158	Catalytic converter
G3/4	Right O_2 sensor upstream TWC
G3/6	Right O_2 sensor downstream of TWC

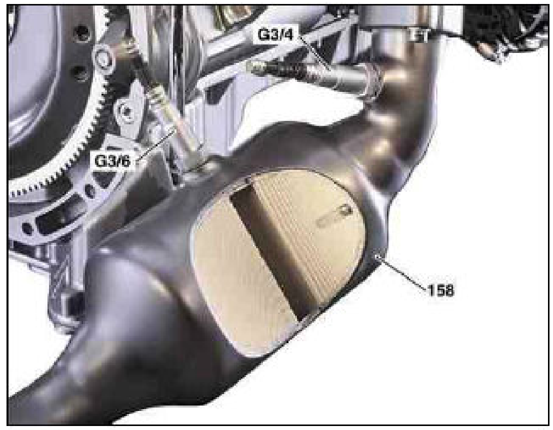


Fig. 9: Identifying Three-Way Catalytic Converter Components - Shown On Engine 272.963, Right Cylinder Bank
Courtesy of MERCEDES-BENZ OF NORTH AMERICA.

Catalytic converter design (schematic)

1	ceramic monolith
2	Wire mesh (embedded)
3	Double-walled housing (insulation)
4	Substrate (washcoat) with a coating of platinum and rhodium

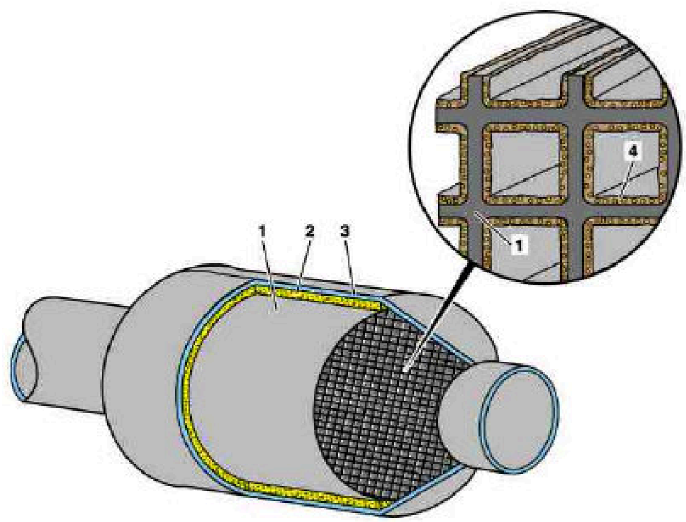


Fig. 10: Identifying Three-Way Catalytic Converter Design (Schematic) Diagram
Courtesy of MERCEDES-BENZ OF NORTH AMERICA.

In each catalytic converter, there are two ceramic monoliths with each approx. 600 cells. The exhaust gas flows through these passages. The ceramic consists of high temperature-resistant magnesium aluminum silicate.

The monoliths are extremely sensitive to warping and are embedded in an elastic wire mesh of high-carbon steel wire and mounted inside a double-wall housing of stainless steel.

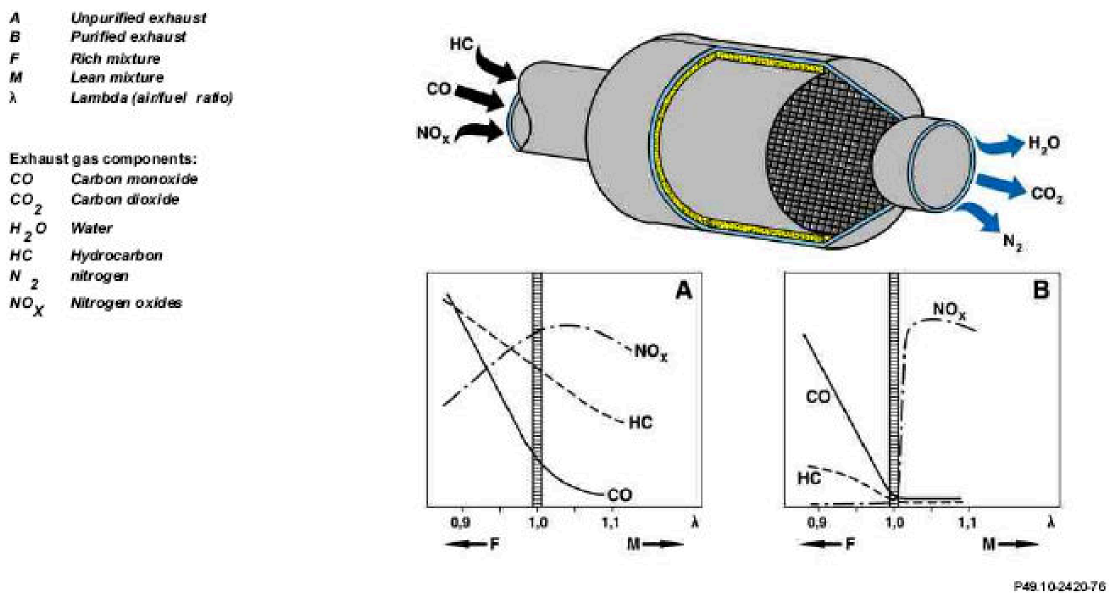
Ceramic monoliths require a support layer of alumina (Al_2O_3) (the "washcoat"), which increases the effective surface of the catalytic converter by a factor of 7000.

The active catalytic layer coated on the substrate is available in three-way catalysts primarily out of platinum and Rhodium.

Platinum promotes the oxidation of hydrocarbons (HC) and carbon monoxide (CO) and Rhodium the reduction of nitrogen oxides (NO_X).

[i] Owing to its property of simultaneously reducing three pollutant components, it is called a "three-way catalyst".

Function



<u>**Fig. 11: Identifying Three-Way Catalytic Converter Function Diagram**</u>
Courtesy of MERCEDES-BENZ OF NORTH AMERICA.

The exhaust gases flow through the three way catalytic converter and hence come into contact with the rare metals, platinum and Rhodium.

- The carbon monoxide (CO) is converted to carbon dioxide (CO_2) and hydrocarbons (HC) converted to water (H_2O) + carbon dioxide (CO_2) by oxidation.
- Due to reduction, nitrogen oxides (NO_X) are converted into nitrogen (N_2) + carbon dioxide (CO_2).

The critical factors for the conversion of the pollutants is the residual oxygen content in the exhaust. It is determined through lambda control and maintained at lambda=1 in normal operation.

Operating conditions

As is the case for the O_2 sensor, the operating temperature also plays a very important role in the case of the catalytic converter. Appreciable conversion of the pollutants does not commence until an operating temperature of approx. 250°C. This temperature is reached quickly after the engine is started, due to the near-engine location, the air-gap insulation on the exhaust manifold and mixture enrichment.

Ideal operating conditions for high conversion rates and a long life prevail at temperatures between around 400 to 800°C.

The temperature of the three way catalytic converter can increase

The temperature of the three way catalytic converter can increase beyond 1400 °C due to a malfunctioning of the engine such as misfiring etc. These high temperatures can lead to destruction of the catalytic converter, by melting the ceramic monoliths.

Another requirement for reliable long-term operation is that only unleaded fuel be used. Lead compounds form a deposit on the active surface and as a result prevent the exhaust gases from coming into contact with the catalytic layer.

i If the vehicle is driven during direct injection in stratified charge operation with excess air, the catalytic converter cannot convert the nitrogen oxide sufficiently. Additional NOX storage catalytic converters are necessary.

COMPONENT DESCRIPTION FOR THE OXIDATION CATALYTIC CONVERTOR - GF49.10-P-3006GZ

ENGINE 642 in MODEL 164.1 /8

ENGINE 642 in MODEL 463

19 Oxidation catalytic converter

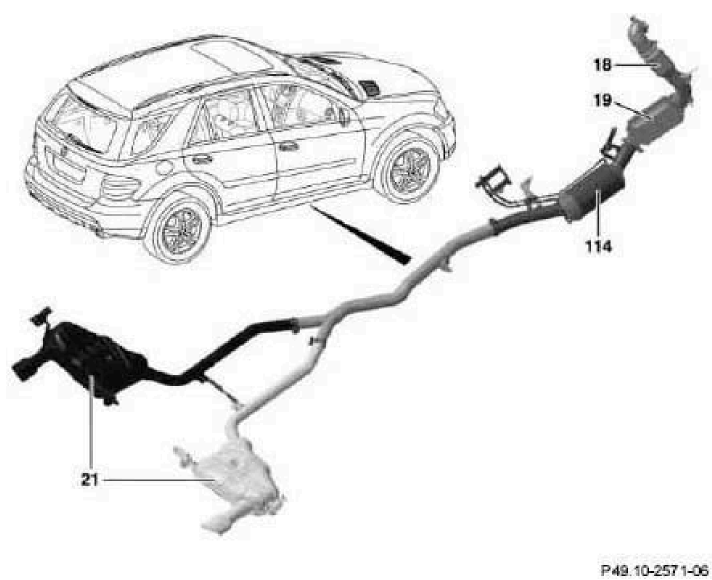


Fig. 12: Identifying Oxidation Catalytic Convertor - Engine 642 In Models 164.1 /8, 463
Courtesy of MERCEDES-BENZ OF NORTH AMERICA.

Location

The oxidation catalytic converter is near-engine mounted downstream of the turbocharger.

Body

Schematic view of oxidation catalytic converter

Task

Reducing the pollutant components of carbon monoxide (CO), hydrocarbon (HC), oxides of nitrogen (NO_X)

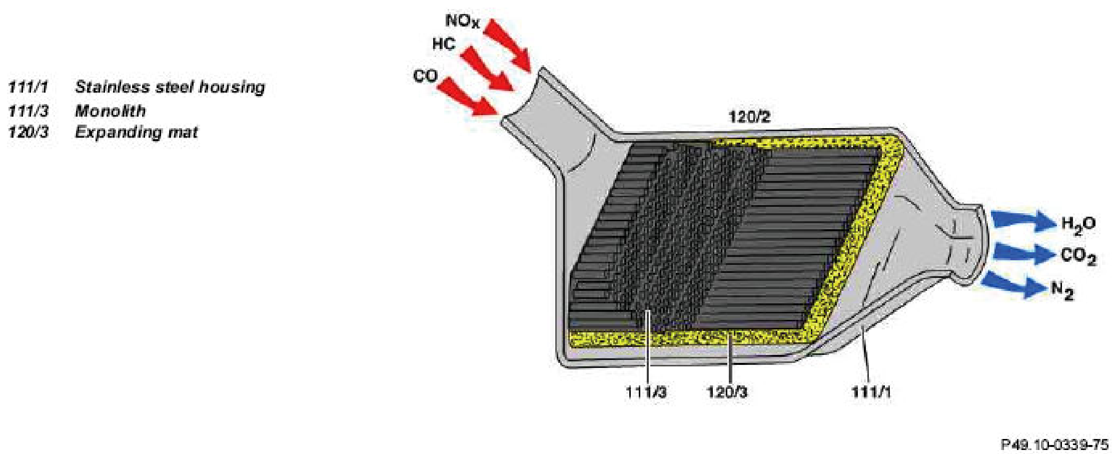


Fig. 13: Schematic View Of Oxidation Catalytic Converter
Courtesy of MERCEDES-BENZ OF NORTH AMERICA.

[i] The exhaust flow consists of a number substances including:

- CO
- HC
- NO_X

111/3 ceramic monolith
111/4 Carrier layer (washcoat) with a coating of platinum
183 Exhaust

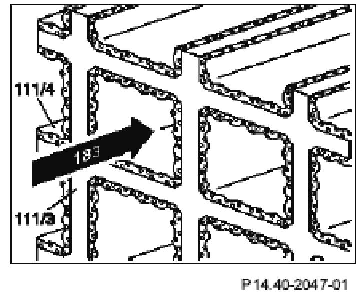


Fig. 14: Identifying Monolith Ceramic Body Small Passages
Courtesy of MERCEDES-BENZ OF NORTH AMERICA.

Function

The ceramic monolith is a ceramic body through which many thousands are small passages are drawn. The ceramic consists of a high temperature-resistant magnesium-aluminium silicate.

The monolith which is extremely sensitive to voltages is embedded in an elastic expanded matting and mounted in a stainless steel housing.

Coating

The carrier layer applied to the ceramic monolith with the operative catalytic layer consists of platinum and accelerates oxidation of HCs and CO.

The HC and CO act to reduce the NO_X portion. This is made possible by the special catalytic converter design.

i The content of rare metals contained in an oxidation catalytic converter is approx. 5 grams, depending on size and design.

CATALYTIC CONVERTER EFFICIENCY MONITORING FUNCTION - GF49.10-P-3033AMG

ENGINE 156.980 in MODEL 164, 251

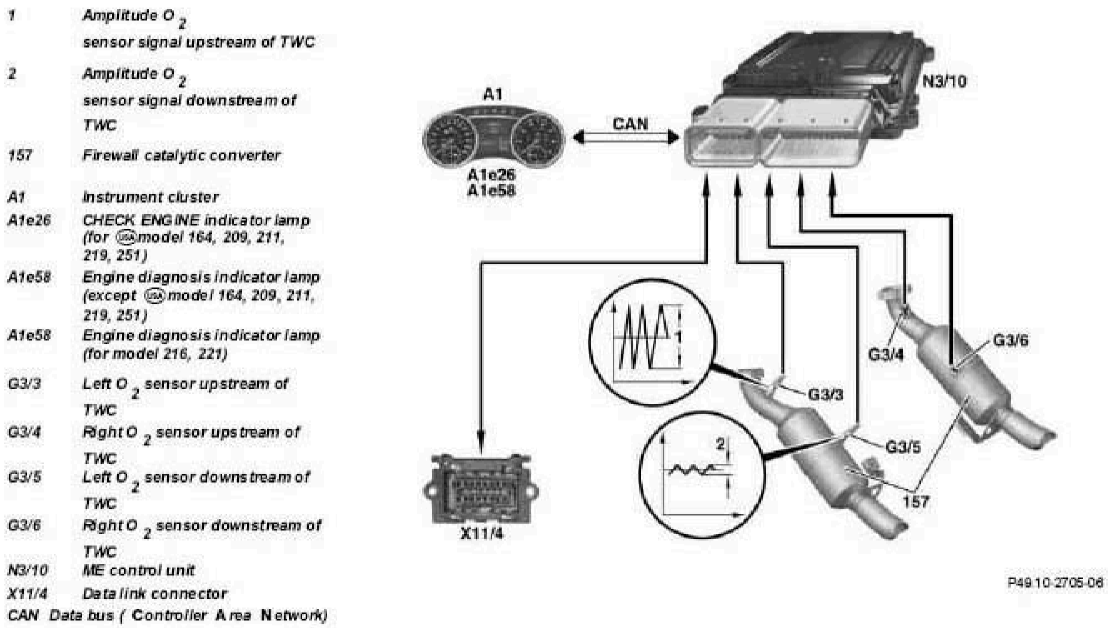


Fig. 15: Identifying Catalytic Converter Efficiency Monitoring Function Diagram - Engine 156.980
Courtesy of MERCEDES-BENZ OF NORTH AMERICA.

By law, HC emissions must not go above certain limits. The task of monitoring catalytic converter effectiveness to obtain insights from the oxygen storage capacity of catalytic converters about their aging and therefore their HC conversion. The oxygen stored during the "lean phase" is then reduced totally or partially during the "rich phase". Aging leads to reduction in the storage capacity of catalytic converters whereby the HC conversion is removed.

When the firewall catalytic converter is operationally warm and lambda control enabled, the amplitude sizes of the O_2 sensor signals downstream and upstream of the firewall catalytic converters are compared. Changes in the oxygen content downstream of the firewall catalytic converters are almost completely dampened by the high oxygen storage capacity of the firewall catalytic converters.

This results in the O_2 sensor signal downstream of the firewall catalytic converters being virtually constant with a small amplitude. If the firewall catalytic converter is no longer operational, the O_2 sensor signal upstream and downstream of the firewall catalytic converters will be equal.

Wideband oxygen sensors are installed upstream of the firewall catalytic converter which can exactly measure the mixture composition. Downstream of the firewall catalytic converters or after the first catalytic converter inserts (for model 164, 216, 221, 251) there are voltage-jump oxygen sensors with which at 450 mV a sensor voltage lambda=1 is recognized.

During the first stage, the oxygen stored when the mixture is rich (lambda =0.95) is reduced until the sensor voltages downstream of the TWC are >650 mV.

In the next operation step, a lean mixture (lambda=1.05) is set and the system waits until sensor voltages downstream of the TWC are <200 mV.