



Certificate of Calibration

PRIMARY REFERENCE GAS MIXTURE

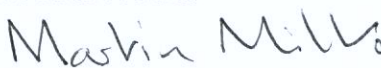
Cylinder Number: D64 1624

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CUSTOMER: Deutscher Wetterdienst**ADDRESS:** Meteorologisches Observatorium Hohenpeissenberg, Albin-Schwaiger-Weg
10, D-82383 Hohenpeissenberg, Germany**CALIBRATION DATE:** 2nd December 2009**DESCRIPTION:** 30 hydrocarbon species (ozone precursors) and 9 terpene species in nitrogen
AMOUNT FRACTIONS:

Species	Amount Fraction (nmol/mol)	Species	Amount Fraction (nmol/mol)
ethane	2.07 ± 0.04	2,2,4-trimethylpentane	2.00 ± 0.04
ethene	2.05 ± 0.04	octane	1.98 ± 0.04
propane	2.05 ± 0.04	toluene	1.97 ± 0.04
propene	2.01 ± 0.04	ethylbenzene	1.95 ± 0.04
2-methylpropane	2.04 ± 0.04	<i>m</i> -xylene	1.95 ± 0.04
butane	1.98 ± 0.04	<i>p</i> -xylene	1.93 ± 0.04
ethyne	2.04 ± 0.04	<i>o</i> -xylene	2.01 ± 0.04
<i>trans</i> -but-2-ene	1.98 ± 0.04	1,3,5-trimethylbenzene	2.01 ± 0.04
but-1-ene	1.95 ± 0.04	1,2,4-trimethylbenzene	2.08 ± 0.04
<i>cis</i> -but-2-ene	1.96 ± 0.04	1,2,3-trimethylbenzene	1.95 ± 0.04
2-methylbutane	1.98 ± 0.04	acetone	2.03 ± 0.30
pentane	2.01 ± 0.04	(+/-)- α -pinene	1.98 ± 0.06
1,3-butadiene	2.01 ± 0.04	myrcene	1.90 ± 0.10
<i>trans</i> -pent-2-ene	1.91 ± 0.04	+3-carene	1.98 ± 0.06
pent-1-ene	1.95 ± 0.04	limonene	2.09 ± 0.06
2-methylpentane	1.98 ± 0.04	<i>p</i> -cymene	1.99 ± 0.10
hexane	1.99 ± 0.04	<i>cis</i> -ocimene	2.03 ± 0.10
isoprene	4.00 ± 0.08	1,8-cineole	2.16 ± 0.11
heptane	1.96 ± 0.04	camphor	1.94 ± 0.19
benzene	2.00 ± 0.04		

The reported uncertainties of the results are based on standard uncertainties multiplied by a coverage factor of $k = 2$, providing a level of confidence of approximately 95%.

METHODS: Preparation: Gravimetry Analysis: Gas Chromatography (FID)**EXPIRY:** Certificate valid for 2 years from issue, excluding terpenes & acetone**PRESSURE:** Fill pressure: 100 bar; minimum utilisation pressure: 10 bar**STORAGE:** No special requirements**OUTLET:** DIN477 No.1 valve**TRACEABILITY:** The values on this certificate are traceable to NPL Primary Standards**INTENDED USE:** Calibration standard**Reference:** 2009100428**Date of issue:** 21st December 2009**Signed:**  (Authorised Signatory)**Name:** Dr M J T Milton (for Managing Director)**Checked by:** 