



Experis® gas mixtures

Wherever accuracy, stability and reliability are essential

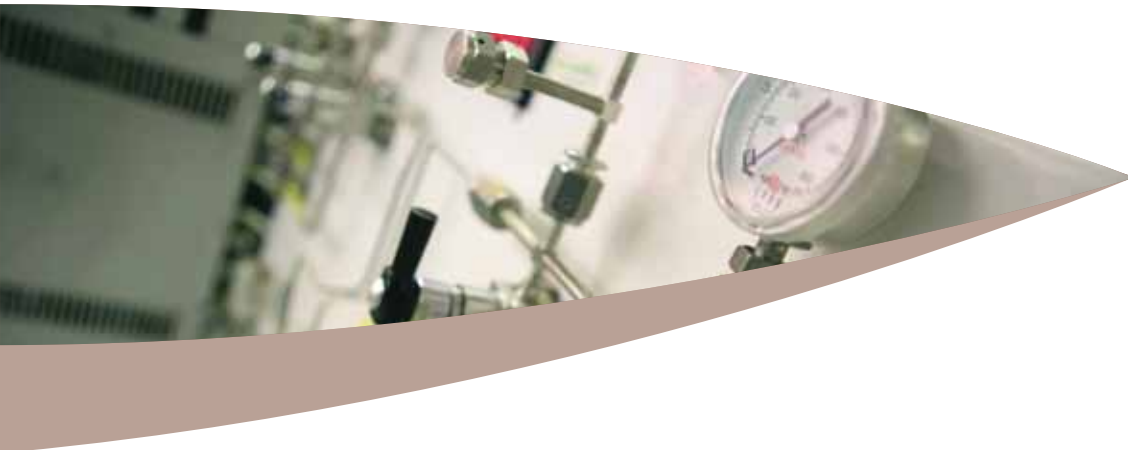
“Careful and methodical analysis is key to everything we test. Getting it wrong could affect our excellent reputation and of course add cost to our operation. That is why it’s essential to use the most accurate calibration gas mixtures.”

Martin Hughes
Manager Operations and Instrumentation
Millbrook Proving Ground Ltd
UK



For over 40 years, the Air Products specialty gases business has been driven by a single, critical objective: to help you achieve consistently reliable performance in both analytical and process applications.





➤ *Stay in control*

Calibration mixtures



Process mixtures



ISO17025 certified mixtures



These days, the need to keep your manufacturing process under tight control is greater than ever. Rising customer expectations, ever-tighter regulatory requirements, downward pressure on prices - they all combine to make process accuracy an essential, not a luxury.

Whatever your product, it may well involve the direct use of special gas mixtures at some stage. And it will almost certainly use gas mixtures indirectly, for calibrating analysers and other measuring equipment in the lab, on-line in your process, or in monitoring your emissions to air and water.

The quality and reliability of these gas mixtures are critical to your business. For process gases, off-specification gas can easily mean off-specification product. For calibration gases, the problems are

potentially even more serious. If you can't trust your instruments, you don't know precisely what you're buying, making, selling, or discharging. At best, that could lose you money. At worst, it could upset your customers – or the environmental authorities.

That's why it's essential to buy the most reliable and accurate gas mixtures.

Choosing Experis® gas mixtures, with their high accuracy, stability and full traceability, will put you in control of your process and protect your investment.

- **Accuracy**
- **Stability**
- **Traceability**
- **Peace of mind**



👉 *Gas mixtures are everywhere*

Experis® gas mixtures are used across all sectors of industry, from manufacturers of potato chips to silicon chips, natural gas to synthetic products. Direct process applications for Experis® gas mixtures include lasers, protective atmospheres in furnaces, biological cultures, safety testing of natural gas appliances and even lighting.

But the largest area of use is for calibrating instruments such as continuous emissions monitoring systems or chromatographs. The chemical, environmental, petrochemical, pharmaceutical, automotive and analytical services industries are some of our biggest customers – and you'll find Experis® gas mixtures wherever there is a laboratory or an on-line analyser.

↘ **Some of the
markets we serve**

“We use complex gas calibration mixtures, sometimes containing up to 20 components, to analyse materials throughout our entire production process. Not only is the accuracy of the gas mixture key, but also the reliability of supply – we cannot afford to receive late deliveries. That’s why we work with Air Products.”

Thomas Ronkholz
Labor Scholven
BP Gelsenkirchen GmbH
Germany



**Analytical &
Laboratories**



Automotive



**Chemicals &
Petrochemicals**



**Detection &
Safety**



Electronics



**Environmental
control**



Pharmaceuticals



Natural gas





Gravimetric filling



Volumetric filling



Manometric filling

Accuracy you can rely on

Producing calibration gas mixtures to a blend tolerance of fractions of a percent is demanding at the best of times. When dealing with highly reactive gases, or components measured in parts per billion (ppb), it's much more difficult to create mixture compositions that are both accurate and stable. Thanks to many years of experience in making and handling specialty gases, however, Air Products is able to get it right every time.

An Experis® gas mixture starts life as two or more component gases, each carefully purified to reduce its levels of moisture and other contaminants to ppb levels. Each of more than 300 different raw materials is analysed and their purity is certified.

The components are then blended to the required tolerance, using carefully selected methods.

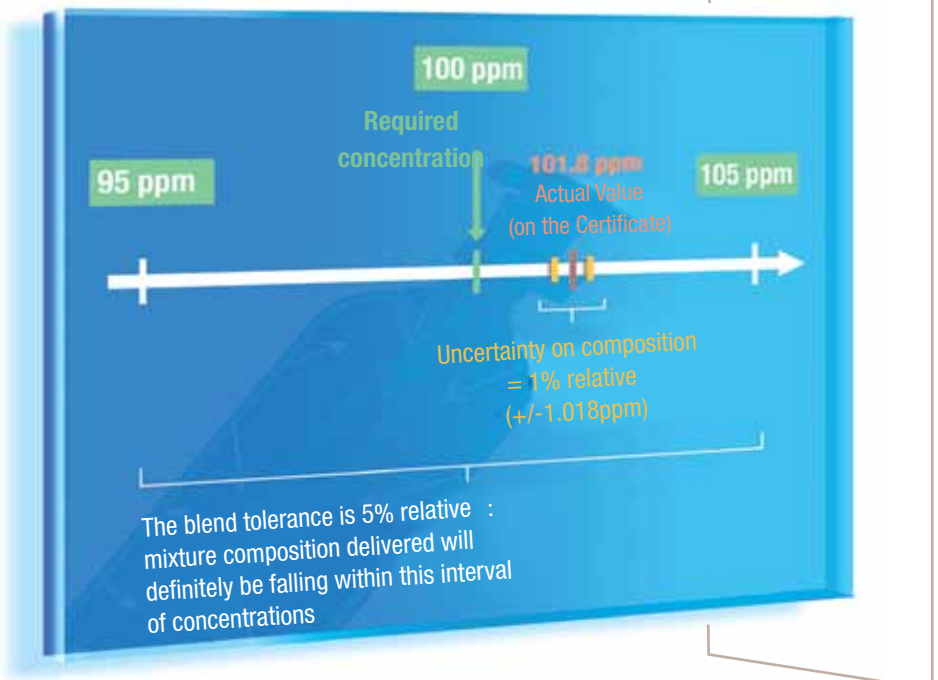
Air Products employs several blending methods, depending on the application. Gravimetric filling using highly accurate scales is the most common technique.



Blend tolerance and uncertainty

“Analytical equipment is improving in accuracy all the time - but even the best can't be relied on without proper calibration.”

Ir. Peter Aernouts
Instrumentation Engineer,
Analytical Systems
Elster-Instromet NV
Belgium



Figures are for illustration purposes only. Tolerance and uncertainty values vary for each mixture.

Small uncertainties can mean big savings

But pressure-based blending and volumetric filling, where components are added into the cylinder using a syringe as well as successive dilution, are also possible. The method is carefully selected for each bespoke mixture. This ensures minimised levels of uncertainty for the composition, cost effectiveness and faster delivery times.

- Customised filling method
- Minimised levels of uncertainty

For many processes, a manufacturing tolerance of one percent is good going, even when all analytical equipment is calibrated accurately. If analyzer calibration is poor, your losses through product giveaway could be several percent and that can be worth a lot of money. In other cases, off-specification process or **poor calibration gas mixtures can ruin valuable final product.**

At Air Products, we offer **validated gas calibration mixtures** with the highest quality in accuracy, stability and traceability. It's just one less thing to worry about.

- Accuracy
- Stability
- Traceability
- Peace of mind

Emissions' trading for greenhouse gases provides a good example.

As part of the global effort to combat climate change, in January 2005 the European Union launched its Greenhouse Gas Emission Trading Scheme (EU-ETS), the largest in the world to date.

The current phase of the EU-ETS is designed to prepare European nations for phase II that will operate from 2008 under the Kyoto Protocol. The EU-ETS and similar schemes use market financial trading mechanisms to reduce carbon dioxide (CO₂) emissions from heavy industry. This is done by granting companies tradable permits to emit fixed quantities of CO₂. Each year the allowance must be reduced. For this to work, companies need to measure their CO₂ emissions to their best ability using traceable validated measurement process with known uncertainty. This in turn requires accurate calibration of the monitoring equipment with traceable validated uncertainty budget.

Suppose a company emits 100,000 t/y of CO₂, and measures this with a poorly calibrated analyser that has an uncertainty of $\pm 2\%$. The measured amount of CO₂ emitted could be as high as 102,000 t/y. With emissions permits trading at £55 per tonne of CO₂, the company would have to pay an extra £110,000 annually to license the emission of non-existent CO₂. Clearly, **it pays to minimise measurement uncertainty by using calibration gases with the lowest possible uncertainty values.** The principal driver of accuracy is the calibration mixture issued with an accredited ISO17025 certificate.



➤ Month after month . . .

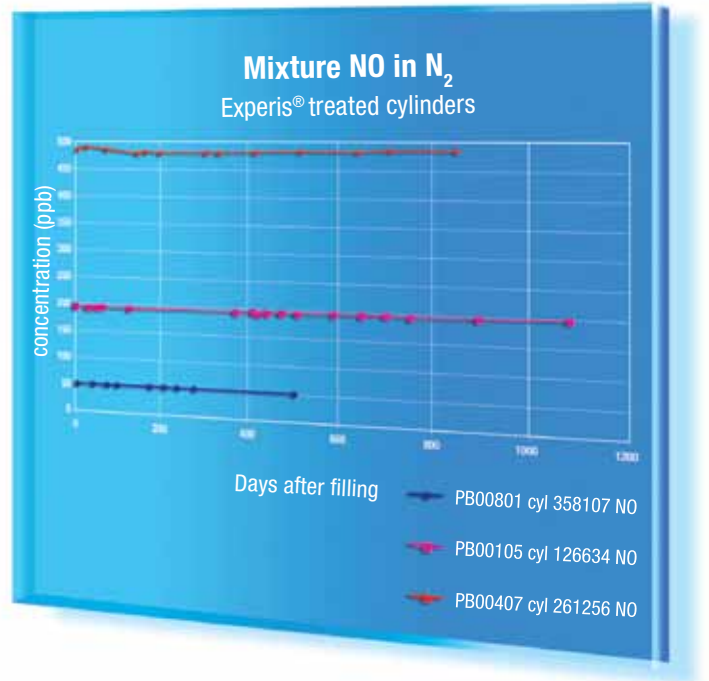
Getting the right mix of gases into the cylinder is only the starting point.

Ten months later, your cylinder – now three-quarters empty – has been in hot storerooms and freezing yards.

The question is: what does it contain now?

The answer is: whatever it contained when it left the factory, and we have the figures to prove it. Through careful choice of cylinder and valve, high-tech surface treatments, cylinder preparation and careful selection of component gases, we can create mixtures that will remain within tight specifications for years, even when their component gases are highly reactive and for ultra-low concentrations. The graph on this page speaks for itself.

- **Bespoke cylinder treatment**
- **Longer shelf life**
- **Certified shelf life**



“Stability of gas mixtures is important for us, since some gas calibration mixtures we use are low turnover and contain reactive components like NO. Since every Experis® gas mixture cylinder has its own unique surface treatment, we can be sure that the content stays as it should be.”

Ángel Moratilla I Abad
Technical Manager
Ambiental De Verificaciones S.L.
Spain



➤ Special treatments for longer shelf life

The cylinders and valves used for Experis® gas mixtures are carefully chosen to suit the gases they will contain. Materials used, surface finish, internal preparation and special internal coatings all ensure that our cylinders do not interfere with the gas mixtures in any way. These steps are vital, because even trace amounts of moisture or other impurities adsorbed on the cylinder surface can seriously alter the composition of many gas mixtures.

We believe our cylinder-coating technology is the best in the world. All you need to know is that Experis® gas mixtures have the longest shelf life available.



Mark Sistem, Lead Development Scientist, examines the Experis® treated cylinder

Traceability guaranteed

Every cylinder of Experis® calibration gas is filled to order by dedicated and experienced Air Products experts at one of our sites in Europe. Each cylinder has a unique identifier, and both the cylinder and its contents are fully traceable to national and international standards. And to guarantee that what we say is inside, is inside, each cylinder comes with a certificate of analysis fully compliant with ISO6141, including all required traceability data.

- Traceability to national standards
- ISO6141 certification
- ISO17025 accreditation



A filled Experis® cylinder is ready for finishing

“With ever tightening legislation around traceability, we can’t afford to cut corners.

The calibration certificate that is delivered with our gas mixtures is compliant with ISO6141. This helps us to meet our traceability requirements, leaving us to concentrate on what we do best.”

Ron van den Berg

Section Leader Laboratory Spijkensisse
SGS Nederland B.V. - Oil, Gas & Chemicals
Netherlands



Each individual Experis® calibration mixture is delivered with a certificate of analysis fully compliant to ISO6141.

For more stringent needs, Air Products also delivers mixtures with ISO17025 calibration certificates.

Unique cylinder identifier for TRACEABILITY purposes

STABILITY period for each mixture

CERTIFIED CONCENTRATION per component for calibration purposes

EXPANDED UNCERTAINTY associated to each certified concentration, given with a 95% interval of confidence and calculated according to ISO6142 and ISO6143 standards

Information on TRACEABILITY to international standards : Primary Reference Materials (PRMs) and standard masses from National Standards Laboratories like NPL, NMI, NIST,...

UNITS		UNITS	UNITS	UNITS	UNITS	UNITS	UNITS	UNITS	UNITS
Mass	0.1000	0.1000	% mass	± 2%					
Volume	0.0000	0.0000	% vol	± 0.5%					
Carbon Dioxide	1.000	1.000	% mass	± 0.5%					
Nitrogen	0.1000	0.1000	% mass	± 2%					
Oxygen	0.1000	0.1000	% mass	± 0.5%					
Hydrogen	0.0000	0.0000	% mass	± 0.5%					

✦ *ISO17025 mixtures for the calibration of:*

✦ Air quality monitoring systems

Components: NO, SO₂ and CO in low concentrations in air or N₂



✦ Vehicle exhaust monitoring systems

used for MOTs
Components: CO, CO₂, C₃H₈, O₂, N₂



✦ Natural gas analysers

used to measure the calorific value of natural gas
Components: Hydrocarbons in methane



✦ *ISO17025 accreditation*



For the ultimate in accuracy and traceability, Experis® mixture cylinders can also be supplied with calibration certificates from one of our ISO17025 accredited laboratories, confirming their suitability for the most demanding analytical applications across a wide range of industries; automotive, environmental, natural gas industries, and more.

Worldwide recognition and international acceptance

A certificate issued by an accreditation body in one country is recognised across all countries whose accreditation bodies are signatories to the EA (European Cooperation for Accreditation) Multilateral Agreement (MLA) or to the ILAC (International Laboratory Accreditation Cooperation) Multilateral Agreement (MLA). Therefore, for example, an ENAC certificate is equivalent to a certificate from UKAS, RvA, COFRAC, BELAC, DKD, etc...

(Source: www.european-accreditation.org)

✦ *What you need, when you need it*

Experis® gas mixtures can contain from one to more than 100 components, at concentrations from per cent down to ppb. Their main constituents range from the basic, such as carbon monoxide and carbon dioxide, to more difficult-to-handle gases such as HCl or complex aromatics. Their minor components can be any gas you've ever heard of, and some you possibly haven't. We supply gas mixtures in a wide range of mixture compositions and quantities, depending on the

application, and we're as happy to make up a single cylinder containing a bespoke mixture as to supply a hundred standard cylinders. We also provide mixtures in packs, allowing you greater flexibility of supply.

So whether you need one cylinder or a hundred, a one-off or a regular order, let our Experis® experts take control - and leave you to concentrate on what you do best.

<i>Mixture type</i>	<i>Uncertainty (95% Confidence)</i>	<i>Who will supply?</i>
<i>PSM - Primary Standard Gas Mixtures</i>	$\pm 0.02\%-0.1\%$	<i>National Standards Laboratories (for their own use only)</i>
<i>PRM - Primary Reference Gas Mixtures</i>	$\pm 0.1\%-0.4\%$	<i>National Standards Laboratories</i>
<i>CRM - Certified Reference Gas Mixtures</i>	$\pm 0.5\%-3\%$	<i>ISO17025 accredited laboratories</i>
<i>Commercial Experis® Gas Mixtures</i>	$\pm 1\%-5\%$	



“As a laboratory accredited to ISO17025, we need to use highly pure and stable reference materials in order to comply with legislative requirements. The certified mixtures supplied by Air Products provide us with this, as well as total security and traceability.”

Emma Antolinez

Technical Director

Calibración de Analizadores de Gas, S.L.

Spain



www.airproducts.com/experis



➤ **Experis® solutions for all your specialty gas needs**

Experis® gas mixtures from Air Products are the answer to all your needs for precision process gas mixtures, calibration gases and certified reference materials. But the Experis® gases range goes far beyond mixtures. It includes single ultra-pure gases using our patented BIP® purification technology for analytical applications. We also provide gases and gas-handling equipment tailored to particular industries, including automotive, electronics, natural gas, medical and food.

So whatever your application, if you need ultra high purity gases, gas mixtures or gas handling equipment, choose the Experis® gases range. We guarantee you purity, accuracy, stability and peace of mind.



SINGAPORE

2 International Business Park
03-32 to 35 The Strategy
Singapore 609930
Tel +65 6332 2440
Fax +65 6334 1005

MALAYSIA

Level 2, Bangunan TH Uptown 3
No 3, Jalan SS 21/39
47400 Petaling Jaya
Selangor Darul Ehsan, Malaysia
Tel +603 7727 1836
Fax +603 7726 1832

TAIWAN

5th Floor
21 Chung Shan North Road Section 2
Taipei, Taiwan 104
Tel +886 2 2521 4161
Fax +886 2 2561 8268

HONG KONG

Room 1805-6, Fook Yip Building
53-57 Kwai Fung Crescent
Kwai Chung, Hong Kong
Tel +852 2421 9236
Fax +852 2420 4294

CHINA

Shanghai
5/F Building 72
887 Zu Chong Zi Road
Zhangjiang Hi-Tech Park
Shanghai, P.R. China, 201203
Tel +86 21 3896 2000
Fax +86 21 5080 7525

Beijing

No 160 Beiqing Road
Wenquan Town, Haidian District
Beijing, P.R. China, 100095
Tel +86 10 6245 9280
Fax +86 10 6245 1440

Shenzhen

No 7 Songhu Road
Shekou Industrial Zone
Shenzhen, P.R. China, 518067
Tel +86 755 2669 2537
Fax +86 755 2668 6177

SOUTH KOREA

7th Floor, Gateway Tower Building
12 Dongja-Dong, Yongsan-Gu
Seoul 140-709
South Korea
Tel +82 2 2170 8000 (8024)
Fax +82 2 733 0288

INDONESIA

Cikarang Industrial Estate
Blok F1-3
Cikarang – Bekasi 17530
West Java
Indonesia
Tel +62 21 286 38600
Fax +62 21 898 40059

THAILAND

11th Floor, Rajanakarn Bldg
183 South Sathorn Road
Yannawa, Sathorn
Bangkok 10120, Thailand
Tel +662 685 6789
Fax +662 685 6790

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www.airproducts.com