

## Car exhaust control. With HiQ® specialty gases.

### Car exhaust control

Car exhaust and smog are a problem for human beings and our nature in most parts of the world. Nevertheless, we continue driving around in our cars. The question is then: how can we develop vehicles and regulations to reduce the health risks and environmental damages? How can we limit the level of exhaust? These are topics that governments, international organizations and the industry in the whole world are continuously working with and for the last 30 years, governments around the world have been progressively decreasing vehicle emission limits.

### Periodic testing of car emissions

All car engines are tested at many stages in their lifecycles. In the development phase, they are tested to minimize emissions and achieve maximum energy conversion. The next step is specific type approval, which involves rigorous testing against international laws. The third test stage is during series production to see whether each unit complies with its design specifications. The last and normally the most familiar test is the car's annual checkup at the garage, where among other measurements the exhaust is controlled.



### Correct calibration

Several of these engine and vehicle tests are carried through with different analytical instruments. The performance and correctness of the instruments are dependent on correct calibration, normally performed with a gas mixture. A wide range of gas mixtures has been developed for this industry, both for the development of cars and gas mixtures that are used during compliance testing and for regular testing.

Calibration mixtures for routine car exhaust control typically contain propane, carbon monoxide and carbon dioxide. In addition, the level of oxygen ( $O_2$ ) is controlled to calculate the lambda value, calibrated with a gas mixture of  $O_2$  in nitrogen. The lambda value represents the burning efficiency of the engine.

### Accreditation

The result of the periodic car exhaust test is greatly dependent on the garage performing the measurements. The measurement must be done correctly under reliable conditions and the instruments must be calibrated in a trustworthy way. An important facet here, beside the measuring procedure itself, is the calibration gas mixture.

The garage performing the measurements normally needs an official approval. One way of assuring the measurements is through accreditation. Several countries have chosen this way. In many countries, the calibration gas mixtures must be made by a supplier who has an accreditation for analyzing them. Accredited facilities are obliged to keep track records as a basis for all legal aspects. To offer a flexible service, Linde holds several accreditations according to ISO17025 for analyzing such calibration mixtures. Please contact your local organization for details.

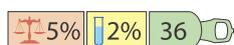
### HiQ® product program

The HiQ® specialty gas product program offers a wide range of calibration mixtures that fulfill the requirements in terms of car exhaust control.

## Calibration mixtures

The range of standard calibration mixtures for car emission control is wide and covers most of the different calibration needs from the lower to the higher concentration area. Below are some typical examples of calibration mixtures for the European market covering both the high and the low concentration level:

### Car emission



	CO/CO <sub>2</sub> /propane carem 3.5/14/0.2 %	CO/CO <sub>2</sub> /propane carem 0.5/6/0.0 %
Component concentration	3.5 % CO 14 % CO <sub>2</sub> 2000 ppm C <sub>3</sub> H <sub>8</sub>	0.5 % CO 6 % CO <sub>2</sub> 200 ppm C <sub>3</sub> H <sub>8</sub>
Balance gas	Nitrogen	Nitrogen
Product code	2272	2263

### Automotive

The corresponding mixtures with 1 % analytical uncertainty when particularly high accuracy is needed and for pattern approval of instruments are:

CO/CO <sub>2</sub> /propane auto 3.5/14/0.2 %	Product code 2248
CO/CO <sub>2</sub> /propane auto 0.5/6/0.02 %	Product code 2256

For other calibration mixtures, please look into the HiQ® product catalog 'Automotive' or ask your local Linde sales representative. If you do not find your mixture among the predefined mixtures, we can of course produce the mixture that fulfills your demands.

## O<sub>2</sub> for lambda measurement



	Oxygen carem high
Component concentration	1-30 % O <sub>2</sub>
Balance gas	Nitrogen
Product code	2785

For O<sub>2</sub> mixtures also, there is a range of different products in the HiQ® product program.

### Cylinder size

Calibration mixtures are normally delivered in cylinders with a volume of 5, 10 and 20 liters, well suited for mobile calibration services. Other sizes can be obtained upon request.

### Recommended cylinder regulators

The REDLINE® two stage regulator C200/2 provides a stable secondary outlet pressure. The C200/2 can be plain or equipped with a shut-off valve (type A), a needle valve (type B) or equipped for purging of the high-pressure side (type P).

For calibration of car emission measurements, we recommend the C200/P in brass. The regulator can be delivered with the following working range of outlet pressure:

REDLINE®		Outlet pressure		Product code
		bar	psi	
Two stage	C200/2 A, brass	0.2-3	3-45	5484
Two stage	C200/2 A, brass	0.5-6	8-85	3131
Two stage	C200/2 A, brass	1-10.5	15-150	3132

### More information

Please look into our HiQ® catalog 'Automotive', consult your local Linde sales representative or visit our website <http://hiq.linde-gas.com> to get more information about gases for the automotive industry.



Blending tolerance



Analysis uncertainty



Shelf life

