure the function of the SCR system over lifetime, to protect its components against damage and to reach optimum emissions there are some conditions or strategies where the SCR system works in a reduced way.

These conditions or strategies are:

a) Engine warm up
b) Cold ambient temperature
c) Limitation of urea injection
d) Deactivation of adaptation

5. Restriction calibration

a) Engine warm up

- Temperature of SCR catalyst below light off:

At engine cold start the temperature of the SCR catalyst is too low for a reaction of the reductant with NOx (catalyst light off). Furthermore injection of urea would lead to an additional cooling of the SCR catalyst and further delay of catalyst light off. For that reason urea is not injected until the temperature upstream of the SCR catalyst is above 170°C.

- Urea supply system release:

Pressure build up is not activated until the exhaust gas temperature upstream of the SCR catalyst has reached more than 90°C. Because the urea dosing begins to start at temperatures of 170°C upstream of the SCR catalyst this strategy has no impact on the emissions.

b) Cold ambient temperature

Depending on the urea temperature in the urea tank a defrost time is set for the heating prior to activating the urea pump. Heating starts below -5°C.
At a urea temperature of -15°C urea will be heated for 20min prior to pump activation. At -25°C this time is extended to 45min.

c) Limitation of urea injection

The amount of urea which can be vaporized is limited by two main factors,

the temperature of the exhaust gas and the exhaust gas mass flow. If the temperature is low the amount of urea which can be vaporized is limited. At high exhaust gas mass flow the amount of useful urea is also limited due to insufficient vaporization time.

d) Adaptation not active

The adaptation is based on an SCR catalyst efficiency model and is not active at exhaust gas temperature upstream of the SCR catalyst below 220°C and above 350°C because the SCR catalyst efficiency cannot be modelled accurately enough. The reason is a high gradient of the SCR catalyst efficiency depending on small temperature variance. The adaptation compensates long term deviations, singular deactivations have no direct influence on emissions.

6. Wrong medium detection

There are two strategies implemented to detect wrong Diesel Exhaust Fluid

a) Detection by SCR efficiency diagnostic

b) Continuous monitoring by SCR adaptation

a) Detection by SCR efficiency diagnostic:

This method was introduced by BMW starting with 2009MY. After the refill detection of the active DEF-tank, the SCR efficiency diagnostic is started. There will be a strong dilution of DEF, if the active and passive tanks are filled with large amount of water. This will be detected by the SCR efficiency diagnosis. The driver inducement is started using the warning sequence. The miles count down starts and is displayed to the driver with the message:

- No restart after 200 miles

b) Continuous monitoring by SCR adaptation

The deviation from the optimum operation point is detected by NOx Sensor. An adaptation is performed for compensation. The ammonia cross sensitivity of the sensor is used also. Illustrated in figure 2.
This calculated adaptation factor is monitored. Diluted DEF can be compensated by higher dosing quantity and leads to an increased adaption factor. The influence of the adaption factor to the emissions is shown in table 2.
A System fault is detected when the adaptation threshold is exceeded. The driver inducement is started using the warning sequence. The miles count down starts and is displayed to the driver with the message:

- No restart after 200 miles

figure 02

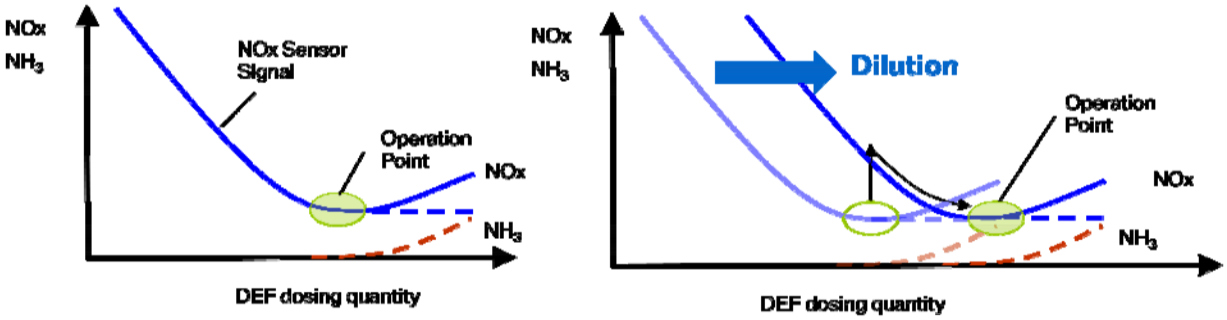


Figure 2: Adaption of the SCR system

Table 2: Emission impact of wrong DEF and SCR Adaption Factor

- Active tank: full (100%DEF)
- Passive tank: empty, then refilled with water (worst case dilution of passive tank)
- Emission impact of diluted DEF is compensated by SCR Adaption Factor
- Driver inducement is started, when adaption factor > threshold (1,69)

Example given F30, F31:

Distance cumulated [mi]	Active tank DEF [%]	Passive tank DEF [%]	SCR Adaption Factor	NOx [g/mi]
0	100	0	1,00	0,037
400	94,2	0	1,05	0,037
800	88,4	0	1,13	0,038
1200	82,5	0	1,25	0,038
1600	76,7	0	1,31	0,038
2000	70,9	0	1,4	0,039
2400	65,1	0	1,51	0,039
2800	59,3	0	1,60	0,039
3200	53,5	0	1,7	0,040
3600	47,6	0	1,7	0,041
4000	41,8	0	1,7	0,043
4400	36	0	1,7	0,043
4800	30,2	0	1,7	0,046
5200	24,4	0	1,7	0,048
5600	18,5	0	1,7	0,051
6000	12,7	0	1,7	0,055
6400	6,9	0	1,7	0,058
6800	1,1	0	1,7	0,061

Emissions within standard (SCR Adaption Factor)

Inducement (200mil)

EI-AECD consideration

For EI-AECD consideration the emission control system was analyzed and the AECD´s were identified. Please refere to the attached documents for AECD description.

By analyzing the AECD´s we identified one EI-AECD that is turned off because of engine protection.

All other AECD´s are calibrated to the maximum emission efficiency and are not turned off or are not derated.

The EI-AECD that was identified is the EGR disablement above 120°C engine coolant temperature and an ambient pressure of less than 800 hPa. The EI-AECD is justified with the purpose to protect the engine against damage resulting from overheating and the collapse of the overall cooling system.

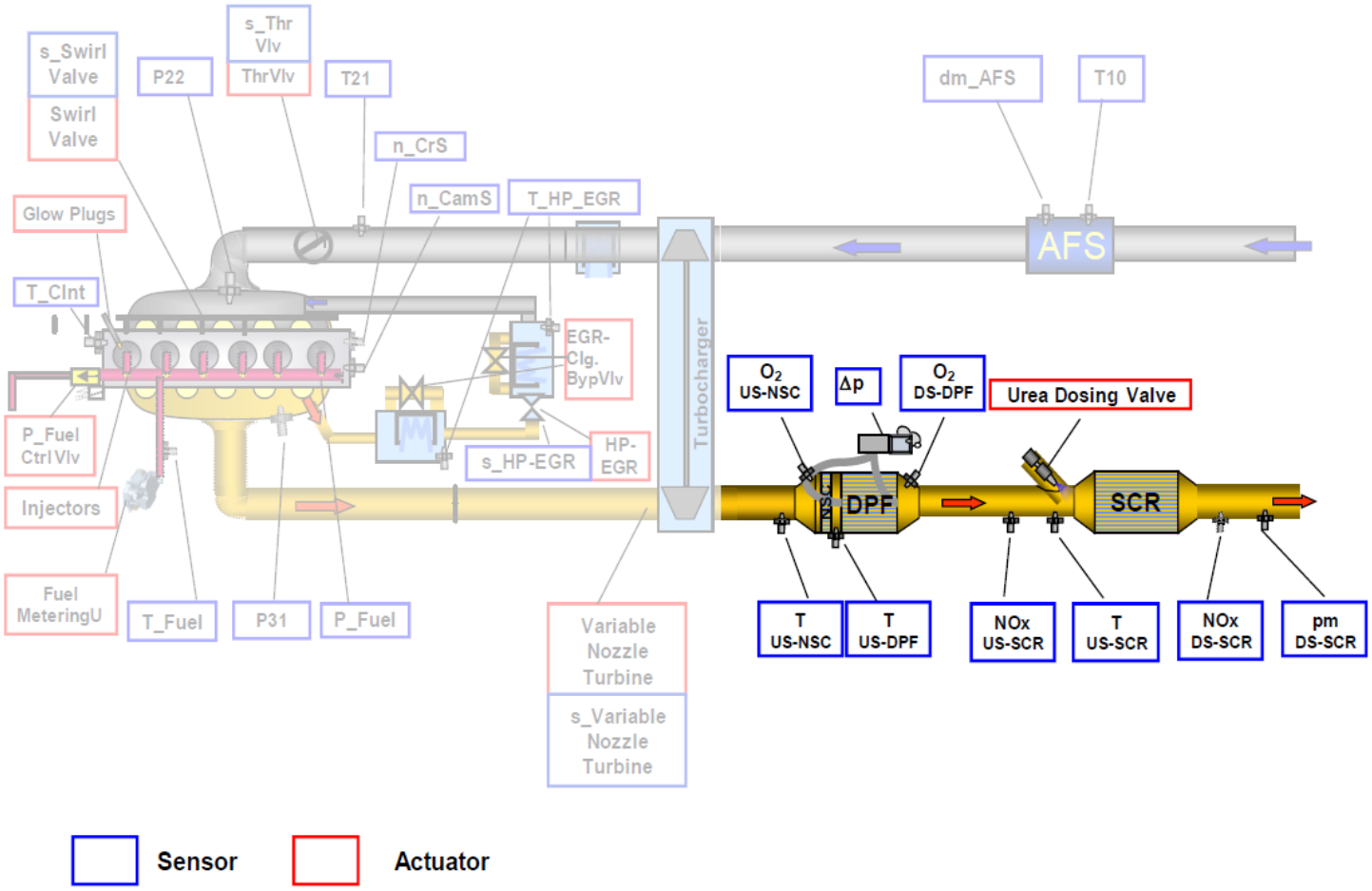
According to the requirement of tracking engine run time while EI-AECD is active two counters were introduced according to the specifications of 1968.2 (6) run time tracking requirements.

Mode $01

	PID (hex)
total engine run time	7F
engine run time for AECD - deactivation of EGR due to excessive engine coolant temperature - reduction of EGR due to high altitude	81

Diesel Aftertreatment Technology N47, N57 Engines

Schematic view



	AECD description	Sensor	Description	Sensed Parameter Range High ~ Low (unit)	Sensor Value High (unit)	Sensor Value Low (unit)	Sensor still working	Failure Detectio	Failure Indicatio	Failure Consequen	Default Mode	Consequence summary
Temperature Sensors	T01: Engine Coolant temperature	Engine Coolant Temperature Sensor	Negative Temperature Coefficient Resistor (NTC). Located in the water jacket of the cylinder block.	145 ~ -40 °C	200 mV	4990 mV	no	OBD	MIL=on and failure code stored	MIL = on Repair requested limited torque	Default Value (79.86°C)	EGR reduced, Engine protection
	T02: Intake air temperature	Intake Air Temperature Sensor	Negative Temperature Coefficient Resistor (NTC). Integrated into air-flow sensor.	155 ~ -50°C	70 mV	4950 mV	no	OBD	MIL=on and failure code stored	MIL = on Repair	Default Value	EGR reduced, Engine protection
	T03: Charge Air Cooler Temperature	Charge Air Cooler Temperature Sensor	Negative Temperature Coefficient Resistor (NTC). Located between charge air cooler and intake manifold.	120 ~ -40°C	200mV	4950 mV	no	OBD	MIL=on and failure code stored	MIL = on Repair	model based value	EGR reduced, Engine protection
	T04: Ambient Air Temperature	Ambient Air Temperature Sensor	Negative Temperature Coefficient Resistor (NTC). Located behind front bumper. Signal transmitted via CAN.	50 ~ -40°C	-	-	-	OBD	MIL=on and failure code stored	MIL = on Repair	Default Value	
	T05: Exhaust Gas Temperature (NSC upstream)	Exhaust Gas Temperature Sensor	Negative Temperature Coefficient Resistor (NTC). Located between turbocharger and Diesel oxygen catalyst.	800 ~ -40°C	49 mV	4980 mV	no	OBD	MIL=on and failure code stored	MIL = on Repair requested	model based value	DPF-Regeneration disabled, Engine and after treatment system protection
	T06: Exhaust Gas Temperature (DPF upstream)	Exhaust Gas Temperature Sensor	Negative Temperature Coefficient Resistor (NTC). Located between Diesel oxygen catalyst and Diesel particulate filter.	800 ~ -40°C	49 mV	4980 mV	no	OBD	MIL=on and failure code stored	MIL = on Repair	model based value	
	T07: Exhaust Gas Temperature (SCR upstream)	Exhaust Gas Temperature Sensor	Negative Temperature Coefficient Resistor (NTC). Located upstream the SCR (Selective Catalyst Reduction) catalyst.	800 ~ -40°C	49 mV	4980 mV	no	OBD	MIL=on and failure code stored	MIL = on Repair	model based value	DEF Dosing based on temperature model value
	T08: Temperature EGR Cooler Downstream	Exhaust Gas Temperature Sensor	Negative Temperature Coefficient Resistor (NTC). Located downstream the EGR cooler.	550 ~ -50°C	200 mV	4980 mV	no	OBD	MIL=on and failure code stored	MIL = on Repair requested	Default Value (40.96°C)	EGR reduced, Engine protection; after-treatment system protection
	T09: Urea Tank Temperature	Urea Temperature Sensor	The T-Sensor is integrated in the DEF supply module and located inside of the active tank.	80 ~ -40°C	102000 µs	20000 µs	no	OBD	MIL=on and failure code stored	MIL = on Repair	Default Value	
Speed sensors	S01: Engine speed	Magneto Resistive Sensor	Scanning the teeth of a reference wheel, directly attached to the crankshaft. The change of the magnetic flux is processed by the ECM.	-	-	-	no	OBD	MIL=on and failure code stored	MIL = on Repair requested limited torque and power / no	model based value	
	S02: Vehicle speed	Inductive Impulse Sensor	The amplified signal of the ABS-Sensors of wheels is processed by the ECM.	-	-	-	-	OBD	MIL=on and failure code stored	MIL = on Repair requested limited torque	model based value	
Auxiliary sensors	X01: Air Flow	Hot-film mass air-flow sensor (HFM)	The HFM is integrated in the induction system and located between the air filter and turbo charger.	800 ~ -35 kg/h 1168.6 ~ 1 kg/h	71.4 µs 71.4 µs	833.35 µs 909 µs	no	OBD	MIL=on and failure code stored	MIL = on Repair requested limited torque	-	EGR off, DPF-Regeneration disabled, NSC-Regeneration disabled, Engine protection and after-treatment system protection,
	X02: Ambient Pressure	Pressure Sensor	The Ambient Pressure Sensor is located in the ECM housing.	1200 ~ 280 hPa	4970 mV	200 mV	no	OBD	MIL=on and failure code stored	MIL = on Repair requested limited torque and	Default Value (800.00 hPa)	EGR switched off to prevent wrong EGR rate, DPF-Regeneration disabled, Engine protection and after-treatment system protection, power limitation
	X03: Boost pressure	Pressure Sensor	The Boost Pressure Sensor measures the turbo charger generated pressure in the intake manifold.	4438 ~ 63 hPa	4751 mV	70 mV	no	OBD	MIL=on and failure code stored	MIL = on Repair requested limited torque	Default Value (900.00 hPa) and open loop control	EGR switched off to prevent wrong EGR rate, DPF-Regeneration disabled, Engine protection and after-treatment system protection,
	X04: CSF Differential Pressure	Pressure Sensor	The DPF Differential Pressure Sensor measures the pressure drop across the Diesel Particulate Filter.	1000 ~ -100hPa	4800 mV	152 mV	no	OBD	MIL=on and failure code stored	MIL = on Repair requested	Depending on the severity of the fault: 1)EGR reduced or 2)Regeneration disabled	1)EGR reduced 2)DPF-Regeneration disabled, Engine protection and after- treatment
	X05: Fuel Pressure	Pressure Sensor	The Fuel Pressure Sensor measures the rail pressure of the common rail injection system.	2210000 ~ 0hPa	3169mV	131mV	no	OBD	MIL=on and failure code stored	MIL = on Repair requested limited torque	none	DPF-Regeneration disabled, Engine protection and after-treatment system protection
	X06: Gear Information	-	The Gear Information is reported by CAN from Transmission Control Unit to the ECM.	-	-	-	-	OBD	MIL=on and failure code stored	MIL = on Repair	model based value	
	X07: Exhaust Gas Pressure	Pressure Sensor	The Exhaust Gas Pressure Sensor measures the pressure in the exhaust manifold.	5000 ~ 600 hPa	4800 mV	200 mV	no	OBD	MIL=on and failure code stored	MIL = on Repair requested limited torque	Default Value (500hPa)	EGR switched off to prevent wrong EGR rate, Engine protection, power limitation
	X08: NOx Concentration (SCR upstream)	NOx Sensor	The Sensor measures the NOx concentration in the exhaust gas upstream the Selective Catalytic Reduction Catalyst.	-	1650 ppm	-100ppm	no	OBD	MIL=on and failure code stored	MIL = on Repair	model based value	
	X09: NOx Concentration (SCR downstream)	NOx Sensor	The Sensor measures the NOx concentration in the exhaust gas downstream the Selective Catalytic Reduction Catalyst.	-	1650 ppm	-100ppm	no	OBD	MIL=on and failure code stored	MIL = on Repair	none	
	X10: Lambda_0 (NSC upstream)	Lambda Sensor	The Sensor measures the AF ratio in the exhaust gas upstream the **N**Ox - **S**torage **C**atalyst.	air ~ 0.65	2.53mA	-2.45mA	no	OBD	MIL=on and failure code stored	MIL = on Repair requested limeted torque and	none	NSC-Regeneration disabled, after-treatment system protection
	X11: Lambda_1 (NSC downstream)	Lambda Sensor	The Sensor measures the AF ratio in the exhaust gas downstream the **N**Ox - **S**torage **C**atalyst.	air ~ 0.65	2.53mA	-2.45mA	no	OBD	MIL=on and failure code stored	MIL = on Repair	none	
Inducement	I01: Wrong DEF Detection		1) After a refill detecion of the DEF tank the catalysator efficency is monitored 2) SCR Adaption detects wrong DEF if adaption limit is exceeded	-	-	-	-	OBD	MIL=on and failure code stored	MIL = on Repair requested after miles cont down	none	no engine start
	I02: DEF Tank Empty Detection		The level senors indicate the DEF level of the tanks	-	-	-	-	OBD	Warning=on and failure code stored	MIL = on Repair requested after miles cont down	none	no engine start