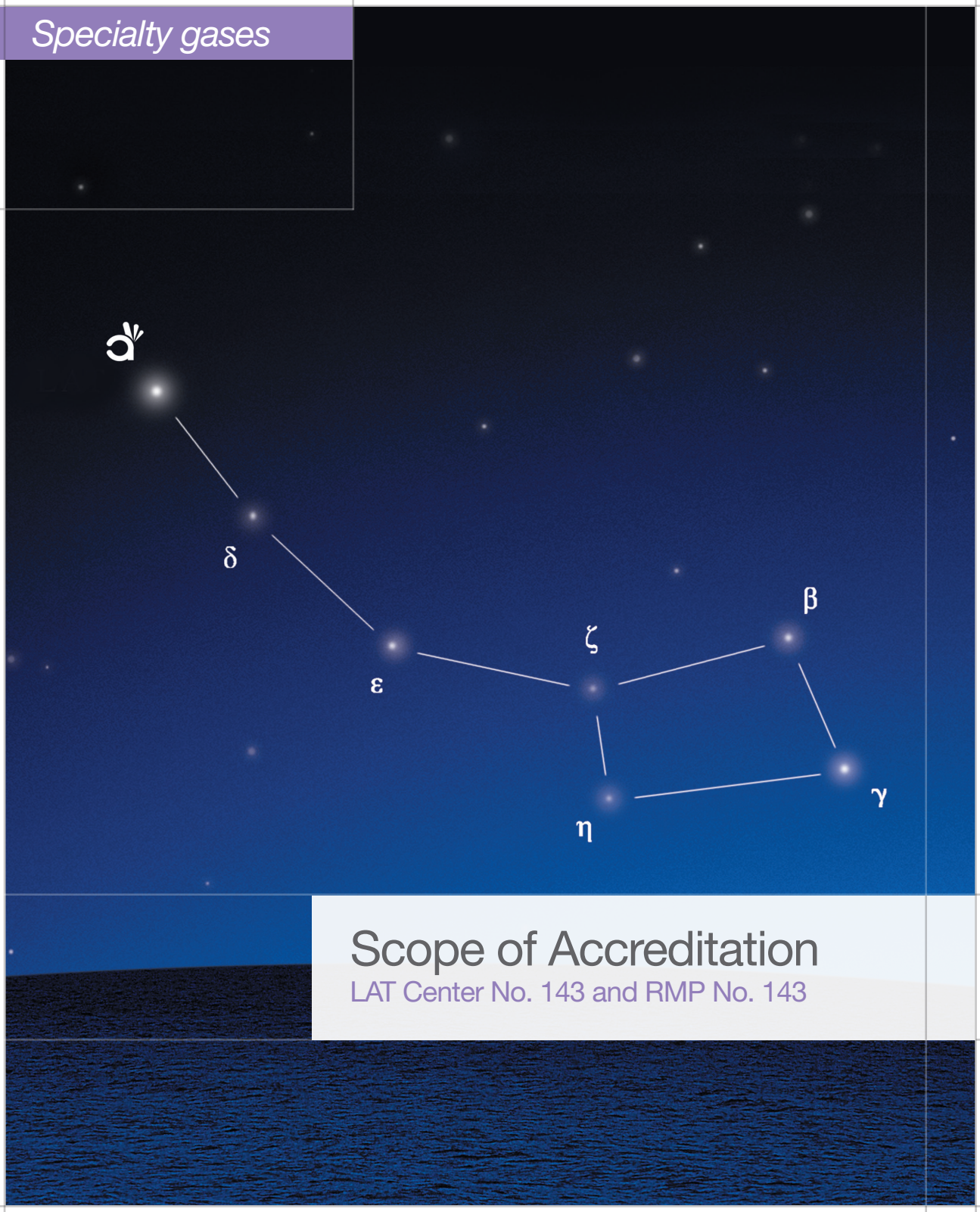
perfecta

SIAD

Specialty gases



Scope of Accreditation

LAT Center No. 143 and RMP No. 143

The SIAD Group

SIAD is an international chemical group active for almost 100 years
in the businesses of **Industrial Gases, Engineering,**
Healthcare, LPG and Natural Gas;
in addition it offers energy solutions and environmental management services.

Values

Research, Technology and Innovation

Experience, Tradition and Strength

Geographical and sector diversification

Commitment to Quality, Safety and the Environment

Reliability, Professionalism and Expertise

Attention to social and cultural issues

Sections

Industrial Gases

SIAD - Production and distribution of industrial, specialty, food-grade and medical gases. Present in 16 European countries with manufacturing and trading companies.
Tecnoservizi Ambientali - Services aimed at achieving environmental sustainability through the recovery and/or the disposal of hazardous and non-hazardous industrial waste.

Healthcare

Medigas Italia / Magaldi Life - Innovative services and products for home and hospital care.

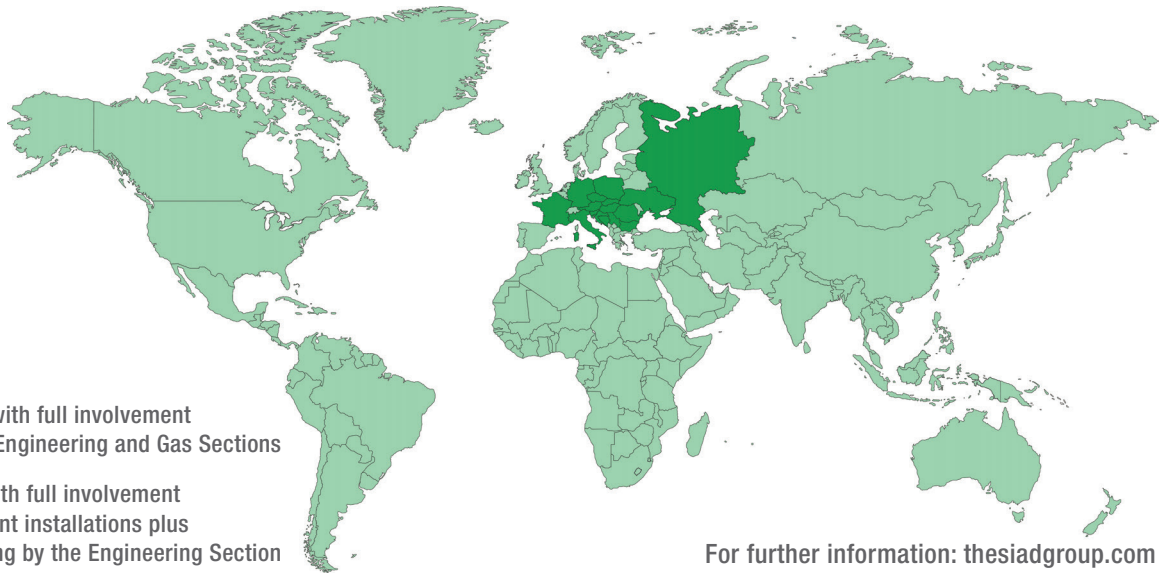
Engineering

SIAD Macchine Impianti - Design, production and installation of cryogenic air separation units, cryogenic nitrogen generators, natural gas liquefaction systems, reciprocating compressors for process gas and air, plus instrument air packages.
ESA - Systems, solutions and components for industrial combustion.
Tecno Project Industriale - Systems for the production, recovery, extraction, liquefaction and vaporization of carbon dioxide and biogas upgrading systems. Biogas upgrading plants to purify biogas produced by anaerobic digestion from organic waste, processing scrap and by-products, effluent from livestock farming, crop wastes and other biomass and plants for polishing and liquefaction of biomethane, bioLNG and bioCO_2.
Pentatec - Gas analysis systems.

LPG and Natural Gas

Istrabenz plini Group - Production and sale of liquefied petroleum gas and methane gas for civil and industrial use.

Worldwide presence



Areas with full involvement by the Engineering and Gas Sections

Area with full involvement and plant installations plus servicing by the Engineering Section

For further information: thesiadgroup.com


The Periodic Table of Elements

Index

Certified Calibration mixtures and Certified Reference Materials

Over the last few years there has been progressive growth in the demand for Certified Reference Materials and traceable metrological calibration mixtures. There is also an increasing need to have clear and documented traceability to the samples of SI Units of Measurement maintained by National and International Metrological Institutes.

THE SIAD RESEARCH LABORATORY HAS OBTAINED THE ACCREDITATION AS LAT CALIBRATION CENTER NO. 143 IN 2001, IT ALSO IS ACCREDITED IN QUALITY OF PRODUCER OF REFERENCE MATERIALS RMP NO. 143.

LAT Calibration Center No. 143 and Reference Material Producer RMP No. 143

The LAT Center and the RMP Producer stem from the SIAD Research Laboratory and from its decades of experience and expertise in the preparation and analysis of traceable metrological mixtures.

The accredited mixtures are in fact the result of the evolution and improvement of the SIAD procedures used for preparing the calibration mixtures.

TYPES OF ACCREDITATION

ACCREDIA L'ENTE ITALIANO DI ACCREDITAMENTO

LAT N° 143

ACCREDIA L'ENTE ITALIANO DI ACCREDITAMENTO

RMP N° 143

The LAT Center is accredited according to the **ISO/IEC 17025** standard for gravimetric and analytical calibration of gas mixtures and for the calibration of equipment for analytical measurement.

The RMP Producer is accredited according to the standard **ISO 17034** for the production of Certified Reference Materials.

Accredited metrological mixtures traceable to the International System of Units of Measurement

The calibrations performed by the LAT Center and the Certified Reference Materials of the RMP Producer refer to the national and international units of measurement samples of the International System of Units of Measurement (SI). To perform the correct measurements it is important that the units of measurement used are uniquely defined and shared internationally.
The International System (SI) of the Units of Measurement responds to this need, establishing the units of measurement "defined basic" and from which all the other measurements in use derive.

Accredited Calibrations and Certified Gaseous Reference Materials (CRM)

The attribute that distinguishes the calibrations of LAT Center no. 143 and the mixtures of the RMP Producer No. 143 is the traceability of the certified measurements, which enhances the value of the final product, enables the compliance to the international standard measurement systems, has a competitive advantage while dealing in global markets because the certificates issued by the LAT Center and the RMP Producer are recognized and accepted internationally.

TRACEABILITY

Property of a measurement result whereby the result can be related to a reference through a documented unbroken chain of calibrations, each contributing to the measurement uncertainty.

The attribute that distinguishes the calibrations of the LAT Center no. 143 and the mixtures produced by the RMP producer no. 143 is the traceability of the certified measurements.

Thanks to these accreditations, SIAD can produce:

- ✓ gas mixtures calibrated gravimetrically according to the standard ISO 6142-1 or according to an accredited method internally developed, these are the Accredia traceable mixture G-CGM and W-CGM, both analytically verified;
- ✓ gas mixtures calibrated analytically by comparison with other traceable mixtures of the Center in accordance with standard ISO 6143; these are the traceable mixtures A-CGM;
- ✓ certified reference materials (C-CRM and W-CRM) produced gravimetrically according to ISO 6142-1 with guarantee stated on the certificate.

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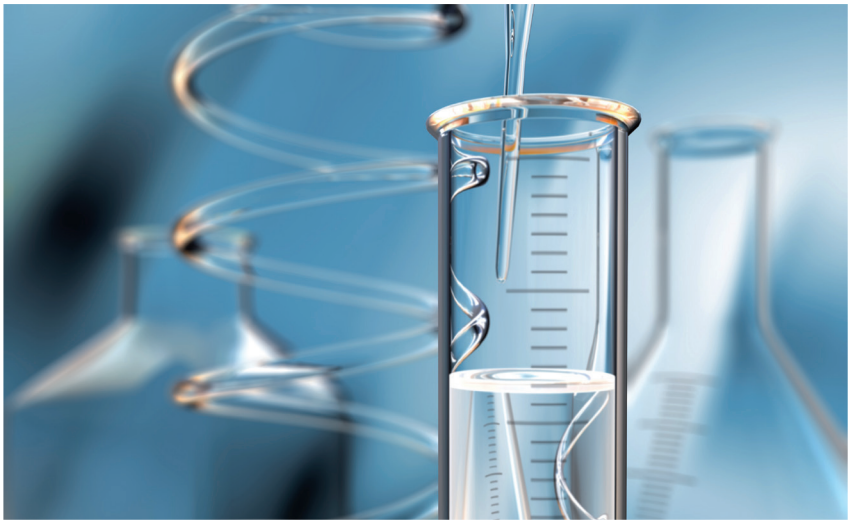
The LAT Center and and the RMP Producer can produce traceable mixtures that can be used in the environmental field:

- for monitoring gas emissions into the atmosphere;
- for air quality and workplace monitoring;
- for monitoring of the industrial emissions;
- for controlling the emissions of vehicles and engines.

Furthermore, the Center and the Producer can produce traceable metrological mixtures and certified reference materials:

- with a methane matrix, reproducing the composition of natural gas, containing sulphur compounds and odorants for natural gas;
- for controlling refinery gases;
- for calibrating breathalyzers;
- for controlling the concentrations of moisture in gases.



STABILITY

The RMP Producer can warrant and declare the stability of these mixtures on the certificate.
This warranty is based on the studies carried out since birth of the laboratory and systematically since 2004.
Traceable mixtures are used to calibrate instruments involved in the validation of gravimetric results.

Accreditation tables of RMP Producer No. 143

AM - CA
ENVIRONMENTAL MONITORING

C-CRM

ACCREDIA
RMP N° 143

The RMP Producer No. 143 can produce Certified Reference Gas Materials (CRM) as it is accredited according to ISO 17034. For this type of mixtures the Producer warrants and certifies a range of time (stability) in which the homogeneity of the mixture and the values of concentration are stable.

THE CRMs ARE PRODUCED GRAVIMETRICALLY ACCORDING TO THE STANDARD ISO 6142-PART 1

Metrological traceability derives from the masses calibrated by a Primary Metrology Institute or by an Accredited Center used for gravimetric preparation of the mixtures.
The calculation of the concentration and the uncertainty of the calibration takes into account:

- the choice and quality of the raw materials and the original mixtures;
- the masses used for calibrating the scale and its performance;
- the calibration ambient conditions;
- the preparation procedure with all the uncertainties relating to the weighing process.

All the individually prepared mixtures are analytically verified.
The analysis follows the guidelines of ISO 6143, which provides a three-point calibration, or the guidelines of ISO 12963, which provides two-point or single-point calibration.
The samples used for instrumental calibration are traceable mixtures within the Center and of the Producer or certified by a Primary Metrology Institute.
The CRMs are characterized by the better preparation tolerance, defined as the difference between the requested value and the certified value, and by very small relative extended uncertainties.

The RMP is accredited for the quantity “amount of substance”

Permanent Laboratory

MEASURAND Production of Gaseous Reference Materials C-CRM (Gravimetric method)		CALIBRATION CAPABILITY Amount fraction range mol/mol		RELATIVE EXPANDED UNCERTAINTY (*)
Analyte	Matrix	From	To	C-CRM
ENVIRONMENTAL MONITORING				
Ammonia (NH_3)	Nitrogen - Air	$5 \cdot 10^{-6}$	$500 \cdot 10^{-6}$	3%
Benzene (C_6H_6)	Nitrogen	$5 \cdot 10^{-9}$	$200 \cdot 10^{-9}$	2%
Butanol ($C_4H_{10}O$)	Nitrogen	$20 \cdot 10^{-6}$	$0{,}1 \cdot 10^{-2}$	2%
Carbon dioxide (CO_2)	Nitrogen	$10 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	0,8%
		$100 \cdot 10^{-6}$	$1 \cdot 10^{-2}$	0,4%
		$1 \cdot 10^{-2}$	$50 \cdot 10^{-2}$	0,3%
		$50 \cdot 10^{-2}$	$99{,}8 \cdot 10^{-2}$	0,2%
	Methane	$500 \cdot 10^{-6}$	$1 \cdot 10^{-2}$	1%
		$1 \cdot 10^{-2}$	$60 \cdot 10^{-2}$	0,5%
	Air	$100 \cdot 10^{-6}$	$1 \cdot 10^{-2}$	0,4%
		$1 \cdot 10^{-2}$	$50 \cdot 10^{-2}$	0,3%
	Helium	$40 \cdot 10^{-6}$	$100 \cdot 10^{-2}$	0,5%
		$100 \cdot 10^{-6}$	$1 \cdot 10^{-2}$	0,4%
		$1 \cdot 10^{-2}$	$50 \cdot 10^{-2}$	0,3%

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C-CRM

CA - XY

ENVIRONMENTAL MONITORING

MEASURAND Production of Gaseous Reference Materials C-CRM (Gravimetric method)		CALIBRATION CAPABILITY Amount fraction range mol/mol		RELATIVE EXPANDED UNCERTAINTY (*)
Analyte	Matrix	From	To	C-CRM
ENVIRONMENTAL MONITORING				
Carbon dioxide (CO_2)	Oxygen	$12 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	0,5%
		$100 \cdot 10^{-6}$	$1 \cdot 10^{-2}$	0,4%
		$1 \cdot 10^{-2}$	$50 \cdot 10^{-2}$	0,3%
Carbon monoxide (CO)	Nitrogen	$1 \cdot 10^{-6}$	$10 \cdot 10^{-6}$	1%
		$10 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	0,8%
		$100 \cdot 10^{-6}$	$0,1 \cdot 10^{-2}$	0,7%
		$0,1 \cdot 10^{-2}$	$10 \cdot 10^{-2}$	0,6%
	Air	$1 \cdot 10^{-6}$	$10 \cdot 10^{-6}$	1%
		$10 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	0,8%
		$100 \cdot 10^{-6}$	$0,1 \cdot 10^{-2}$	0,7%
		$0,1 \cdot 10^{-2}$	$5,45 \cdot 10^{-2}$	0,6%
	Oxygen	$0,5 \cdot 10^{-6}$	$10 \cdot 10^{-6}$	2%
Ethylbenzene (C_8H_{10})	Nitrogen	$5 \cdot 10^{-9}$	$200 \cdot 10^{-9}$	4,5%
Nitric oxide (NO)	Nitrogen	$0,12 \cdot 10^{-6}$	$0,4 \cdot 10^{-6}$	3%
		$0,4 \cdot 10^{-6}$	$1 \cdot 10^{-6}$	1,2%
		$1 \cdot 10^{-6}$	$10 \cdot 10^{-6}$	1%
		$10 \cdot 10^{-6}$	$0,1 \cdot 10^{-2}$	0,7%
		$0,1 \cdot 10^{-2}$	$0,25 \cdot 10^{-2}$	0,5%
Nitrogen dioxide (NO_2)	Nitrogen - Air	$5 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	3%
Nitrous oxide (N_2O)	Nitrogen - Air	$1 \cdot 10^{-6}$	$30 \cdot 10^{-6}$	1,5%
		$30 \cdot 10^{-6}$	$0,1 \cdot 10^{-2}$	1%
Oxygen (O_2)	Nitrogen	$10 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	2%
		$100 \cdot 10^{-6}$	$0,1 \cdot 10^{-2}$	1%
		$0,1 \cdot 10^{-2}$	$1 \cdot 10^{-2}$	0,66%
		$1 \cdot 10^{-2}$	$25 \cdot 10^{-2}$	0,42%
		$25 \cdot 10^{-2}$	$99,8 \cdot 10^{-2}$	0,2%
	Methane	$200 \cdot 10^{-6}$	$2 \cdot 10^{-2}$	2%
	Helium	$100 \cdot 10^{-6}$	$0,1 \cdot 10^{-2}$	1%
		$0,1 \cdot 10^{-2}$	$3 \cdot 10^{-2}$	0,66%
		$3 \cdot 10^{-2}$	$25 \cdot 10^{-2}$	0,42%
	Argon	$3 \cdot 10^{-2}$	$80 \cdot 10^{-2}$	0,42%
Sulphur dioxide (SO_2)	Nitrogen - Air	$0,1 \cdot 10^{-6}$	$0,25 \cdot 10^{-6}$	4%
		$0,25 \cdot 10^{-6}$	$1 \cdot 10^{-6}$	3%
		$1 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	1,5%
		$100 \cdot 10^{-6}$	$0,3 \cdot 10^{-2}$	0,66%
Toluene (C_7H_8)	Nitrogen	$5 \cdot 10^{-9}$	$200 \cdot 10^{-9}$	3%
Water (H_2O)	Nitrogen	$10 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	6,5%
o-Xylene (o-C_8H_{10})	Nitrogen	$5 \cdot 10^{-9}$	$200 \cdot 10^{-9}$	4,5%
m-Xylene (m-C_8H_{10})	Nitrogen	$5 \cdot 10^{-9}$	$200 \cdot 10^{-9}$	4,5%
p-Xylene (p-C_8H_{10})	Nitrogen	$5 \cdot 10^{-9}$	$200 \cdot 10^{-9}$	4,5%

MEASURAND Production of Gaseous Reference Materials C-CRM (Gravimetric method)		CALIBRATION CAPABILITY Amount fraction range mol/mol		RELATIVE EXPANDED UNCERTAINTY (*)
Analyte	Matrix	From	To	C-CRM
HYDROCARBONS / NATURAL GAS				
Acetylene (C_2H_2)	Nitrogen	$1 \cdot 10^{-6}$ $100 \cdot 10^{-6}$	$100 \cdot 10^{-6}$ $0{,}4 \cdot 10^{-2}$	2% 1%
Argon (Ar)	Methane	$200 \cdot 10^{-6}$	$5 \cdot 10^{-2}$	5%
Butadiene 1.3 (C_4H_6)	Nitrogen	$1 \cdot 10^{-6}$	$0{,}1 \cdot 10^{-2}$	2%
	Methane	$0{,}5 \cdot 10^{-2}$	$3 \cdot 10^{-2}$	2%
Butane (C_4H_{10})	Nitrogen	$1 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $5 \cdot 10^{-2}$	2% 1% 0,8%
	Methane	$100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$0{,}1 \cdot 10^{-2}$ $4 \cdot 10^{-2}$	1% 0,8%
Butene - 1 (C_4H_8)	Nitrogen	$1 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $5 \cdot 10^{-2}$	2% 1% 0,8%
	Methane	$0{,}1 \cdot 10^{-2}$	$1 \cdot 10^{-2}$	0,8%
Carbon dioxide (CO_2)	Nitrogen	$10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $1 \cdot 10^{-2}$ $50 \cdot 10^{-2}$	$100 \cdot 10^{-6}$ $1 \cdot 10^{-2}$ $50 \cdot 10^{-2}$ $99{,}8 \cdot 10^{-2}$	0,5% 0,4% 0,3% 0,2%
	Methane	$500 \cdot 10^{-6}$ $1 \cdot 10^{-2}$	$1 \cdot 10^{-2}$ $60 \cdot 10^{-2}$	1% 0,5%
	Air	$100 \cdot 10^{-6}$ $1 \cdot 10^{-2}$	$1 \cdot 10^{-2}$ $50 \cdot 10^{-2}$	0,4% 0,3%
	Helium	$40 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $1 \cdot 10^{-2}$	$100 \cdot 10^{-2}$ $1 \cdot 10^{-2}$ $50 \cdot 10^{-2}$	0,5% 0,4% 0,3%
	Oxygen	$12 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $1 \cdot 10^{-2}$	$100 \cdot 10^{-6}$ $1 \cdot 10^{-2}$ $50 \cdot 10^{-2}$	0,5% 0,4% 0,3%
Carbon monoxide (CO)	Methane	$0{,}025 \cdot 10^{-2}$	$25 \cdot 10^{-2}$	0,6%
Ethane (C_2H_6)	Nitrogen	$1 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $5 \cdot 10^{-2}$	$100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $5 \cdot 10^{-2}$ $35 \cdot 10^{-2}$	1,2% 1% 0,8% 0,5%
	Methane	$500 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $10 \cdot 10^{-2}$	$0{,}1 \cdot 10^{-2}$ $10 \cdot 10^{-2}$ $35 \cdot 10^{-2}$	1% 0,8% 0,5%
Ethylene (C_2H_4)	Nitrogen	$1 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $5 \cdot 10^{-2}$	1,2% 1% 0,8%
	Methane	$1 \cdot 10^{-2}$ $10 \cdot 10^{-2}$	$10 \cdot 10^{-2}$ $16 \cdot 10^{-2}$	1% 0,8%
Helium (He)	Nitrogen	$1 \cdot 10^{-2}$	$20 \cdot 10^{-2}$	1%
	Methane	$100 \cdot 10^{-6}$	$50 \cdot 10^{-2}$	3%
Heptane (C_7H_{16})	Methane	$50 \cdot 10^{-6}$	$0{,}2 \cdot 10^{-2}$	1%
Hexane (C_6H_{14})	Nitrogen	$1 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $0{,}4 \cdot 10^{-2}$	2% 1% 0,8%

Follow on page 12

C-CRM

HE - OX

HYDROCARBONS / NATURAL GAS

MEASURAND Production of Gaseous Reference Materials C-CRM (Gravimetric method)		CALIBRATION CAPABILITY Amount fraction range mol/mol		RELATIVE EXPANDED UNCERTAINTY (*)
Analyte	Matrix	From	To	C-CRM
HYDROCARBONS / NATURAL GAS				
Hexane (C_6H_{14})	Methane	$50 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$0{,}1 \cdot 10^{-2}$ $1 \cdot 10^{-2}$	1% 0,8%
Hydrogen (H_2)	Nitrogen	$0{,}07 \cdot 10^{-2}$ $6 \cdot 10^{-2}$	$6 \cdot 10^{-2}$ $90 \cdot 10^{-2}$	1,1% 0,5%
	Methane	$100 \cdot 10^{-6}$ $2 \cdot 10^{-2}$ $20 \cdot 10^{-2}$	$2 \cdot 10^{-2}$ $20 \cdot 10^{-2}$ $90 \cdot 10^{-2}$	2% 1% 0,5%
	Helium	$2 \cdot 10^{-2}$	$6 \cdot 10^{-2}$	1,1%
	Argon	$2 \cdot 10^{-2}$	$6 \cdot 10^{-2}$	1,1%
Isobutane (C_4H_{10})	Nitrogen	$1 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $5 \cdot 10^{-2}$	2% 1% 0,8%
	Methane	$100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$0{,}1 \cdot 10^{-2}$ $4 \cdot 10^{-2}$	1% 0,8%
Isobutene (C_4H_8)	Nitrogen	$1 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $5 \cdot 10^{-2}$	2% 1% 0,8%
	Methane	$0{,}1 \cdot 10^{-2}$	$1 \cdot 10^{-2}$	0,8%
Isopentane (C_5H_{12})	Methane	$50 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$0{,}1 \cdot 10^{-2}$ $3{,}5 \cdot 10^{-2}$	1% 0,8%
Methane (CH_4)	Nitrogen	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$10 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $98 \cdot 10^{-2}$	0,5% 0,4% 0,3%
	Methane	$1 \cdot 10^{-2}$ $50 \cdot 10^{-2}$	$50 \cdot 10^{-2}$ $99{,}8 \cdot 10^{-2}$	0,4% 0,2%
	Air	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$10 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $2{,}2 \cdot 10^{-2}$	0,5% 0,4% 0,3%
Neopentane (C_5H_{12})	Methane	$50 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$0{,}1 \cdot 10^{-2}$ $3{,}5 \cdot 10^{-2}$	1% 0,8%
Nitrogen (N_2)	Nitrogen	$1 \cdot 10^{-2}$	$99 \cdot 10^{-2}$	0,2%
	Methane	$500 \cdot 10^{-6}$ $10 \cdot 10^{-2}$	$10 \cdot 10^{-2}$ $95 \cdot 10^{-2}$	3% 0,5%
Nonane (C_9H_{20})	Methane	$50 \cdot 10^{-6}$	$0{,}02 \cdot 10^{-2}$	1%
Octane (C_8H_{18})	Methane	$50 \cdot 10^{-6}$	$0{,}05 \cdot 10^{-2}$	1%
Oxygen (O_2)	Nitrogen	$10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $1 \cdot 10^{-2}$ $25 \cdot 10^{-2}$	$100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $1 \cdot 10^{-2}$ $25 \cdot 10^{-2}$ $99{,}8 \cdot 10^{-2}$	2% 1% 0,66% 0,42% 0,2%
	Methane	$200 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$0{,}1 \cdot 10^{-2}$ $2 \cdot 10^{-2}$	5% 2%
	Helium	$100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $3 \cdot 10^{-2}$	$0{,}1 \cdot 10^{-2}$ $3 \cdot 10^{-2}$ $25 \cdot 10^{-2}$	1% 0,66% 0,42%
	Argon	$3 \cdot 10^{-2}$	$80 \cdot 10^{-2}$	0,42%

MEASURAND Production of Gaseous Reference Materials C-CRM (Gravimetric method)		CALIBRATION CAPABILITY Amount fraction range mol/mol		RELATIVE EXPANDED UNCERTAINTY (*)
Analyte	Matrix	From	To	C-CRM
HYDROCARBONS / NATURAL GAS				
Pentane (C_5H_{12})	Methane	$50 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$0{,}1 \cdot 10^{-2}$ $2 \cdot 10^{-2}$	1% 0,8%
Propane (C_3H_8)	Nitrogen	$0{,}1 \cdot 10^{-6}$ $1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $18 \cdot 10^{-2}$	2% 1% 0,8% 0,4% 0,3%
	Methane	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $18 \cdot 10^{-2}$	1,5% 1,2% 0,8% 0,7%
	Air	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $0{,}85 \cdot 10^{-2}$	1% 0,8% 0,4% 0,3%
Propylene (C_3H_6)	Nitrogen - Methane	$0{,}05 \cdot 10^{-2}$	$7 \cdot 10^{-2}$	0,8%

C-CRM

CA - TE

SULPHURATED GASES

MEASURAND Production of Gaseous Reference Materials C-CRM (Gravimetric method)		CALIBRATION CAPABILITY Amount fraction range mol/mol		RELATIVE EXPANDED UNCERTAINTY (*)
Analyte	Matrix	From	To	C-CRM
SULPHURATED GASES				
Carbonyl sulphide (COS)	Nitrogen - Methane	$1 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	5%
Dimethyl sulphide (C_2H_6S)	Nitrogen - Methane	$0{,}5 \cdot 10^{-6}$ $10 \cdot 10^{-6}$	$10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$	10% 5%
Hydrogen sulphide (H_2S)	Nitrogen - Methane	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$	$10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $250 \cdot 10^{-6}$	5% 3% 2%
Isopropyl mercaptan (C_3H_8S)	Nitrogen - Methane	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$	$10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$	10% 5%
Methyl ethyl sulphide (C_3H_8S)	Nitrogen - Methane	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$	$10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$	10% 5%
Methyl mercaptan (CH_4S)	Nitrogen - Methane	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$	$10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$	10% 5%
Methyl sulphide (C_2H_6S)	Nitrogen - Methane	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$	$10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$	10% 5%
N-Propyl mercaptan (C_3H_8S)	Nitrogen - Methane	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$	$10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$	10% 5%
Tert-butyl mercaptan ($C_4H_{10}S$)	Nitrogen - Methane	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$	$10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$	10% 5%
Tetrahydrothiophene (C_4H_8S)	Nitrogen - Methane	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$	$10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$	5% 3%

MEASURAND Production of Gaseous Reference Materials C-CRM (Gravimetric method)		CALIBRATION CAPABILITY Amount fraction range mol/mol		RELATIVE EXPANDED UNCERTAINTY (*)
Analyte	Matrix	From	To	C-CRM
FUEL GAS				
Carbon dioxide (CO_2)	Nitrogen	$10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $1 \cdot 10^{-2}$ $50 \cdot 10^{-2}$	$100 \cdot 10^{-6}$ $1 \cdot 10^{-2}$ $50 \cdot 10^{-2}$ $99{,}8 \cdot 10^{-2}$	0,5% 0,4% 0,3% 0,2%
	Methane	$500 \cdot 10^{-6}$ $1 \cdot 10^{-2}$	$1 \cdot 10^{-2}$ $60 \cdot 10^{-2}$	0,4% 0,3%
	Air	$100 \cdot 10^{-6}$ $1 \cdot 10^{-2}$	$1 \cdot 10^{-2}$ $50 \cdot 10^{-2}$	0,4% 0,3%
	Helium	$40 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $1 \cdot 10^{-2}$	$100 \cdot 10^{-2}$ $1 \cdot 10^{-2}$ $50 \cdot 10^{-2}$	0,5% 0,4% 0,3%
	Oxygen	$12 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $1 \cdot 10^{-2}$	$100 \cdot 10^{-6}$ $1 \cdot 10^{-2}$ $50 \cdot 10^{-2}$	0,5% 0,4% 0,3%
Carbon monoxide (CO)	Nitrogen	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $10 \cdot 10^{-2}$	1% 0,8% 0,7% 0,6%
	Air	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $5{,}45 \cdot 10^{-2}$	1% 0,8% 0,7% 0,6%
	Oxygen	$0{,}5 \cdot 10^{-6}$	$10 \cdot 10^{-6}$	2%
Hydrogen (H_2)	Nitrogen	$0{,}07 \cdot 10^{-2}$ $6 \cdot 10^{-2}$	$6 \cdot 10^{-2}$ $90 \cdot 10^{-2}$	1,1% 0,5%
	Methane	$100 \cdot 10^{-6}$ $2 \cdot 10^{-2}$ $20 \cdot 10^{-2}$	$2 \cdot 10^{-2}$ $20 \cdot 10^{-2}$ $90 \cdot 10^{-2}$	2% 1% 0,5%
	Helium - Argon	$2 \cdot 10^{-2}$	$6 \cdot 10^{-2}$	1,1%
Methane (CH_4)	Nitrogen	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$10 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $98 \cdot 10^{-2}$	0,5% 0,4% 0,3%
	Methane	$1 \cdot 10^{-2}$ $50 \cdot 10^{-2}$	$50 \cdot 10^{-2}$ $99{,}8 \cdot 10^{-2}$	0,2% 0,1%
	Air	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$10 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $2{,}2 \cdot 10^{-2}$	0,5% 0,4% 0,3%
Nitrogen (N_2)	Nitrogen	$1 \cdot 10^{-2}$	$99 \cdot 10^{-2}$	0,2%
	Methane	$500 \cdot 10^{-6}$ $10 \cdot 10^{-2}$	$10 \cdot 10^{-2}$ $95 \cdot 10^{-2}$	3% 0,5%

C-CRM

ET

FORENSIC

MEASURAND Production of Gaseous Reference Materials C-CRM (Gravimetric method)		CALIBRATION CAPABILITY Amount fraction range mol/mol		RELATIVE EXPANDED UNCERTAINTY (*)
Analyte	Matrix	From	To	C-CRM
FORENSIC				
Ethanol (C_2H_6O)	Nitrogen - Air	$100 \cdot 10^{-6}$	$0{,}1 \cdot 10^{-2}$	2%

(*) The relative expanded uncertainties reported in the table are the minimum values that can be stated on the certificate. The expanded uncertainty of the measurement is expressed as standard uncertainty multiplied by a coverage factor k=2 which, for a t-distribution characterized by calculated effective degrees of freedom, provides a level of confidence of approximatively 95%.

For some types of mixtures, where requested by the customer, the calculation of the parameters of the calorific value of the mixture is reported, calculated in accordance with the prescriptions of the ISO 6976 standard. (Upper heating value, Lower heating value, density, relative density, Wobbe index and compressibility factor).

The schedules, divided by application and aimed to help the end-user to find out the proper mixture, are purely illustrative examples. The gases listed above may be used in all the following combinations within the accredited concentration ranges.

	NO	CO	O_2	CO_2	H_2	N_2O	NO_2	BTEX	Hydrocarbons	SO_2	H_2O	Sulphurated gases	He, N_2	Ethanol	NH_3
NO	-	Yes[1]	No	Yes	No[5]	No[5]	No[5]	No[5]	No[5]	Yes	No[5]	No[5]	Yes	No	No
CO		-	Yes[1]	Yes	Yes	Yes[1]	Yes[1]	Yes	Yes	Yes	Yes[2]	Yes	Yes	Yes	Yes
O_2			-	Yes	Yes[1]	Yes	Yes	Yes[1]	Yes[1]	Yes	Yes[2]	Yes[1]	Yes	Yes	Yes[1]
CO_2				-	Yes	Yes	No	Yes	Yes	Yes	Yes[2]	Yes	Yes	Yes	Yes
H_2					-	No	No	Yes	Yes	Yes	Yes[2]	Yes	Yes	Yes	No
N_2O						-	No[5]	Yes[1]	Yes[1]	Yes	Yes[2]	No[5]	Yes	No	No
NO_2							-	No[5]	No[5]	No[5]	No	No[5]	Yes	No	No
BTEX								-	Yes	Yes	Yes[2]	Yes	Yes	No	No
Hydrocarbons									-	Yes	Yes[2]	Yes	Yes	Yes	Yes
SO_2										-	No	Yes[4]	Yes	No	Yes
H_2O											-	No	Yes	No	No
Sulphurated gases												-	Yes	No	No
He, N_2													-	Yes	Yes
Ethanol														-	No
NH_3															-

[1] Feasible up to safety limit levels concerning oxidant and flammable gases.
[2] Only for concentrations of water lower than 100 ppm.
[3] Applicable to saturated hydrocarbons.
[4] Hydrogen sulphide excluded.
[5] Analysis can't be performed.

Accreditation tables of RMP Producer No. 143

AM - NI

W-CRM

ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO
LAT N° 143

The W-CRM working mixtures are produced individually by gravimetric method, following an accredited internal method that allows you to obtain a metrologically traceable product, but with higher uncertainty than CRMs. For this type of mixture, the Manufacturer certifies a time interval within which the homogeneity of the mixture and the stability of the certified values is guaranteed. W-CRM guarantee traceability in all those cases where the uncertainty of the measurement is not a binding factor.

THE CERTIFIED VALUE IS TRACEABLE, VIA AN UNBROKEN CHAIN OF COMPARISONS, TO THE NATIONAL MASS SAMPLES CERTIFIED BY PRIMARY METROLOGY INSTITUTES OR ACCREDITED CALIBRATION CENTERS

Following preparation, the gravimetric concentration of the mixture is analyzed with the aim of confirming the result. Certification uncertainty is calculated on the basis of the mixture production process; this uncertainty may vary, depending on the requested concentration, in percentages ranging between 1 and 10%.

W-CGM are also available as a multi-component gas mixture in line with the compatibility constraints due to the chemical-physical characteristics of the gases.

MEASURAND Production of Gaseous Reference Materials W-CRM		CALIBRATION CAPABILITY Amount fraction range mol/mol		RELATIVE EXPANDED UNCERTAINTY (*)
Analyte	Matrix	From	To	W-CRM
Ammonia (NH_3)	Nitrogen - Air	$5 \cdot 10^{-6}$	$500 \cdot 10^{-6}$	10%
Benzene (C_6H_6)	Nitrogen - Air	$5 \cdot 10^{-9}$	$200 \cdot 10^{-9}$	6%
Carbon dioxide (CO_2)	Nitrogen - Air - Helium	$100 \cdot 10^{-6}$ $1 \cdot 10^{-2}$	$1 \cdot 10^{-2}$ $99{,}5 \cdot 10^{-2}$	2% 1%
	Oxygen	$12 \cdot 10^{-2}$	$99{,}5 \cdot 10^{-2}$	1%
Carbon monoxide (CO)	Nitrogen	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$ $1 \cdot 10^{-2}$	$10 \cdot 10^{-6}$ $1 \cdot 10^{-2}$ $90 \cdot 10^{-2}$	6% 2% 1%
	Air - Helium	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$ $1 \cdot 10^{-2}$	$10 \cdot 10^{-6}$ $1 \cdot 10^{-2}$ $8 \cdot 10^{-2}$	6% 2% 1%
Ethylbenzene (C_8H_{10})	Nitrogen - Air	$5 \cdot 10^{-9}$	$200 \cdot 10^{-9}$	6%
Hydrogen (H_2)	Nitrogen - Helium	$0{,}07 \cdot 10^{-2}$	$90 \cdot 10^{-2}$	2%
	Argon	$2 \cdot 10^{-2}$	$90 \cdot 10^{-2}$	2%
Methane (CH_4)	Nitrogen	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$ $1 \cdot 10^{-2}$	$10 \cdot 10^{-6}$ $1 \cdot 10^{-2}$ $90 \cdot 10^{-2}$	3,5% 2% 1%
	Air	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$ $1 \cdot 10^{-2}$	$10 \cdot 10^{-6}$ $1 \cdot 10^{-2}$ $2{,}2 \cdot 10^{-2}$	3,5% 2% 1%
	Helium - Argon	$1 \cdot 10^{-2}$	$90 \cdot 10^{-2}$	1%
Nitrogen dioxide (NO_2)	Nitrogen - Air	$5 \cdot 10^{-6}$	$1 \cdot 10^{-2}$	6%
Nitrogen oxide (NO)	Nitrogen	$0{,}12 \cdot 10^{-6}$ $0{,}4 \cdot 10^{-6}$ $5 \cdot 10^{-6}$ $20 \cdot 10^{-6}$	$0{,}4 \cdot 10^{-6}$ $5 \cdot 10^{-6}$ $20 \cdot 10^{-6}$ $2500 \cdot 10^{-6}$	8% 6% 3,5% 2%
Nitrous oxide (N_2O)	Nitrogen - Air	$1 \cdot 10^{-6}$ $10 \cdot 10^{-2}$	$10 \cdot 10^{-2}$ $90 \cdot 10^{-2}$	2% 1%

W-CRM

OS - XY

MEASURAND Production of Gaseous Reference Materials W-CRM		CALIBRATION CAPABILITY Amount fraction range mol/mol		RELATIVE EXPANDED UNCERTAINTY (*)
Analyte	Matrix	From	To	W-CRM
Oxygen (O_2)	Nitrogen - Helium	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$ $1 \cdot 10^{-2}$	$10 \cdot 10^{-6}$ $1 \cdot 10^{-2}$ $90 \cdot 10^{-2}$	3,5% 2% 1%
	Argon	$3 \cdot 10^{-2}$	$90 \cdot 10^{-2}$	1%
Propane (C_3H_8)	Nitrogen - Methane	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$ $1,1 \cdot 10^{-2}$	$10 \cdot 10^{-6}$ $1,1 \cdot 10^{-2}$ $90 \cdot 10^{-2}$	3,5% 2% 1%
	Air	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$	$10 \cdot 10^{-6}$ $1,1 \cdot 10^{-2}$	3,5% 2%
Sulphur dioxide (SO_2)	Nitrogen - Air	$1 \cdot 10^{-6}$ $2500 \cdot 10^{-6}$	$2500 \cdot 10^{-6}$ $10 \cdot 10^{-2}$	3% 2%
Toluene (C_7H_8)	Nitrogen - Air	$5 \cdot 10^{-9}$	$200 \cdot 10^{-9}$	6%
o-Xylene (o-C_8H_{10})	Nitrogen - Air	$5 \cdot 10^{-9}$	$200 \cdot 10^{-9}$	8%
m-Xylene (m-C_8H_{10})	Nitrogen - Air	$5 \cdot 10^{-9}$	$200 \cdot 10^{-9}$	8%
p-Xylene (p-C_8H_{10})	Nitrogen - Air	$5 \cdot 10^{-9}$	$200 \cdot 10^{-9}$	8%

(*) The expanded measurement uncertainty is expressed as the model uncertainty multiplied by the coverage factor k=2, which for a normal probability distribution corresponds to a confidence level of about 95%.
For gases whose concentration appears in two successive measuring ranges, the relative expanded uncertainty is adopted.

The gases listed above may form mixtures, in which they are individually in the above concentration, in the following combinations.

	NO	C_3H_8	CO	O_2	CO_2	H_2	N_2O	NO_2	BTEX	CH_4	SO_2	NH_3
NO	-	No	Yes[1]	No	Yes	No	No	No	No	No	No	No
C_3H_8		-	Yes	Yes[1]	Yes	Yes	Yes[1]	No	No	Yes	No	Yes
CO			-	Yes[1]	Yes	Yes	Yes[1]	No	Yes	Yes	Yes	Yes
O_2				-	Yes	Yes[1]	Yes	Yes	Yes[1]	Yes[1]	Yes	Yes[1]
CO_2					-	Yes	No	No	Yes	Yes	Yes	Yes
H_2						-	Yes[1]	Yes[1]	Yes	Yes	Yes	No
N_2O							-	No	Yes[1]	Yes[1]	Yes	No
NO_2								-	Yes[1]	Yes[1]	No	No
BTEX									-	Yes	Yes	No
CH_4										-	Yes	Yes
SO_2											-	Yes
NH_3												-

[1] *Compatible up to the safety limit inherent of oxidizing and flammable gases.*

Accreditation tables of LAT Centre No. 143

G-CGM

ACCREDIA L'ENTE ITALIANO DI ACCREDITAMENTO
LAT N° 143

G-CGMs are gas mixtures calibrated gravimetrically according to the standard ISO 6142. Metrological traceability derives from the masses calibrated by a Primary Metrology Institute or by an Accredited Center used for preparing the mixtures.

METROLOGICAL TRACEABILITY DERIVES FROM THE MASSES CALIBRATED AND USED FOR PREPARING THE MIXTURES

The calculation of the concentration and the uncertainty of the calibration takes into account: the choice and quality of the raw materials and the original mixtures, the masses used for calibrating the balance and its performance, the calibration ambient conditions, and the preparation procedure with all the uncertainties relating to the weighing process.
All the individually prepared mixtures are analytically verified. The analysis follows the guidelines of ISO 6143, which provides a three-point calibration, or the guidelines of ISO 12963, which provides two-point or single-point calibration.
The samples used for instrumental calibration are traceable mixtures or certified by a Primary Metrological Institute.
The G-CGM mixture is then traceable to the mass that is validated by analysis with respect to traceable mixtures.
The validation process is a distinguishing feature of the Center's mixtures to further support the high quality of these mixtures.
G-CGM mixtures, on a par with CRMs, are characterized by the best possible preparation tolerance with current technology, and by very small relative extended uncertainties.
G-CGMs are also available as a multi-component gas mixture in line with the compatibility constraints due to the chemical-physical characteristics of the gases.

A-CGM

ACCREDIA L'ENTE ITALIANO DI ACCREDITAMENTO
LAT N° 143

Analytically calibrated traceable gas mixtures are defined A-CGM: the certified uncertainty and concentration are determined by comparison with the Center's traceable standard (G-CGM o CRM) or with the ones certified/produced by a Primary Metrology Institute.

THE METROLOGICAL TRACEABILITY DERIVES FROM THE MIXTURES USED IN THE CALIBRATION PHASE

The reference standard for analytical calibration is ISO 6143. Instrumental calibration is performed for each mixture using the method of generalized least squares (GLS): 3 traceable gas mixtures are used (G-CGM, CRM or Primary Metrology Institutes mixtures).

The sample to calibrate may be supplied by the customer or produced by SIAD: the Center provides only the analytical calibration for the mixtures of the customer.
If the mixture is produced by SIAD, the Special Gas mixtures stability guarantees apply.

In the hierarchy of the traceability of the Center's products, A-CGM mixtures are metrologically inferior to the gravimetrically calibrated G-CGM mixtures: the calibration is made by comparison and not with a primary method; therefore also the certified minimum uncertainty is higher.

G-CGM / A-CGM

AM - NI

ENVIRONMENTAL MONITORING

LAT Center n. 143 is accredited for the quantity “Amount of substance”

Permanent Laboratory

MEASURAND Calibration of gas mixtures by gravimetric method G-CGM and by analytical method A-CGM		CALIBRATION CAPABILITY Amount fraction range mol/mol		RELATIVE EXPANDED UNCERTAINTY (*)	
Analyte	Matrix	From	To	G-CGM	A-CGM
ENVIRONMENTAL MONITORING					
Ammonia (NH_3)	Nitrogen - Air	$5{\cdot}10^{-6}$	$500{\cdot}10^{-6}$	3%	7%
Benzene (C_6H_6)	Nitrogen	$5{\cdot}10^{-9}$	$200{\cdot}10^{-9}$	2%	3%
Butanol ($C_4H_{10}O$)	Nitrogen	$20{\cdot}10^{-6}$	$0{,}1{\cdot}10^{-2}$	2%	3%
Carbon dioxide (CO_2)	Nitrogen	$10{\cdot}10^{-6}$ $100{\cdot}10^{-6}$ $1{\cdot}10^{-2}$ $50{\cdot}10^{-2}$	$100{\cdot}10^{-6}$ $1{\cdot}10^{-2}$ $50{\cdot}10^{-2}$ $99{,}8{\cdot}10^{-2}$	0,8% 0,4% 0,3% 0,2%	3% 1% 1% 0,3%
	Methane	$500{\cdot}10^{-6}$ $1{\cdot}10^{-2}$	$1{\cdot}10^{-2}$ $60{\cdot}10^{-2}$	1% 0,5%	1% 1%
	Air	$100{\cdot}10^{-6}$ $1{\cdot}10^{-2}$	$1{\cdot}10^{-2}$ $50{\cdot}10^{-2}$	0,4% 0,3%	1% 1%
	Helium	$40{\cdot}10^{-6}$ $100{\cdot}10^{-6}$ $1{\cdot}10^{-2}$	$100{\cdot}10^{-2}$ $1{\cdot}10^{-2}$ $50{\cdot}10^{-2}$	0,5% 0,4% 0,3%	2% 1% 1%
	Oxygen	$12{\cdot}10^{-6}$ $100{\cdot}10^{-6}$ $1{\cdot}10^{-2}$	$100{\cdot}10^{-6}$ $1{\cdot}10^{-2}$ $50{\cdot}10^{-2}$	0,5% 0,4% 0,3%	1% 1% 1%
Carbon monoxide (CO)	Nitrogen	$1{\cdot}10^{-6}$ $10{\cdot}10^{-6}$ $100{\cdot}10^{-6}$ $0{,}1{\cdot}10^{-2}$	$10{\cdot}10^{-6}$ $100{\cdot}10^{-6}$ $0{,}1{\cdot}10^{-2}$ $10{\cdot}10^{-2}$	1% 0,8% 0,7% 0,6%	2% 2% 2% 1%
	Air	$1{\cdot}10^{-6}$ $10{\cdot}10^{-6}$ $100{\cdot}10^{-6}$ $0{,}1{\cdot}10^{-2}$	$10{\cdot}10^{-6}$ $100{\cdot}10^{-6}$ $0{,}1{\cdot}10^{-2}$ $5{,}45{\cdot}10^{-2}$	1% 0,8% 0,7% 0,6%	2% 2% 2% 1%
	Oxygen	$0{,}5{\cdot}10^{-6}$	$10{\cdot}10^{-6}$	2%	3%
Ethylbenzene (C_8H_{10})	Nitrogen	$5{\cdot}10^{-9}$	$200{\cdot}10^{-9}$	4,5%	N.A.
Nitric oxide (NO)	Nitrogen	$0{,}12{\cdot}10^{-6}$ $0{,}4{\cdot}10^{-6}$ $1{\cdot}10^{-6}$ $10{\cdot}10^{-6}$ $0{,}1{\cdot}10^{-2}$	0,4·10-6 $1{\cdot}10^{-6}$ $10{\cdot}10^{-6}$ $0{,}1{\cdot}10^{-2}$ $0{,}25{\cdot}10^{-2}$	3% 1,2% 1% 0,7% 0,5%	4% 3% 2% 1,5% 1%
Nitrogen dioxide (NO_2)	Nitrogen - Air	$5{\cdot}10^{-6}$	$100{\cdot}10^{-6}$	3%	3%
Nitrous oxide (N_2O)	Nitrogen	$1{\cdot}10^{-6}$ $30{\cdot}10^{-6}$	$30{\cdot}10^{-6}$ $0{,}1{\cdot}10^{-2}$	1,5% 1%	3% 1,5%
	Air	$1{\cdot}10^{-6}$ $30{\cdot}10^{-6}$	$30{\cdot}10^{-6}$ $0{,}1{\cdot}10^{-2}$	1,5% 1%	3% 3%

G-CGM / A-CGM

OS - XY

ENVIRONMENTAL MONITORING

MEASURAND Calibration of gas mixtures by gravimetric method G-CGM and by analytical method A-CGM		CALIBRATION CAPABILITY Amount fraction range mol/mol		RELATIVE EXPANDED UNCERTAINTY (*)	
Analyte	Matrix	From	To	G-CGM	A-CGM
ENVIRONMENTAL MONITORING					
Oxygen (O_2)	Nitrogen	$10 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	2%	2%
		$100 \cdot 10^{-6}$	$0{,}1 \cdot 10^{-2}$	1%	2%
		$0{,}1 \cdot 10^{-2}$	$1 \cdot 10^{-2}$	0,66%	1%
		$1 \cdot 10^{-2}$	$25 \cdot 10^{-2}$	0,42%	1%
		$25 \cdot 10^{-2}$	$99{,}8 \cdot 10^{-2}$	0,2%	0,3%
	Methane	$200 \cdot 10^{-6}$	$2 \cdot 10^{-2}$	2%	2%
	Helium	$100 \cdot 10^{-6}$	$0{,}1 \cdot 10^{-2}$	1%	2%
		$0{,}1 \cdot 10^{-2}$	$3 \cdot 10^{-2}$	0,66%	1%
		$3 \cdot 10^{-2}$	$25 \cdot 10^{-2}$	0,42%	1%
	Argon	$3 \cdot 10^{-2}$	$80 \cdot 10^{-2}$	0,42%	2%
Sulphur dioxide (SO_2)	Nitrogen	$0{,}1 \cdot 10^{-6}$	$0{,}25 \cdot 10^{-6}$	4%	5%
		$0{,}25 \cdot 10^{-6}$	$1 \cdot 10^{-6}$	3%	5%
		$1 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	1,5%	2%
		$100 \cdot 10^{-6}$	$0{,}3 \cdot 10^{-2}$	0,66%	1%
	Air	$0{,}1 \cdot 10^{-6}$	$0{,}25 \cdot 10^{-6}$	4%	4,5%
		$0{,}25 \cdot 10^{-6}$	$1 \cdot 10^{-6}$	3%	4,5%
		$1 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	1,5%	2%
		$100 \cdot 10^{-6}$	$0{,}3 \cdot 10^{-2}$	0,66%	1%
Toluene (C_7H_8)	Nitrogen	$5 \cdot 10^{-9}$	$200 \cdot 10^{-9}$	3%	3,5%
Water (H_2O)	Nitrogen	$10 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	6,5%	7%
o-Xylene (o-C_8H_{10})	Nitrogen	$5 \cdot 10^{-9}$	$200 \cdot 10^{-9}$	4,5%	N.A.
m-Xylene (m-C_8H_{10})	Nitrogen	$5 \cdot 10^{-9}$	$200 \cdot 10^{-9}$	4,5%	N.A.
p-Xylene (p-C_8H_{10})	Nitrogen	$5 \cdot 10^{-9}$	$200 \cdot 10^{-9}$	4,5%	N.A.

G-CGM / A-CGM

AC - HE

HYDROCARBONS / NATURAL GAS

MEASURAND Calibration of gas mixtures by gravimetric method G-CGM and by analytical method A-CGM		CALIBRATION CAPABILITY Amount fraction range mol/mol		RELATIVE EXPANDED UNCERTAINTY (*)	
Analyte	Matrix	From	To	G-CGM	A-CGM
HYDROCARBONS / NATURAL GAS					
Acetylene (C_2H_2)	Nitrogen	$1 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	2%	4%
		$100 \cdot 10^{-6}$	$0{,}4 \cdot 10^{-2}$	1%	3%
Argon (Ar)	Methane	$200 \cdot 10^{-6}$	$5 \cdot 10^{-2}$	5%	N.A.
Butadiene 1.3 (C_4H_6)	Nitrogen	$1 \cdot 10^{-6}$	$0{,}1 \cdot 10^{-2}$	2%	3%
	Methane	$0{,}5 \cdot 10^{-2}$	$3 \cdot 10^{-2}$	2%	3%
Butane (C_4H_{10})	Nitrogen	$1 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	2%	3%
		$100 \cdot 10^{-6}$	$0{,}1 \cdot 10^{-2}$	1%	2%
		$0{,}1 \cdot 10^{-2}$	$5 \cdot 10^{-2}$	0,8%	1,5%
	Methane	$100 \cdot 10^{-6}$	$0{,}1 \cdot 10^{-2}$	1%	2%
		$0{,}1 \cdot 10^{-2}$	$4 \cdot 10^{-2}$	0,8%	1,5%
Butene - 1 (C_4H_8)	Nitrogen	$1 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	2%	3%
		$100 \cdot 10^{-6}$	$0{,}1 \cdot 10^{-2}$	1%	2%
		$0{,}1 \cdot 10^{-2}$	$5 \cdot 10^{-2}$	0,8%	1,5%
	Methane	$0{,}1 \cdot 10^{-2}$	$1 \cdot 10^{-2}$	0,8%	1%
Carbon dioxide (CO_2)	Nitrogen	$10 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	0,8%	3%
		$100 \cdot 10^{-6}$	$1 \cdot 10^{-2}$	0,4%	1%
		$1 \cdot 10^{-2}$	$50 \cdot 10^{-2}$	0,3%	1%
		$50 \cdot 10^{-2}$	$99{,}8 \cdot 10^{-2}$	0,2%	0,3%
	Methane	$500 \cdot 10^{-6}$	$1 \cdot 10^{-2}$	1%	1,5%
		$1 \cdot 10^{-2}$	$60 \cdot 10^{-2}$	0,5%	1,5%
	Air	$100 \cdot 10^{-6}$	$1 \cdot 10^{-2}$	0,4%	1%
		$1 \cdot 10^{-2}$	$50 \cdot 10^{-2}$	0,3%	1%
	Helium	$40 \cdot 10^{-6}$	$100 \cdot 10^{-2}$	0,5%	2%
		$100 \cdot 10^{-6}$	$1 \cdot 10^{-2}$	0,4%	1%
		$1 \cdot 10^{-2}$	$50 \cdot 10^{-2}$	0,3%	1%
	Oxygen	$12 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	0,5%	1%
		$100 \cdot 10^{-6}$	$1 \cdot 10^{-2}$	0,4%	1%
		$1 \cdot 10^{-2}$	$50 \cdot 10^{-2}$	0,3%	1%
Carbon monoxide (CO)	Methane	$0{,}025 \cdot 10^{-2}$	$25 \cdot 10^{-2}$	0,6%	1%
Ethane (C_2H_6)	Nitrogen	$1 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	1,2%	3%
		$100 \cdot 10^{-6}$	$0{,}1 \cdot 10^{-2}$	1%	2%
		$0{,}1 \cdot 10^{-2}$	$5 \cdot 10^{-2}$	0,8%	1%
		$5 \cdot 10^{-2}$	$35 \cdot 10^{-2}$	0,5%	1%
	Methane	$500 \cdot 10^{-6}$	$0{,}1 \cdot 10^{-2}$	1%	2%
		$0{,}1 \cdot 10^{-2}$	$10 \cdot 10^{-2}$	0,8%	2%
		$10 \cdot 10^{-2}$	$35 \cdot 10^{-2}$	0,5%	2%
Ethylene (C_2H_4)	Nitrogen	$1 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	1,2%	3%
		$100 \cdot 10^{-6}$	$0{,}1 \cdot 10^{-2}$	1%	2%
		$0{,}1 \cdot 10^{-2}$	$5 \cdot 10^{-2}$	0,8%	1%
	Methane	$1 \cdot 10^{-2}$	$10 \cdot 10^{-2}$	1%	2%
		$10 \cdot 10^{-2}$	$16 \cdot 10^{-2}$	0,8%	1%
Helium (He)	Nitrogen	$1 \cdot 10^{-2}$	$20 \cdot 10^{-2}$	1%	1,5%
	Methane	$100 \cdot 10^{-6}$	$50 \cdot 10^{-2}$	3%	3%
Heptane (C_7H_{16})	Methane	$50 \cdot 10^{-6}$	$0{,}2 \cdot 10^{-2}$	1%	2%
Hexane (C_6H_{14})	Nitrogen	$1 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	2%	3%
		$100 \cdot 10^{-6}$	$0{,}1 \cdot 10^{-2}$	1%	2%
		$0{,}1 \cdot 10^{-2}$	$0{,}4 \cdot 10^{-2}$	0,8%	1,5%

G-CGM / A-CGM

HE - OX

HYDROCARBONS / NATURAL GAS

MEASURAND Calibration of gas mixtures by gravimetric method G-CGM and by analytical method A-CGM		CALIBRATION CAPABILITY Amount fraction range mol/mol		RELATIVE EXPANDED UNCERTAINTY (*)	
Analyte	Matrix	From	To	G-CGM	A-CGM
HYDROCARBONS / NATURAL GAS					
Hexane (C_6H_{14})	Methane	$50 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$0{,}1 \cdot 10^{-2}$ $1 \cdot 10^{-2}$	1% 0,8%	2% 1,5%
Hydrogen (H_2)	Nitrogen	$0{,}07 \cdot 10^{-2}$ $6 \cdot 10^{-2}$	$6 \cdot 10^{-2}$ $90 \cdot 10^{-2}$	1,1% 0,5%	2% 0,7%
	Methane	$100 \cdot 10^{-6}$ $2 \cdot 10^{-2}$ $20 \cdot 10^{-2}$	$2 \cdot 10^{-2}$ $20 \cdot 10^{-2}$ $90 \cdot 10^{-2}$	2% 1% 0,5%	2% 0,7% 0,7%
	Helium - Argon	$2 \cdot 10^{-2}$	$6 \cdot 10^{-2}$	1,1%	2%
Isobutane (C_4H_{10})	Nitrogen	$1 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $5 \cdot 10^{-2}$	2% 1% 0,8%	3% 2% 1,5%
	Methane	$100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$0{,}1 \cdot 10^{-2}$ $4 \cdot 10^{-2}$	1% 0,8%	2% 1,5%
Isobutene (C_4H_8)	Nitrogen	$1 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $5 \cdot 10^{-2}$	2% 1% 0,8%	3% 2% 1,5%
	Methane	$0{,}1 \cdot 10^{-2}$	$1 \cdot 10^{-2}$	0,8%	1,5%
Isopentane (C_5H_{12})	Methane	$50 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$0{,}1 \cdot 10^{-2}$ $3{,}5 \cdot 10^{-2}$	1% 0,8%	2% 1,5%
Methane (CH_4)	Nitrogen	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$10 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $98 \cdot 10^{-2}$	0,5% 0,4% 0,3%	2% 1% 0,5%
	Methane	$1 \cdot 10^{-2}$ $50 \cdot 10^{-2}$	$50 \cdot 10^{-2}$ $99{,}8 \cdot 10^{-2}$	0,4% 0,2%	0,4% 0,2%
	Air	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$10 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $2{,}2 \cdot 10^{-2}$	0,5% 0,4% 0,3%	2% 1% 1%
Neopentane (C_5H_{12})	Methane	$50 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$0{,}1 \cdot 10^{-2}$ $3{,}5 \cdot 10^{-2}$	1% 0,8%	2% 1,5%
Nitrogen (N_2)	Nitrogen	$1 \cdot 10^{-2}$	$99 \cdot 10^{-2}$	0,2%	0,3%
	Methane	$500 \cdot 10^{-6}$ $10 \cdot 10^{-2}$	$10 \cdot 10^{-2}$ $95 \cdot 10^{-2}$	3% 0,5%	3% 1,5%
Nonane (C_9H_{20})	Methane	$50 \cdot 10^{-6}$	$0{,}02 \cdot 10^{-2}$	1%	2%
Octane (C_8H_{18})	Methane	$50 \cdot 10^{-6}$	$0{,}05 \cdot 10^{-2}$	1%	2%
Oxygen (O_2)	Nitrogen	$10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $1 \cdot 10^{-2}$ $25 \cdot 10^{-2}$	$100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $1 \cdot 10^{-2}$ $25 \cdot 10^{-2}$ $99{,}8 \cdot 10^{-2}$	2% 1% 0,66% 0,42% 0,2%	2% 2% 1% 1% 0,3%
	Methane	$200 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$0{,}1 \cdot 10^{-2}$ $2 \cdot 10^{-2}$	5% 2%	6% 3%
	Helium	$100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $3 \cdot 10^{-2}$	$0{,}1 \cdot 10^{-2}$ $3 \cdot 10^{-2}$ $25 \cdot 10^{-2}$	1% 0,66% 0,42%	2% 1% 1%
	Argon	$3 \cdot 10^{-2}$	$80 \cdot 10^{-2}$	0,42%	2%

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G-CGM / A-CGM

PE - PR

HYDROCARBONS / NATURAL GAS

MEASURAND Calibration of gas mixtures by gravimetric method G-CGM and by analytical method A-CGM		CALIBRATION CAPABILITY Amount fraction range mol/mol		RELATIVE EXPANDED UNCERTAINTY (*)	
Analyte	Matrix	From	To	G-CGM	A-CGM
HYDROCARBONS / NATURAL GAS					
Pentane (C_5H_{12})	Methane	$50 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$0{,}1 \cdot 10^{-2}$ $2 \cdot 10^{-2}$	1% 0,8%	2% 1,5%
Propane (C_3H_8)	Nitrogen	$0{,}1 \cdot 10^{-6}$ $1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $18 \cdot 10^{-2}$	2% 1% 0,8% 0,4% 0,3%	3% 2% 2% 2% 1%
	Methane	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $18 \cdot 10^{-2}$	1,5% 1,2% 0,8% 0,7%	3% 2% 1% 1%
	Air	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$	$10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $0{,}1 \cdot 10^{-2}$ $0{,}85 \cdot 10^{-2}$	1% 0,8% 0,4% 0,3%	3% 2% 1% 1%
Propylene (C_3H_6)	Nitrogen - Methane	$0{,}05 \cdot 10^{-2}$	$7 \cdot 10^{-2}$	0,8%	1%

There are mixtures, when required by the customer, for whom are stated on the certificate the calorific values calculated according to ISO 6976. (Superior calorific value, inferior calorific value, density, relative density, Wobbe index and compressibility factor).
For gases whose concentrations are in consecutive measurement ranges, the certified relative expanded uncertainty is the highest.

MEASURAND Calibration of gas mixtures by gravimetric method G-CGM and by analytical method A-CGM		CALIBRATION CAPABILITY Amount fraction range mol/mol		RELATIVE EXPANDED UNCERTAINTY (*)	
Analyte	Matrix	From	To	G-CGM	A-CGM
SULPHURATED GASES					
Carbonyl sulphide (COS)(**)	Nitrogen - Methane	$1 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	5%	5%
Dimethyl sulphide (C_2H_6S)(**)	Nitrogen - Methane	$0{,}5 \cdot 10^{-6}$ $10 \cdot 10^{-6}$	$10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$	10% 5%	10% 5%
Hydrogen sulphide (H_2S)(**)	Nitrogen - Methane	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$	$10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $250 \cdot 10^{-6}$	5% 3% 2%	5% 3% 2%
Isopropyl mercaptan (C_3H_8S)(**)	Nitrogen - Methane	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$	$10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$	10% 5%	10% 5%
Methyl ethyl sulphide (C_3H_8S)(**)	Nitrogen - Methane	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$	$10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$	10% 5%	10% 5%
Methyl mercaptan (CH_4S)(**)	Nitrogen - Methane	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$	$10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$	10% 5%	10% 5%
Methyl sulphide (C_2H_6S)(**)	Nitrogen - Methane	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$	$10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$	10% 5%	10% 5%
N-Propyl mercaptan (C_3H_8S)(**)	Nitrogen - Methane	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$	$10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$	10% 5%	10% 5%
Tert-butyl mercaptan ($C_4H_{10}S$)	Nitrogen - Methane	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$	$10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$	10% 5%	10% 5%
Tetrahydrothiophene (C_4H_8S)	Nitrogen - Methane	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$	$10 \cdot 10^{-6}$ $100 \cdot 10^{-6}$	5% 3%	5% 3%

(**) In case of analytical calibration, the component cannot be combined with other sulphurates.

G-CGM / A-CGM

CA - NI

FUEL GAS

MEASURAND Calibration of gas mixtures by gravimetric method G-CGM and by analytical method A-CGM		CALIBRATION CAPABILITY Amount fraction range mol/mol		RELATIVE EXPANDED UNCERTAINTY (*)	
Analyte	Matrix	From	To	G-CGM	A-CGM
FUEL GAS					
Carbon dioxide (CO_2)	Nitrogen	$10 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	0,5%	3%
		$100 \cdot 10^{-6}$	$1 \cdot 10^{-2}$	0,4%	1%
		$1 \cdot 10^{-2}$	$50 \cdot 10^{-2}$	0,3%	1%
		$50 \cdot 10^{-2}$	$99,8 \cdot 10^{-2}$	0,2%	0,3%
	Methane	$500 \cdot 10^{-6}$	$1 \cdot 10^{-2}$	0,4%	1%
		$1 \cdot 10^{-2}$	$60 \cdot 10^{-2}$	0,3%	1%
	Air	$100 \cdot 10^{-6}$	$1 \cdot 10^{-2}$	0,4%	1%
		$1 \cdot 10^{-2}$	$50 \cdot 10^{-2}$	0,3%	1%
	Helium	$40 \cdot 10^{-6}$	$100 \cdot 10^{-2}$	0,5%	2%
		$100 \cdot 10^{-6}$	$1 \cdot 10^{-2}$	0,4%	1%
		$1 \cdot 10^{-2}$	$50 \cdot 10^{-2}$	0,3%	1%
	Oxygen	$12 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	0,5%	1%
		$100 \cdot 10^{-6}$	$1 \cdot 10^{-2}$	0,4%	1%
		$1 \cdot 10^{-2}$	$50 \cdot 10^{-2}$	0,3%	1%
Carbon monoxide (CO)	Nitrogen	$1 \cdot 10^{-6}$	$10 \cdot 10^{-6}$	1%	2%
		$10 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	0,8%	2%
		$100 \cdot 10^{-6}$	$0,1 \cdot 10^{-2}$	0,7%	2%
		$0,1 \cdot 10^{-2}$	$10 \cdot 10^{-2}$	0,6%	1%
	Air	$1 \cdot 10^{-6}$	$10 \cdot 10^{-6}$	1%	2%
		$10 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	0,8%	2%
		$100 \cdot 10^{-6}$	$0,1 \cdot 10^{-2}$	0,7%	2%
		$0,1 \cdot 10^{-2}$	$5,45 \cdot 10^{-2}$	0,6%	1%
	Oxygen	$0,5 \cdot 10^{-6}$	$10 \cdot 10^{-6}$	2%	3%
Hydrogen (H_2)	Nitrogen	$0,07 \cdot 10^{-2}$	$6 \cdot 10^{-2}$	1,1%	2%
		$6 \cdot 10^{-2}$	$90 \cdot 10^{-2}$	0,5%	0,7%
	Methane	$100 \cdot 10^{-6}$	$2 \cdot 10^{-2}$	2%	2%
		$2 \cdot 10^{-2}$	$20 \cdot 10^{-2}$	1%	0,7%
		$20 \cdot 10^{-2}$	$90 \cdot 10^{-2}$	0,5%	0,7%
	Helium - Argon	$2 \cdot 10^{-2}$	$6 \cdot 10^{-2}$	1,1%	2%
Methane (CH_4)	Nitrogen	$1 \cdot 10^{-6}$	$10 \cdot 10^{-6}$	0,5%	2%
		$10 \cdot 10^{-6}$	$0,1 \cdot 10^{-2}$	0,4%	1%
		$0,1 \cdot 10^{-2}$	$98 \cdot 10^{-2}$	0,3%	0,5%
	Methane	$1 \cdot 10^{-2}$	$50 \cdot 10^{-2}$	0,2%	0,2%
		$50 \cdot 10^{-2}$	$99,8 \cdot 10^{-2}$	0,1%	0,1%
	Air	$1 \cdot 10^{-6}$	$10 \cdot 10^{-6}$	0,5%	2%
		$10 \cdot 10^{-6}$	$0,1 \cdot 10^{-2}$	0,4%	1%
		$0,1 \cdot 10^{-2}$	$2,2 \cdot 10^{-2}$	0,3%	1%
Nitrogen (N_2)	Nitrogen	$1 \cdot 10^{-2}$	$99 \cdot 10^{-2}$	0,2%	0,3%
	Methane	$500 \cdot 10^{-6}$	$10 \cdot 10^{-2}$	3%	3%
		$10 \cdot 10^{-2}$	$95 \cdot 10^{-2}$	0,5%	1,5%

G-CGM / A-CGM

ET

FORENSIC

MEASURAND Calibration of gas mixtures by gravimetric method G-CGM and by analytical method A-CGM		CALIBRATION CAPABILITY Amount fraction range mol/mol		RELATIVE EXPANDED UNCERTAINTY (*)	
Analyte	Matrix	From	To	G-CGM	A-CGM
FORENSIC					
Ethanol (C_2H_6O)	Nitrogen - Air	$100 \cdot 10^{-6}$	$0{,}1 \cdot 10^{-2}$	2%	5%

(*) The relative expanded uncertainties reported in the table are the minimum values that can be stated on the certificate.
The expanded uncertainty of the measurement is expressed as standard uncertainty multiplied by a coverage factor k=2 which, for a t-distribution characterized by calculated effective degrees of freedom, provides a level of confidence of approximatively 95%.

For some types of mixtures, where requested by the customer, the calculation of the parameters of the calorific value of the mixture is reported, calculated in accordance with the prescriptions of the ISO 6976 standard. (Upper heating value, Lower heating value, density, relative density, Wobbe index and compressibility factor).

The schedules, divided by application and aimed to help the end-user to find out the proper mixture, are purely illustrative examples. The gases listed above may be used in all the following combinations within the accredited concentration ranges.

	NO	CO	O_2	CO_2	H_2	N_2O	NO_2	BTEX	Hydrocarbons	SO_2	H_2O	Sulphurated gases	He, N_2	Ethanol	NH_3
NO	-	Yes[1]	No	Yes	No[5]	No[5]	No[5]	No[5]	No[5]	Yes	No[5]	No[5]	Yes	No	No
CO		-	Yes[1]	Yes	Yes	Yes[1]	Yes[1]	Yes	Yes	Yes	Yes[2]	Yes	Yes	Yes	Yes
O_2			-	Yes	Yes[1]	Yes	Yes	Yes[1]	Yes[1]	Yes	Yes[2]	Yes[1]	Yes	Yes	Yes[1]
CO_2				-	Yes	Yes	No	Yes	Yes	Yes	Yes[2]	Yes	Yes	Yes	Yes
H_2					-	No	No	Yes	Yes	Yes	Yes[2]	Yes	Yes	Yes	No
N_2O						-	No[5]	Yes[1]	Yes[1]	Yes	Yes[2]	No[5]	Yes	No	No
NO_2							-	No[5]	No[5]	No[5]	No	No[5]	Yes	No	No
BTEX								-	Yes	Yes	Yes[2]	Yes	Yes	No	No
Hydrocarbons									-	Yes	Yes[2]	Yes	Yes	Yes	Yes
SO_2										-	No	Yes[4]	Yes	No	Yes
H_2O											-	No	Yes	No	No
Sulphurated gases												-	Yes	No	No
He, N_2													-	Yes	Yes
Ethanol														-	No
NH_3															-

[1] Feasible up to safety limit levels concerning oxidant and flammable gases.
[2] Only for concentrations of water lower than 100 ppm.
[3] Applicable to saturated hydrocarbons.
[4] Hydrogen sulphide excluded.
[5] Analysis can't be performed.

Accreditation tables of LAT Centre No. 143

W-CGM

ACCREDIA L'ENTE ITALIANO DI ACCREDITAMENTO
LAT N° 143

The W-CGMs are prepared individually, following an accredited internal method that provides a metrologically traceable mixture, but with a higher uncertainty than the G-CGMs. The W-CGMs guarantee traceability in all those cases where measurement uncertainty is not a binding factor.

THE CERTIFIED VALUE IS TRACEABLE, VIA AN UNBROKEN CHAIN OF COMPARISONS, TO THE NATIONAL MASS SAMPLES CERTIFIED BY PRIMARY METROLOGY INSTITUTES OR ACCREDITED CALIBRATION CENTERS.

Following preparation, the gravimetric concentration of the mixture is analyzed with the aim of confirming the result. Certification uncertainty is calculated on the basis of the mixture production process; this uncertainty may vary, depending on the requested concentration, in percentages ranging between 1 and 10%. W-CGM are also available as a multi-component gas mixture in line with the compatibility constraints due to the chemical-physical characteristics of the gases.

LAT Center n. 143 is accredited for the quantity “Amount of substance”

Permanent Laboratory

MEASURAND “Working standard” gas mixtures W-CGM		CALIBRATION CAPABILITY Amount fraction range mol/mol		RELATIVE EXPANDED UNCERTAINTY (*)
Analyte	Matrix	From	To	W-CGM
Ammonia (NH_3)	Nitrogen - Air	$5{\cdot}10^{-6}$	$500{\cdot}10^{-6}$	10%
Benzene (C_6H_6)	Nitrogen - Air	$5{\cdot}10^{-9}$	$200{\cdot}10^{-9}$	6%
Carbon dioxide (CO_2)	Nitrogen - Air - Helium	$100{\cdot}10^{-6}$	$1{\cdot}10^{-2}$	2%
		$1{\cdot}10^{-2}$	$99{,}5{\cdot}10^{-2}$	1%
	Oxygen	$12{\cdot}10^{-2}$	$99{,}5{\cdot}10^{-2}$	1%
Carbon monoxide (CO)	Nitrogen	$1{\cdot}10^{-6}$	$10{\cdot}10^{-6}$	6%
		$10{\cdot}10^{-6}$	$1{\cdot}10^{-2}$	2%
		$1{\cdot}10^{-2}$	$90{\cdot}10^{-2}$	1%
	Air - Helium	$1{\cdot}10^{-6}$	$10{\cdot}10^{-6}$	6%
		$10{\cdot}10^{-6}$	$1{\cdot}10^{-2}$	2%
		$1{\cdot}10^{-2}$	$8{\cdot}10^{-2}$	1%
Ethylbenzene (C_8H_{10})	Nitrogen - Air	$5{\cdot}10^{-9}$	$200{\cdot}10^{-9}$	8%
Hydrogen (H_2)	Nitrogen - Helium	$0{,}07{\cdot}10^{-2}$	$90{\cdot}10^{-2}$	2%
	Argon	$2{\cdot}10^{-2}$	$90{\cdot}10^{-2}$	2%
Methane (CH_4)	Nitrogen	$1{\cdot}10^{-6}$	$10{\cdot}10^{-6}$	3,5%
		$10{\cdot}10^{-6}$	$1{\cdot}10^{-2}$	2%
		$1{\cdot}10^{-2}$	$90{\cdot}10^{-2}$	1%
	Air	$1{\cdot}10^{-6}$	$10{\cdot}10^{-6}$	3,5%
		$10{\cdot}10^{-6}$	$1{\cdot}10^{-2}$	2%
		$1{\cdot}10^{-2}$	$2{,}2{\cdot}10^{-2}$	1%
	Helium - Argon	$1{\cdot}10^{-2}$	$90{\cdot}10^{-2}$	1%
Nitric oxide (NO)	Nitrogen	$0{,}12{\cdot}10^{-6}$	$0{,}4{\cdot}10^{-6}$	8%
		$0{,}4{\cdot}10^{-6}$	$5{\cdot}10^{-6}$	6%
		$5{\cdot}10^{-6}$	$20{\cdot}10^{-6}$	3,5%
		$20{\cdot}10^{-6}$	$2500{\cdot}10^{-6}$	2%

W-CGM

NI - XY

MEASURAND "Working standard" gas mixtures W-CGM		CALIBRATION CAPABILITY Amount fraction range mol/mol		RELATIVE EXPANDED UNCERTAINTY (*)
Analyte	Matrix	From	To	W-CGM
Nitrogen dioxide (NO_2)	Nitrogen - Air	$5{\cdot}10^{-6}$	$1{\cdot}10^{-2}$	6%
Nitrous oxide (N_2O)	Nitrogen - Air	$1{\cdot}10^{-6}$ $10{\cdot}10^{-2}$	$10{\cdot}10^{-2}$ $90{\cdot}10^{-2}$	2% 1%
Oxygen (O_2)	Nitrogen - Helium	$1{\cdot}10^{-6}$ $10{\cdot}10^{-6}$ $1{\cdot}10^{-2}$	$10{\cdot}10^{-6}$ $1{\cdot}10^{-2}$ $90{\cdot}10^{-2}$	3,5% 2% 1%
	Argon	$3{\cdot}10^{-2}$	$90{\cdot}10^{-2}$	1%
Propane (C_3H_8)	Nitrogen - Methane	$1{\cdot}10^{-6}$ $10{\cdot}10^{-6}$ $1{,}1{\cdot}10^{-2}$	$10{\cdot}10^{-6}$ $1{,}1{\cdot}10^{-2}$ $90{\cdot}10^{-2}$	3,5% 2% 1%
	Air	$1{\cdot}10^{-6}$ $10{\cdot}10^{-6}$	$10{\cdot}10^{-6}$ $1{,}1{\cdot}10^{-2}$	3,5% 2%
Sulphur dioxide (SO_2)	Nitrogen - Air	$1{\cdot}10^{-6}$ $2500{\cdot}10^{-6}$	$2500{\cdot}10^{-6}$ $10{\cdot}10^{-2}$	3% 2%
Toluene (C_7H_8)	Nitrogen - Air	$5{\cdot}10^{-9}$	$200{\cdot}10^{-9}$	6%
o-Xylene (o-C_8H_{10})	Nitrogen - Air	$5{\cdot}10^{-9}$	$200{\cdot}10^{-9}$	8%
m-Xylene (m-C_8H_{10})	Nitrogen - Air	$5{\cdot}10^{-9}$	$200{\cdot}10^{-9}$	8%
p-Xylene (p-C_8H_{10})	Nitrogen - Air	$5{\cdot}10^{-9}$	$200{\cdot}10^{-9}$	8%

(*) The relative expanded uncertainties reported in the table are the minimum values that can be stated on the certificate. The expanded uncertainty of the measurement is expressed as standard uncertainty multiplied by a coverage factor k=2 which, for a t-distribution characterized by calculated effective degrees of freedom, provides a level of confidence of approximatively 95%.

Gases listed above can be used in multicomponent mixtures, each one in the range of concentration reported in the table, complying the matrix hereafter.

	NO	C_3H_8	CO	O_2	CO_2	H_2	N_2O	NO_2	BTEX	CH_4	SO_2	NH_3
NO	-	No	Yes[1]	No	Yes	No	No	No	No	No	Yes	No
C_3H_8		-	Yes	Yes[1]	Yes	Yes	Yes[1]	No	No	Yes	No	Yes
CO			-	Yes[1]	Yes	Yes	Yes[1]	No	Yes	Yes	Yes	Yes
O_2				-	Yes	Yes[1]	Yes	Yes	Yes[1]	Yes[1]	Yes	Yes[1]
CO_2					-	Yes	No	No	Yes	Yes	Yes	Yes
H_2						-	Yes[1]	Yes[1]	Yes	Yes	Yes	No
N_2O							-	No	Yes[1]	Yes[1]	Yes	No
NO_2								-	Yes[1]	Yes[1]	No	No
BTEX									-	Yes	Yes	No
CH_4										-	Yes	Yes
SO_2											-	Yes
NH_3												-

[1] Feasible up to safety limit levels concerning oxidant and flammable gases.

Calibration of equipment for analytical measurement in the laboratory or at customer

ANALYTICAL MEASUREMENT

ACCREDIA L'ENTE ITALIANO DI ACCREDITAMENTO
LAT N° 143

The LAT Center can calibrate analytical measuring equipment, gas chromatographs and analyzers.
The main calibrated detectors are indicated below

Gas chromatographs with:
- *FID* detector for hydrocarbons;
- *TCD* and *PDD* detectors for oxygen, carbon dioxide, nitrogen, carbon monoxide;
- *SCD* and *AED* detectors for sulfur compounds.

Analyzers with:
- *IR* cell for carbon dioxide, carbon monoxide, nitrogen oxide;
- *UV* cell for sulfur dioxide, nitrogen oxide;
- *chemiluminescence* for nitrogen oxide and nitrogen dioxide;
- *paramagnetic* for oxygen;
- *cooled* mirror cell for humidity.

THE CALIBRATION IS PERFORMED IN ACCORDANCE WITH STANDARD ISO 6143, USING THE METHOD OF GENERALIZED LEAST SQUARES (GLS).

It is important to define the correct calibration conditions so that they reflect the actual use of the instrument.
It is therefore necessary to request calibration in the most suitable range and to indicate the matrix gas in which the instrument is to be used.
SIAD technicians assist the customer in defining the correct conditions in which the calibration must be carried out according to: type of detector, calibration range, analysis function (e.g., quadratic or linear), linearity of response of the instrument.
The number of traceable mixtures necessary for calibrating the equipment will depend on these variables being correctly defined.
The accreditation table gives the calibration ranges and the minimum uncertainty that can be certified for each type of detector. The main recommended applications are:
- checking the state of calibration of analytical equipment (for example, checking the measurement line or realignment);
- compliance of the instrument with standards (legislative parameters, specifications of supply, etc.).

Calibration of equipment for analytical measurement: at LAT center and external calibration

Table

MEASURAND Analytical measurement equipment: at the LAT Center and External Calibrations	CALIBRATION CAPABILITY Amount fraction range mol/mol		RELATIVE EXPANDED UNCERTAINTY (*)
GAS CHROMATOGRAPHY AND ANALYZER DETECTORS	From	To	
TCD E FID per			
Acetylene (C_2H_2)	$1 \cdot 10^{-6}$	$0{,}4 \cdot 10^{-2}$	2%
Butanol ($C_4H_{10}O$)	$20 \cdot 10^{-6}$	$0{,}1 \cdot 10^{-2}$	2%
Butane (C_4H_{10})	$1 \cdot 10^{-6}$	$5 \cdot 10^{-2}$	2%
Etano (C_2H_6)	$1 \cdot 10^{-6}$	$35 \cdot 10^{-2}$	1%
Ethanol (C_2H_6O)	$100 \cdot 10^{-6}$	$1000 \cdot 10^{-6}$	5%
Ethylene (C_2H_4)	$1 \cdot 10^{-6}$	$16 \cdot 10^{-2}$	1%
Heptane (C_7H_{16})	$50 \cdot 10^{-6}$	$0{,}2 \cdot 10^{-2}$	1%

AT LAT CENTER AND EXTERNAL CALIBRATIONS

MEASURAND Analytical measurement equipment: at the LAT Center and External Calibrations	CALIBRATION CAPABILITY Amount fraction range mol/mol		RELATIVE EXPANDED UNCERTAINTY (*)
GAS CHROMATOGRAPHY AND ANALYZER DETECTORS	From	To	
Hexane (C_6H_{14})	$1 \cdot 10^{-6}$	$1 \cdot 10^{-2}$	2%
Isobutane (C_4H_{10})	$1 \cdot 10^{-6}$	$5 \cdot 10^{-2}$	2%
Isobutene (C_4H_8)	$1 \cdot 10^{-6}$	$5 \cdot 10^{-2}$	2%
Isopentane (C_5H_{12})	$50 \cdot 10^{-6}$	$3{,}5 \cdot 10^{-2}$	1%
Methane (CH_4)	$1 \cdot 10^{-6}$	$50 \cdot 10^{-2}$	2%
	$50 \cdot 10^{-2}$	$99{,}8 \cdot 10^{-2}$	0,1%
Neopentane (C_5H_{12})	$50 \cdot 10^{-6}$	$3{,}5 \cdot 10^{-2}$	1%
Nonane (C_9H_{20})	$50 \cdot 10^{-6}$	$0{,}02 \cdot 10^{-2}$	1%
Octane (C_8H_{18})	$50 \cdot 10^{-6}$	$0{,}05 \cdot 10^{-2}$	1%
Pentane (C_5H_{12})	$50 \cdot 10^{-6}$	$3 \cdot 10^{-2}$	1%
Propane (C_3H_8)	$1 \cdot 10^{-6}$	$18 \cdot 10^{-2}$	1%
Propylene (C_3H_6)	$0{,}05 \cdot 10^{-2}$	$7 \cdot 10^{-2}$	0,3%
1-3 butadiene (C_4H_6)	$1 \cdot 10^{-6}$	$3 \cdot 10^{-2}$	2%
1-butene (C_4H_8)	$1 \cdot 10^{-6}$	$5 \cdot 10^{-2}$	2%
PID and FID for			
Benzene (C_6H_6)	$5 \cdot 10^{-9}$	$200 \cdot 10^{-9}$	2,5%
Ethylbenzene (C_8H_{10})	$5 \cdot 10^{-9}$	$200 \cdot 10^{-9}$	4,5%
Toluene (C_7H_8)	$5 \cdot 10^{-9}$	$200 \cdot 10^{-9}$	3%
m-Xylene (m-C_8H_{10})	$5 \cdot 10^{-9}$	$200 \cdot 10^{-9}$	4,5%
o-Xylene (o-C_8H_{10})	$5 \cdot 10^{-9}$	$200 \cdot 10^{-9}$	4,5%
p-Xylene (p-C_8H_{10})	$5 \cdot 10^{-9}$	$200 \cdot 10^{-9}$	4,5%
AED, PFPD, SCD, TCD and ELECTROCHEMICAL for			
Carbonyl sulphide (COS)	$1 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	5%
Dimethyl sulphide (C_2H_6S)	$0{,}5 \cdot 10^{-6}$	$10 \cdot 10^{-6}$	10%
	$10 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	5%
Hydrogen sulphide (H_2S)	$1 \cdot 10$	$250 \cdot 10^{-6}$	5%
Isopropyl mercaptan (C_3H_8S)	$1 \cdot 10^{-6}$	$10 \cdot 10^{-6}$	10%
	$10 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	5%
Methyl ethyl sulphide (CH_4S)	$1 \cdot 10^{-6}$	$10 \cdot 10^{-6}$	10%
	$10 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	5%
Methyl mercaptan (CH_4S)	$1 \cdot 10^{-6}$	$10 \cdot 10^{-6}$	10%
	$10 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	5%
Methyl sulphide (C_2H_6S)	$1 \cdot 10^{-6}$	$10 \cdot 10^{-6}$	10%
	$10 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	5%
N-Propyl mercaptan (C_3H_8S)	$1 \cdot 10^{-6}$	$10 \cdot 10^{-6}$	10%
	$10 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	5%
Tert-butyl mercaptan ($C_4H_{10}S$)	$1 \cdot 10^{-6}$	$10 \cdot 10^{-6}$	10%
	$10 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	5%
Tetrahydrothiophene (C_4H_8S)	$1 \cdot 10^{-6}$	$10 \cdot 10^{-6}$	5%
	$10 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	3%

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AT LAT CENTER AND EXTERNAL CALIBRATIONS

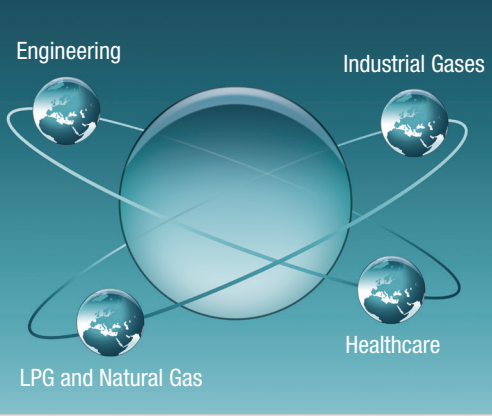
MEASURAND Analytical measurement equipment: at the LAT Center and External Calibrations	CALIBRATION CAPABILITY Amount fraction range mol/mol		RELATIVE EXPANDED UNCERTAINTY (*)
GAS CHROMATOGRAPHY AND ANALYZER DETECTORS	From	To	
PDD and TCD for			
Carbon dioxide (CO_2)	$10 \cdot 10^{-6}$ $50 \cdot 10^{-2}$	$50 \cdot 10^{-2}$ $99{,}8 \cdot 10^{-2}$	1% 0,3%
Carbon monoxide (CO)	$1 \cdot 10^{-6}$ $10 \cdot 10^{-6}$	$10 \cdot 10^{-2}$ $90 \cdot 10^{-2}$	1% 0,3%
Helium (He)	$100 \cdot 10^{-6}$	$50 \cdot 10^{-2}$	3%
Hydrogen (H_2)	$500 \cdot 10^{-6}$ $20 \cdot 10^{-6}$	$20 \cdot 10^{-2}$ $90 \cdot 10^{-2}$	1% 0,3%
Nitrogen (N_2)	$500 \cdot 10^{-6}$ $10 \cdot 10^{-2}$	$10 \cdot 10^{-2}$ $99 \cdot 10^{-2}$	3% 0,3%
Nitrous oxide (N_2O)	$1 \cdot 10^{-6}$	$0{,}1 \cdot 10^{-2}$	1%
Oxygen (O_2)	$10 \cdot 10^{-6}$ $25 \cdot 10^{-2}$	$25 \cdot 10^{-2}$ $99{,}8 \cdot 10^{-6}$	1% 0,3%
FID – METHANIZER for			
Carbon dioxide (CO_2)	$10 \cdot 10^{-6}$	$2000 \cdot 10^{-6}$	1%
Carbon monoxide (CO)	$1 \cdot 10^{-6}$	$4000 \cdot 10^{-6}$	1%
Methane (CH_4)	$1 \cdot 10^{-6}$	$2000 \cdot 10^{-6}$	1%
INFRARED (NDIR and FTIR) for			
Ammonia (NH_3)	$5 \cdot 10^{-6}$	$500 \cdot 10^{-6}$	3%
Carbon dioxide (CO_2)	$1 \cdot 10^{-6}$ $50 \cdot 10^{-2}$	$50 \cdot 10^{-2}$ $99{,}8 \cdot 10^{-2}$	1% 0,3%
Carbon monoxide (CO)	$1 \cdot 10^{-6}$ $10 \cdot 10^{-2}$	$10 \cdot 10^{-2}$ $90 \cdot 10^{-2}$	1% 0,3%
Nitric oxide (NO)	$0{,}12 \cdot 10^{-6}$ $0{,}4 \cdot 10^{-6}$	$0{,}4 \cdot 10^{-6}$ $2500 \cdot 10^{-6}$	3% 1%
Nitrogen dioxide (NO_2)	$5 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	3%
Nitrous oxide (N_2O)	$1 \cdot 10^{-6}$	$0{,}1 \cdot 10^{-2}$	1%
Sulphur dioxide (SO_2)	$0{,}1 \cdot 10^{-6}$ $1 \cdot 10^{-6}$ $100 \cdot 10^{-6}$	$1 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $3000 \cdot 10^{-6}$	5% 2% 1%
CHEMILUMINESCENCE for			
Nitric oxide (NO)	$0{,}12 \cdot 10^{-6}$ $0{,}4 \cdot 10^{-6}$	$0{,}4 \cdot 10^{-6}$ $2500 \cdot 10^{-6}$	3% 1%
Nitrogen dioxide (NO_2)	$5 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	5%
ULTRAVIOLET for			
Ammonia (NH_3)	$5 \cdot 10^{-6}$	$500 \cdot 10^{-6}$	3%
Hydrogen sulphide (H_2S)	$1 \cdot 10^{-6}$	$250 \cdot 10^{-6}$	5%
Nitric oxide (NO)	$0{,}12 \cdot 10^{-6}$ $0{,}4 \cdot 10^{-6}$	$0{,}4 \cdot 10^{-6}$ $2500 \cdot 10^{-6}$	3% 1%
Nitrogen dioxide (NO_2)	$5 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	5%
Sulphur dioxide (SO_2)	$0{,}1 \cdot 10^{-6}$	$3000 \cdot 10^{-6}$	1%

AT LAT CENTER AND EXTERNAL CALIBRATIONS

MEASURAND Analytical measurement equipment: at the LAT Center and External Calibrations	CALIBRATION CAPABILITY Amount fraction range mol/mol		RELATIVE EXPANDED UNCERTAINTY (*)
GAS CHROMATOGRAPHY AND ANALYZER DETECTORS	From	To	
ELECTROCHEMICAL. ELECTROLYTIC AND CATALYTIC for			
Carbon dioxide (CO_2)	$10 \cdot 10^{-6}$ $50 \cdot 10^{-2}$	$50 \cdot 10^{-2}$ $99{,}8 \cdot 10^{-2}$	1% 0,3%
Carbon monoxide (CO)	$1 \cdot 10^{-6}$ $10 \cdot 10^{-2}$	$10 \cdot 10^{-2}$ $90 \cdot 10^{-2}$	1% 0,3%
Methane (CH_4)	$1 \cdot 10^{-6}$ $50 \cdot 10^{-2}$	$50 \cdot 10^{-2}$ $99{,}8 \cdot 10^{-2}$	1% 0,3%
Nitric oxide (NO)	$0{,}12 \cdot 10^{-6}$ $0{,}4 \cdot 10^{-6}$	$0{,}4 \cdot 10^{-6}$ $2500 \cdot 10^{-6}$	3% 1%
Oxygen (O_2)	$10 \cdot 10^{-6}$ $25 \cdot 10^{-2}$	$25 \cdot 10^{-2}$ $99{,}8 \cdot 10^{-2}$	1% 0,3%
Sulphur dioxide (SO_2)	$0{,}1 \cdot 10^{-6}$ $1 \cdot 10^{-6}$ $100 \cdot 10^{-6}$	$1 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $3000 \cdot 10^{-6}$	5% 2% 1%
Water (H_2O)	$10 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	6,5%
CAPACITIVE and CHILLED MIRROR for			
Water (H_2O)	$10 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	6,5%
PARAMAGNETIC and ZIRCONIUM OXIDE for			
Oxygen (O_2)	$10 \cdot 10^{-6}$ $25 \cdot 10^{-2}$	$25 \cdot 10^{-2}$ $99{,}8 \cdot 10^{-2}$	1% 0,3%
LASER (TDL, QCL, OA-ICOS, CRDS) for			
Ammonia (NH_3)	$5 \cdot 10^{-6}$	$500 \cdot 10^{-6}$	3%
Carbon dioxide (CO_2)	$10 \cdot 10^{-6}$ $50 \cdot 10^{-2}$	$50 \cdot 10^{-2}$ $99{,}8 \cdot 10^{-2}$	1% 0,3%
Carbon monoxide (CO)	$1 \cdot 10^{-6}$ $10 \cdot 10^{-2}$	$10 \cdot 10^{-2}$ $90 \cdot 10^{-2}$	1% 0,3%
Methane (CH_4)	$1 \cdot 10^{-6}$ $50 \cdot 10^{-2}$	$50 \cdot 10^{-2}$ $99{,}8 \cdot 10^{-2}$	1% 0,3%
Nitric oxide (NO)	$0{,}12 \cdot 10^{-6}$ $0{,}4 \cdot 10^{-6}$	$0{,}4 \cdot 10^{-6}$ $2500 \cdot 10^{-6}$	3% 1%
Nitrogen dioxide (NO_2)	$5 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	3%
Nitrous oxide (N_2O)	$1 \cdot 10^{-6}$	$0{,}1 \cdot 10^{-2}$	1%
Oxygen (O_2)	$10 \cdot 10^{-6}$ $25 \cdot 10^{-2}$	$25 \cdot 10^{-2}$ $99{,}8 \cdot 10^{-2}$	1% 0,3%
Sulphur dioxide (SO_2)	$0{,}1 \cdot 10^{-6}$ $1 \cdot 10^{-6}$ $100 \cdot 10^{-6}$	$1 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ $3000 \cdot 10^{-6}$	5% 2% 1%
Water (H_2O)	$10 \cdot 10^{-6}$	$100 \cdot 10^{-6}$	6,5%

(*) The relative expanded uncertainties reported in the table are the minimum values that can be stated on the certificate.
The expanded uncertainty of the measurement is expressed as standard uncertainty multiplied by a coverage factor k=2 which, for a t-distribution characterized by calculated effective degrees of freedom, provides a level of confidence of approximatively 95%.
For gases whose concentrations are in consecutive measurement ranges, the certified relative expanded uncertainty is the highest.

The SIAD Group



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