

## Key comparison CCQM-K90

MEASURAND : Mole fraction of formaldehyde (HCHO) in nitrogen

Nominal value : ~ 2  $\mu\text{mol/mol}$

|          |  |
|----------|--|
| $t$      | time in days   |
| $a_1$    | loss rate  |
| $x_0$    | HCHO mole fraction extrapolated to 14 Aug 2014 ( $t = 0$ ) |
| $x_i$    | reported values at time $t$                                |
| $u(x_i)$ | standard uncertainty of $x_i$                              |
| $x_R$    | reference value at time $t$                                |
| $u(x_R)$ | standard uncertainty of $x_R$                              |

| Lab $i$ | Cylinder | Day M       | $t / \text{d}$ | $a_1$<br>/ ( $\mu\text{mol/mol}$ ) / d | $x_0$<br>/ ( $\mu\text{mol/mol}$ ) | $x_i$<br>/ ( $\mu\text{mol/mol}$ ) | $u(x_i)$<br>/ ( $\mu\text{mol/mol}$ ) | $x_{Ri}$<br>/ ( $\mu\text{mol/mol}$ ) | $u(x_{Ri})$<br>/ ( $\mu\text{mol/mol}$ ) |
|---------|----------|-------------|----------------|--|------------------------------------|------------------------------------|---------------------------------------|---------------------------------------|--|
| BIPM    | C6       | 2 Sep 2015  | 384.00         | $-3.81 \cdot 10^{-5}$                  | 1.9682                             | 1.967                              | 0.044                                 | 1.960                                 | 0.004                                    |
| KRISS   | C12      | 23 Sep 2015 | 385.00         | $-5.95 \cdot 10^{-5}$                  | 2.0345                             | 2.029                              | 0.013                                 | 2.022                                 | 0.004                                    |
| LNE     | C13      | 17 Sep 2015 | 399.00         | $-6.89 \cdot 10^{-5}$                  | 2.0750                             | 2.097                              | 0.014                                 | 2.059                                 | 0.004                                    |
| NIM     | C7       | 10 Aug 2015 | 361.00         | $-8.54 \cdot 10^{-5}$                  | 2.0386                             | 1.976                              | 0.020                                 | 2.022                                 | 0.004                                    |
| NMIJ    | C14      | 24 Jul 2015 | 344.00         | $-6.91 \cdot 10^{-5}$                  | 2.0697                             | 2.063                              | 0.005                                 | 2.058                                 | 0.004                                    |
| NPL     | C2       | 19 Aug 2015 | 370.00         | $-5.87 \cdot 10^{-5}$                  | 2.0361                             | 2.088                              | 0.026                                 | 2.024                                 | 0.004                                    |
| VNIIM   | C11      | 25 Aug 2015 | 376.00         | $-6.73 \cdot 10^{-5}$                  | 2.0678                             | 2.150                              | 0.030                                 | 2.054                                 | 0.004                                    |
| VSL     | C8       | 28 Aug 2015 | 379.00         | $-6.11 \cdot 10^{-5}$                  | 2.0546                             | 1.960                              | 0.035                                 | 2.031                                 | 0.005                                    |

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The key comparison reference value,  $x_{R,i}$ , for each cylinder is identical to the determination made by the BIPM, using their largest uncertainty.

The degree of equivalence of each laboratory  $i$  with respect to the key comparison reference value is given by a pair of terms:

$D_i = (x_i - x_{R,i})$  and its expanded uncertainty  $U_i$  ( $k = 2$ ), where  $U_i^2 = 4 [(u(x_i))^2 + (u(x_{R,i}))^2]$  both expressed in µmol/mol.

|              | $D_i$        | $U_i$ |
|--------------|--------------|-------|
|              | / (µmol/mol) |       |
| <b>BIPM</b>  | 0.007        | 0.011 |
| <b>KRISS</b> | 0.007        | 0.026 |
| <b>LNE</b>   | 0.038        | 0.029 |
| <b>NIM</b>   | -0.046       | 0.041 |
| <b>NMIJ</b>  | 0.005        | 0.012 |
| <b>NPL</b>   | 0.064        | 0.053 |
| <b>VNIIM</b> | 0.096        | 0.061 |
| <b>VSL</b>   | -0.071       | 0.071 |

CCQM-K90: formaldehyde (HCHO) in nitrogen  
at a nominal value of 2  $\mu\text{mol/mol}$

Degrees of equivalence [ $D_i$  and its expanded uncertainty ( $k = 2$ ),  $U_i$ ]

