New Diesel Technologies, Pass & LT

Tom Rayk, NAPA
Emissions & Fuel Standards

- **NOx (g/hp-hr)**
  - 1994
  - 1998
  - 2002

- **PM (g/hp-hr)**
  - 2007
  - 2010

- **Fuel Standards**
  - 500 PPM (6/93)
  - SULFUR
  - ULSF 15 PPM (6/06)

- **ULTRA-LOW SULFUR HIGHWAY DIESEL FUEL**
  - (15 ppm Sulfur Maximum)
  - Required for use in all model year 2007 and later highway diesel vehicles and engines.
  - Recommended for use in all diesel vehicles and engines.
2010 EPA Diesel Emission Changes

• The EPA further tightened emissions regulations for on-road diesel engines
• NOx Emissions need to be reduced to 0.2 gram per brake horsepower per hour
• Particulates regulated down to 0.01 g/BHP-HR
• This requires a host of new technology to be implemented
• New Fuel and Glow Plug Management System EDC 17 Introduced to Work with New Requirements
DPF Regeneration

- Porous Cell Wall
- Alternate cell plugging pattern
Regenerate?

- Intake air valve closes to richen mixture and raise exhaust temp into the DOC to 662°F
- Dosing valve events then raise temp to 932°F
- Above 800°F regeneration in the DPF is initiated
Increased NOx?

Answer: SCR – (selective catalytic reduction) using urea injection in 2010
# Urea Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Typical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urea Concentration</td>
<td>32.5 +/- 0.7%</td>
</tr>
<tr>
<td>Specific gravity at 20° C</td>
<td>1.087 – 1.093 kg/m³</td>
</tr>
<tr>
<td>Refractive index at 20° C</td>
<td>1.3814 – 1.3843</td>
</tr>
<tr>
<td>Free Ammonia (alkalinity)</td>
<td>0.2% max</td>
</tr>
<tr>
<td>Biuret</td>
<td>0.3% max</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>None</td>
</tr>
<tr>
<td>Insoluble matter</td>
<td>20ppm max</td>
</tr>
<tr>
<td>Phosphates</td>
<td>0.5 ppm max</td>
</tr>
<tr>
<td>Calcium</td>
<td>0.5 ppm max</td>
</tr>
<tr>
<td>Iron</td>
<td>0.5 ppm max</td>
</tr>
<tr>
<td>Copper</td>
<td>0.2 ppm max</td>
</tr>
<tr>
<td>Zinc</td>
<td>0.2 ppm max</td>
</tr>
<tr>
<td>Chromium</td>
<td>0.2 ppm max</td>
</tr>
<tr>
<td>Nickel</td>
<td>0.2 ppm max</td>
</tr>
<tr>
<td>Aluminum</td>
<td>0.5 ppm max</td>
</tr>
<tr>
<td>Magnesium</td>
<td>0.5 ppm max</td>
</tr>
<tr>
<td>Sodium</td>
<td>0.5 ppm max</td>
</tr>
<tr>
<td>Potassium</td>
<td>0.5 ppm max</td>
</tr>
<tr>
<td>Water Quality</td>
<td>Demin – ISO 3696 applicable</td>
</tr>
</tbody>
</table>
Example of good DEF fluid

- Good DEF fluid
- 2-disc float = serviceable DEF fluid
- NAPA tool # THX108
DEF Fluid

• Bad DEF fluid
• 1- or 3-disc float
• Drain tank and fill with correct DEF fluid
**Fuel Issues**

How many injectors does it take to fix bad fuel?

<table>
<thead>
<tr>
<th>API Gravit</th>
<th># 1 Diesel Fuel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td></td>
</tr>
<tr>
<td>37</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td># 2 Diesel Fuel</td>
</tr>
<tr>
<td>31</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specific Gravit</th>
<th># 1 Diesel Fuel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y .816</td>
<td></td>
</tr>
<tr>
<td>.820</td>
<td></td>
</tr>
<tr>
<td>.825</td>
<td></td>
</tr>
<tr>
<td>.830</td>
<td></td>
</tr>
<tr>
<td>.840</td>
<td></td>
</tr>
<tr>
<td>.845</td>
<td></td>
</tr>
<tr>
<td>.850</td>
<td></td>
</tr>
<tr>
<td>.855</td>
<td></td>
</tr>
<tr>
<td>.860</td>
<td></td>
</tr>
<tr>
<td>.865</td>
<td></td>
</tr>
<tr>
<td>.871</td>
<td></td>
</tr>
<tr>
<td>.876</td>
<td></td>
</tr>
</tbody>
</table>

Each Full API # Rise Will Result In Approximately 2% Less Fuel Economy

Lower API #'s = More BTU’s = More Power & Better Fuel Economy
Aerated Fuel

Aerated fuel testing:

1. Install a clear hose at the outlet of the fuel filter housing.
2. Look for bubbles during poor running conditions.
3. Isolate to find where air is entering.
4. Always loop the line.
Fuel Issues

Vacuum Test

1,000 RPM

3,000 RPM
1996 To Present North American TDI

1996-2003 1Z-ALH Engines
- Turbocharged Direct Injection 1.9L 4cyl Diesel
- VE VP37 (Distributor Type) Bosch Pump
- No Electric Lift Pump
- Timing Belt Driven HP Pump

2004-2006 PD-BEW-BRM
- Turbocharged Direct Injection 1.9L 4cyl Diesel
- Electric lift pump 6-8psi
- Pumpe Duse Injector
- Introduction Varies within Models
Return On Investment

- With improved capabilities and equipment shops may:
  - Reprogramming fees = plus sales
  - Market new capabilities = draw in new customers
  - Become more efficient = more profit
  - Continuous education = higher customer satisfaction
  - Budget for scanner updates = quicker more accurate repairs
SCR Changes Your Business

- Built-in, added sales
- Negativity does not sell well
- Invest in the proper tools and information systems
  - TSB info-common failures with solutions
  - Component function and repair
  - Diagrams
  - Recalls
  - All these increase productivity & profitability
- Software programming solutions
Fuel Filter

• Suction Side Of System
• Normal Recommended Service Every 20,000 Miles
• May Need Heated For Cold Climates
• Loop A Coolant Hose Around Filter Or Use A Stick On Electric Heater.
2004-2006 TDI Pumpe Duse

- Eliminates the need for a high pressure pump
- Solenoid used to limit injection quantity by ECM by bleeding of pressure inside injector
- Driven off camshaft
- Allows for precise injection timing
- Electric lift pump supplies fuel to injector passages in the head (6-8psi)
2004-2006 TDI Pumpe Duse

• Adjustable Rocker Rides Directly On Camshaft
• High Camshaft And Injector Stress Require Use Of Specific Oil
• Worn Cam Lobes Are Common

Engine Oils Which Meet Volkswagen Oil Quality Standards;
VW 505 01 and VW 507 00
Sealing Ring Prone To Leak Compression Into Fuel

Causing Black Fuel Samples

In Severe Cases It Can Lead To Clogged Fuel Filters
2009 And Up Common Rail

- Use Same Low Pressure Lift Pump In Tank
- Medium Pressure Pump Raises Pressure To Around 73 Psi
- Bosch Cp1 High Pressure Pump Feeds Rail
- Piezoelectric Injectors Improved Noise And Emissions
2.0 TDI
2.0 TDI

2012 Volkswagen Jetta 2.0L Eng TDI

- **SUBMODEL:** TDI
- **FUEL TYPE:** Diesel
- **ENGINE CODE:** Eng CD CJAA
- **BODY STYLE:** Sedan
- **DRIVE TYPE:** FWD
- **TRANSFER CASE TYPE:** Not Applicable T/Case Control
- **TRANSMISSION CONTROL TYPE:** Automatic DCT Trans
- **TRANSMISSION CODE:** Trans Mfr CD 02E
  - Trans Mfr CD 02E

2011-2012 Jetta CJAA 2.0 TDI
2012 Passat CKRA 2.0 TDI
VW TDI Clean Diesel Technology
Big Changes for TDI
TDI Fluids
New Engine Oil Requirements
• Modern Volkswagen & Audi Engines Have Features That Require Special Oil:
  • High Shear Forces
  • Turbocharging
  • High Acid Production
  • High Soot Production
  • Exhaust After Treatment
  • Extended Oil Change Intervals
Viscosity & Wear Protection

- In an ideal situation, oil builds a hydrodynamic wedge between moving parts.
- It is called hydrodynamic lubrication.
- 5w-30 oil approved by GM and other American or Asian OEMs will not build a sufficient protective hydrodynamic wedge in VW/Audi engines.
Hydrodynamic Lubrication

- Hydrodynamic lubrication in a crankshaft journal & bearing is very much like a tire hydroplaning on water
# VW Engine Oil

<table>
<thead>
<tr>
<th>SAE Rating</th>
<th>ACEA &amp; other generic approvals</th>
<th>OEM approvals</th>
<th>Minimum Low Shear Kinematic Viscosity (CentiStokes) cSt@ 100°C/212°F</th>
<th>Maximum (CentiStokes) cSt@ 100°C</th>
<th>Minimum High Shear Viscosity (CentiPoise) cP@ 150°C/302°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>20, 0W-20, 5W-20</td>
<td></td>
<td></td>
<td>5.6</td>
<td>&lt;9.3</td>
<td>2.6</td>
</tr>
<tr>
<td>20, 0W-20, 5W-20</td>
<td></td>
<td></td>
<td>Proposed Hyundai-Kia</td>
<td>9.3</td>
<td>&lt;12.5</td>
</tr>
<tr>
<td><strong>30, 0W-30, 5W-30, 10W-30</strong></td>
<td>A1/B1 A5/B5 ILSAC</td>
<td>MOST Ford, Chrysler, GM, Asian</td>
<td>9.3</td>
<td>&lt;12.5</td>
<td><strong>2.9-3.5</strong></td>
</tr>
<tr>
<td><strong>30, 0W-30, 5W-30, 10W-30</strong></td>
<td>A3/B3 A3/B4 ILSAC</td>
<td>Most VW/Audi, BMW, MB, &amp; dexos2</td>
<td>9.3</td>
<td>&lt;12.5</td>
<td><strong>3.5+</strong></td>
</tr>
<tr>
<td><strong>40, 0W-40, 5W-40, 10W-40</strong></td>
<td></td>
<td></td>
<td>12.5</td>
<td>&lt;16.3</td>
<td>2.9</td>
</tr>
<tr>
<td>15W-40</td>
<td></td>
<td></td>
<td></td>
<td>12.5</td>
<td>&lt;16.3</td>
</tr>
<tr>
<td>50, 5W-50, 10W-50, 20W-50</td>
<td></td>
<td></td>
<td></td>
<td>16.3</td>
<td>&lt;21.9</td>
</tr>
<tr>
<td>60, 10W-60</td>
<td></td>
<td></td>
<td></td>
<td>21.9</td>
<td>&lt;26.1</td>
</tr>
</tbody>
</table>
Brake Fluid

• Many VW/Audi applications require a special DOT 4 Fluid With ISO 4925 Class 6 Approval
• Class 6 fluid is under 750 cP@-40C
• Other DOT4 fluids are as high as 1500 cP@-40C.
• The difference in ABS response time at low temperatures could be fatal!
DEF is now required in most new diesel powered cars and trucks

- Has a shelf life of **UP TO** 2 years if stored under ideal conditions.
- DEF can degrade to junk within 3-6 months at 85 degree F
- Try to store for 6 months or less and keep it below 70 degrees F.
Diesel Exhaust Fluid (DEF)

- DEF can be checked with a VW approved refractometer or hydrometer.
- Hydrometers must be compensated for temperature.
- DEF is a critical fluid in modern diesel powered vehicles.
- DEF containers include a batch number and standard date code (mm/dd/yy)
DEF Hydrometer Testing

- NAPA THX308 Hydrometer
- Has 3 floats
- 2 Floats up indicates correct 32.5% Urea
- 1 Float indicates high density
- 3 Floats Indicates Diluted DEF
Timing Belt Replacement

- Timing Belt On 120,000 Mile Schedule For Replacement
- Interference Engine

Tools Needed-
- Diesel Injection Pump Locking Pin 3359
- Crankshaft Stop-t10050
- Camshaft Holder-t10051
- Crankshaft Bolt Torque To Yield
- Tensioner Nut Requires

Most Bolts & Nuts Suggest Replacement Tensioner & Pulleys
Intake Air Flow and Heating

• These engines have an air intake heater that warms up the air going into the engine.
• Intake Heat comes from Rear of Cylinder Head
• There is NO Intake Heater in Ducting for Air Box
Heated PCV
PCV

- The Pressure Control Valve Regulates The Pressure For Ventilation Of The Crankcase.
- It Consists Of A Diaphragm And A Pressure Spring.
- When Blow-by Gases Are Present, The Pressure Control Valve Limits The Vacuum In The Crankcase.
PCV Valve Opened

Engine Gases Enter Cyclone Chambers Where Oil Is Removed When Pressure Inside Crankcase Is Greater Than Ambient Air
Coolant System

- Equalizing Reservoir
- EGR Cooler
- Heater Core
- Water Pump
- Thermostat
- Radiator
- TRAN
- OIL
- BLOCK HEATER
## Common Rail Inputs

- Engine Speed Sensor (G28)
- Camshaft Position Sensor (G40)
- APPS/TPS (G79)(G185)
- Baro (In ECM)
- MAF Sensor (G70)
- Engine Coolant Temp Sensor (G62)
- Charge Air Pressure Sensor G31
- Intake Air Temp Sensor G42/MAP Sensor G71
- Fuel Temperature Sensor G81
- Fuel Pressure Sensor G247
- EGR Potentiometer G212
- Heater O2 Sensor G39

- Exhaust Pressure Sensor G450
- Low Pressure EGR Pressure Sensor
- Brake Switch F
- Charge Pressure Actuator Position Sensor G581
- Cylinder Pressure Sensors (Glow Plugs)
- Throttle Position Sensor
- O2 Sensor Behind TWC (NOx Sensor)
- EGT 1
- EGT 2
- EGT 3
- EGT 4
- EGR Temp Sensor G98
- ECT Radiator Outlet Sensor G83
Group Sensors Together

<table>
<thead>
<tr>
<th>Sensor Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coolant temp at radiator output; unconditioned</td>
<td>3118.0 mV</td>
</tr>
<tr>
<td>Coolant temperature</td>
<td>35 °C</td>
</tr>
<tr>
<td>Coolant temperature at radiator outlet; actuator</td>
<td>31.1 °C</td>
</tr>
<tr>
<td>Diesel particle filter bank 1</td>
<td>0.20/---/--- kPa</td>
</tr>
<tr>
<td>Exhaust gas temperature sensor 1</td>
<td>46.7 °C</td>
</tr>
<tr>
<td>Exhaust gas temperature sensor 2</td>
<td>46.7 °C</td>
</tr>
<tr>
<td>Exhaust temperature 1 bank 1</td>
<td>46.7 °C</td>
</tr>
<tr>
<td>Exhaust temperature 2 bank 1</td>
<td>31.0 °C</td>
</tr>
<tr>
<td>Exhaust temperature bank 1</td>
<td>S1/S2/S3/S4: / 47/47/49/31 °C</td>
</tr>
<tr>
<td>Fuel Metering Valve</td>
<td>15.35 %</td>
</tr>
<tr>
<td>Fuel temperature</td>
<td>42.6 °C</td>
</tr>
<tr>
<td>Sensor for temp after charge air cooler; raw</td>
<td>33.2 °C</td>
</tr>
</tbody>
</table>

KOEO
## Battery Voltage & Starting Status

<table>
<thead>
<tr>
<th>Description</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage terminal 30</td>
<td>13.540 V</td>
</tr>
<tr>
<td>Starter control: Start interruption status</td>
<td>N/A</td>
</tr>
<tr>
<td>Starter control; terminal 50</td>
<td>N/A</td>
</tr>
<tr>
<td>Starter control; terminal 50 acknowledgment</td>
<td>0</td>
</tr>
<tr>
<td>Terminal 15 status</td>
<td>0</td>
</tr>
</tbody>
</table>

- Voltage Feed Is For Critical
- Injectors Use 40V To Operate
- Receives Voltage From Circuit 30
Glow Plug System

Glow Plug Controller
Pulse Width
Modulates Glow Plugs To Control Amperage
Automatic Glow Plug Module

- Ambient Air Temp Sensor Under 64degs F. Will Command AGPM Preheat Request
- Glow Plug Controller J179 Feeds All Glow Plugs Individually
- Glow Plugs Can Heat To Over 1832°F In Less Than 2 Seconds
Glow Plugs

• Glow Plugs Controlled with Scan Tool Pulse on For 10mS
• PWM is to Reduce Electrical Loads on Charging System after Cold Start
• Glow Plugs have Cylinder Pressure Transducers
Glow Plugs

- Glow Plugs Self Test with Scan tool
- Channel 1 all plugs amperage (Low)
- Channel 2 Sync off of Cylinder 3
- Each Plug is on for approx. 3mS
Post Heating Command

- Coolant Temp is Monitored After Start up
- Glow Plugs Commanded on until 64⁰ F. is reached
- Glow plug Voltage Drops in Post Heat phase
- Glow Plugs are phased in Firing Order
Glow Plug Faults Stored

Glow Plug Pressure Sensor Faults
Always Check Connections @ Glow Plug Connections
Should Snap On
There is a VW TSB that addresses glow plug pressure codes.

1. Make sure the connection is good before replacing glow plug.
2. Swap glow plugs and see if fault follows plug.
3. If fault stays at cylinder test the glow plug harness.

<table>
<thead>
<tr>
<th>Description</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum cylinder 1 cylinder pressure</td>
<td>41.898 bar</td>
</tr>
<tr>
<td>Maximum cylinder 2 cylinder pressure</td>
<td>41.938 bar</td>
</tr>
<tr>
<td>Maximum cylinder 3 cylinder pressure</td>
<td>42.953 bar</td>
</tr>
<tr>
<td>Maximum cylinder 4 cylinder pressure</td>
<td>43.055 bar</td>
</tr>
</tbody>
</table>
Glow Plug Codes

- PO6C5, PO6C6, PO6C7, PO6C8 Glow Plug Codes
- Glow Plug Controller Runs Test On Glow Plugs Within The First 2 Seconds Of Ignition Being Turned On
- If Driver Tries To Start Vehicle In The First 2 Seconds It May Lower Voltage To The Point It Fails Test

Codes Could Be Due To Failed Glow Plug Control Module

Circle Indicates Updated Module
No Start Extreme Cold

- Possible Charge Air Cooler frozen
- Creates a air flow restriction
- Install Updated Air Charge Cooler Kit
Fuel Filter

- Fuel Filter Serviced Every 20,000 Miles
- Cartridge Design
- System needs to be Bled When Opened
- Will Cause Permanent Damage to High Pressure Pump If Not Done
- Also Will De-Rate Power If Air Is In the Lines
VW Transfer Pump Amperage

3.5 Amps

02/06/2116 05:25:10 AM

CH 1: 0.20 V DC  10MΩ
CH 2: OFF

mS 11.6
AV: 0.396

Level: 4.00 V
Source: CH 1
Auto
Falling Edge
Fuel Injectors

• Each Individual Injector Has It’s Own Voltage Supply Through ECM
• Each Individual Injector Also Has It’s Own Ground Signal Supplied By ECM
• Injectors Are NOT Grouped Together Like On Previous Common Rails

Special Tool To Stretch O-Ring Over Injector

T10377
Injector Voltage

40 Volts
DeNOx System

- 2010 Emission Changes led to another decrease in Nox emissions
- VW US vehicles utilized two methods of reducing Nox
  - Lean Nox Trap (Conversion only)
  - Selective Catalyst Reduction (Intrusive)
DeNOx System

• Lean NOx Trap
  • Uses Diesel Fuel for NOx conversion similar to a gas engine’s process (run rich at times)
  • Uses More Fuel, reducing overall fuel economy
  • Catalyst Material Size approx. 2X Engine Displacement
  • Used on lighter Diesel Vehicles in VW fleet (Jetta) until 2015
  • More expensive Materials Used
DeNOx Components

- Reductant Injector
- Urea Twist Mixer
- NOx Sensor
- NOx Reduction Catalyst
Reductant Operation

- NOx Reduction using Intrusive System
- Reductant (Urea) is split when heated into two molecules
  - Ammonia
  - Carbon Dioxide
- Catalyst Reaction in the exhaust caused by rapid decomposition of Urea, creating Nitrogen and Water as byproduct
VW Kruse Filler Neck

- Urea Filler located in the trunk
- Special Fitting on Neck Used for adding proper fluid level
- Fluid is Labeled AdBlue
Bottle Can Be Reused
Urea Twist Mixer

- UREA injected takes approximately 15mS to travel from injector to Twist Mixer
- Twist Mixer decomposes UREA into ammonia
- Temperature must be high enough to atomize UREA
Urea Injector

- Urea Injector tasks:
  - Meter Delivery of DEF
  - Prevent DEF from boiling before being delivered
  - Create a pressure differential when ignition key switched off to allow full recovery of DEF back into tank
NOx Sensor

- Located after Twist Mixer
- NOx sensor tasks include:
  - Disassociate O2 from NO
  - Calculate the dosage requirement
  - Calculate Approximate NOx before Twist Mixer
  - Unit is attached to Control Unit that is programmable and needs to be relearned if replaced
NOx Sensor

CAL ID
ECU: $07E8 ECM
03L906012BP 2158
NOX00907807 0013

ECU: $07E9 TCM
02E300057P 3113

[ENTER]

Adaptation of diff. pressure sensor particulate filter
Adaptation of EGR valve
Adaptation of exhaust flap
Adaptation of the turbocharger
Automatic test sequence
Check of SCR efficiency
Compression test 1
Exhaust Gas Recirculation (EGR) test
Filling reducing agent metering system
Initial fuel filling
Low pressure EGR valve adaptation
Low-pressure EGR differential pressure sensor adaptation
Manual test of exhaust flap
Manual test of low pressure EGR filter
Manual test of low pressure EGR valve
Reset learned values quant. meter. unit and press. contr. valve
Reset oxygen sensor learned values
Reset SCR clock
Resetting learned values of cylinder pressure sensors
Resetting of learned values fclosing time correction f inj 1
Resetting of learned values fclosing time correction f inj 2
Resetting of learned values fclosing time correction f inj 3
Resetting of learned values fclosing time correction f inj 4
Resetting of learned values of average quantity adaptation
Resetting of learned values of difference pressure sensor
Resetting of learned values of particle filter
Resetting of SCR tank level detection
SCR metering quantity test
Service regeneration of particle filter
Test charge pressure regulation
Reductant System

- System Temperature is Critical
  - ECM will not command injector until minimum of 90 degs C is achieved at the SCR
  - Reductant Temp is monitored as DEF will freeze
  - There are heater elements to thaw DEF

<table>
<thead>
<tr>
<th>462</th>
<th>SCR catalytic converter average temperature</th>
<th>26.8 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>468</td>
<td>Sensor for reducing agent tank temperature...</td>
<td>26.9 °C</td>
</tr>
</tbody>
</table>
Reductant Injection Not Requested

![VCDS Advanced Measuring Values](image)

<table>
<thead>
<tr>
<th>Loc.</th>
<th>Description</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>362</td>
<td>NOx emission NOx sensor 1</td>
<td>0 ppm</td>
</tr>
<tr>
<td>363</td>
<td>NOx Sensor</td>
<td>NOx11.65535 ppm / NOx21:---</td>
</tr>
<tr>
<td>365</td>
<td>NOx sensor 1; NOx concentration</td>
<td>0 ppm</td>
</tr>
<tr>
<td>368</td>
<td>NOx-Sensor 1; oxygen concentration</td>
<td>0.20670</td>
</tr>
<tr>
<td>429</td>
<td>Pressure sensor for reducing agent; measurement</td>
<td>5006 hPa</td>
</tr>
<tr>
<td>449</td>
<td>Reducing agent injector; activation</td>
<td>0.00 %</td>
</tr>
<tr>
<td>450</td>
<td>Reducing agent injector; resistance</td>
<td>13517 mOhm</td>
</tr>
<tr>
<td>451</td>
<td>Reducing agent pump; activation</td>
<td>14.04 %</td>
</tr>
<tr>
<td>452</td>
<td>Reducing agent purge valve; activation; Bit 0</td>
<td>0</td>
</tr>
<tr>
<td>462</td>
<td>SCR catalytic converter average temperature</td>
<td>234.6 °C</td>
</tr>
</tbody>
</table>
## Exhaust Temperature Sensors

### VCDS Advanced Measuring Values

<table>
<thead>
<tr>
<th>Loc.</th>
<th>Description</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>031</td>
<td>Air mass; actual value:</td>
<td>109.16 g/s</td>
</tr>
<tr>
<td>125</td>
<td>Diesel particle filter bank 1</td>
<td>14.79 kPa</td>
</tr>
<tr>
<td>216</td>
<td>Exhaust gas temperature sensor 1</td>
<td>639.8 °C</td>
</tr>
<tr>
<td>218</td>
<td>Exhaust gas temperature sensor 2</td>
<td>408.8 °C</td>
</tr>
<tr>
<td>220</td>
<td>Exhaust gas temperature sensor 3</td>
<td>322.7 °C</td>
</tr>
<tr>
<td>222</td>
<td>Exhaust gas temperature sensor 4</td>
<td>299.3 °C</td>
</tr>
<tr>
<td>399</td>
<td>Particle filter field regeneration</td>
<td></td>
</tr>
<tr>
<td>401</td>
<td>Particle filter; difference pressure</td>
<td></td>
</tr>
<tr>
<td>410</td>
<td>Particle filter; soot mass</td>
<td></td>
</tr>
<tr>
<td>475</td>
<td>Service regeneration; cur</td>
<td></td>
</tr>
</tbody>
</table>

**Diagram:**
- Exhaust Gas Temperature (EGT) Sensor 1 (on Turbocharger)
- Exhaust Gas Temperature (EGT) Sensor 3 (on Diesel Particulate Filter)
- Exhaust Gas Temperature (EGT) Sensor 2 (on Diesel Particulate Filter)
- Exhaust Gas Temperature (EGT) Sensor 4 (on Diesel Particulate Filter)