

Key comparison CCQM-K3

MEASURAND: Amount-of-substance fraction of automotive emission gases:
Carbon monoxide, Carbon dioxide and Propane in Nitrogen

NOMINAL VALUES: Carbon monoxide 32 mmol/mol
Carbon dioxide 135 mmol/mol
Propane 2.05 mmol/mol
Nitrogen balance

x_i : result of measurement carried out by laboratory i

u_i : combined standard uncertainty of x_i

$x_{i\text{grav}}$: gravimetric value of the gas amount-of-substance fraction in the cylinder received by laboratory i

$u_{i\text{gravR}}$: combined standard uncertainty of $x_{i\text{grav}}$

$u_{i\text{gravR}} = (u_{i\text{grav}}^2 + u_{i\text{ver}}^2)^{1/2}$, where $u_{i\text{grav}}$ and $u_{i\text{ver}}$ are respectively the combined standard uncertainties of the gravimetric production process and of the analytical verification of the gravimetric value

$u_{i\text{grav}} = 0.0002 \cdot x_{i\text{grav}}$ and $u_{i\text{ver}} = 0.0003 \cdot x_{i\text{grav}}$, both in mmol/mol, for Carbon monoxide

$u_{i\text{grav}} = 0.00003 \cdot x_{i\text{grav}}$ and $u_{i\text{ver}} = 0.0003 \cdot x_{i\text{grav}}$, both in mmol/mol, for Carbon dioxide

$u_{i\text{grav}} = 0.00012 \cdot x_{i\text{grav}}$ and $u_{i\text{ver}} = 0.00056 \cdot x_{i\text{grav}}$, both in mmol/mol, for Propane

Lab i	gas	x_i mmol/mol	u_i mmol/mol	$x_{i\text{grav}}$ mmol/mol	$u_{i\text{gravR}}$ mmol/mol	Date of measurement
OMH						
Cylinder 103732						
	Carbon monoxide	31.963	0.015	31.981	0.0115	Oct 98
	Carbon dioxide	135.060	0.055	134.910	0.0407	Oct 98
	Propane	2.0512	0.0012	2.0518	0.00118	Oct 98
BAM						
Cylinder 103729						
	Carbon monoxide	32.080	0.080	32.043	0.0116	Nov 98
	Carbon dioxide	134.900	0.350	134.890	0.0407	Nov 98
	Propane	2.0590	0.0050	2.0499	0.00117	Nov 98
NIST						
Cylinder 103730						
	Carbon monoxide	32.004	0.104	32.024	0.0115	Sept 98
	Carbon dioxide	135.130	0.113	134.960	0.0407	Sept 98
	Propane	2.0520	0.0069	2.0514	0.00117	Nov 98

Lab i	gas	x_i mmol/mol	u_i mmol/mol	$x_{i\text{grav}}$ mmol/mol	$u_{i\text{gravR}}$ mmol/mol	Date of measurement
NMi-VSL						
Cylinder 103738						
	Carbon monoxide	31.860	0.060	31.888	0.0115	Nov 98
	Carbon dioxide	135.100	0.110	135.080	0.0407	Nov 98
	Propane	2.0614	0.0016	2.0614	0.00118	Nov 98
NMIJ						
Cylinder 103731						
	Carbon monoxide	31.974	0.027	32.014	0.0115	Nov 98
	Carbon dioxide	135.148	0.053	135.140	0.0407	Nov 98
	Propane	2.0487	0.0009	2.0487	0.00117	Nov 98
NRCCRM						
Cylinder 103734						
	Carbon monoxide	32.000	0.053	31.960	0.0115	Oct 98
	Carbon dioxide	135.000	0.233	134.940	0.0407	Oct 98
	Propane	2.0520	0.0033	2.0550	0.00118	Oct 98

Key comparison CCQM-K3 (Continued)

MEASURAND: Amount-of-substance fraction of automotive emission gases:
Carbon monoxide, Carbon dioxide and Propane in Nitrogen

NOMINAL VALUES: Carbon monoxide 32 mmol/mol
Carbon dioxide 135 mmol/mol
Propane 2.05 mmol/mol
Nitrogen balance

Lab <i>i</i>	gas	x_i mmol/mol	u_i mmol/mol	$x_{i\text{grav}}$ mmol/mol	$u_{i\text{gravR}}$ mmol/mol	Date of measurement
SMU						
Cylinder 103735						
	Carbon monoxide	31.800	0.046	32.025	0.0115	Oct 98
	Carbon dioxide	135.710	0.275	135.000	0.0407	Oct 98
	Propane	2.0530	0.0150	2.0508	0.00117	Oct 98
KRISS						
Cylinder 103733						
	Carbon monoxide	32.026	0.013	32.041	0.0116	Nov 98
	Carbon dioxide	134.960	0.021	134.980	0.0407	Nov 98
	Propane	2.0508	0.0011	2.0495	0.00117	Nov 98
PTB						
Cylinder 103736						
	Carbon monoxide	32.030	0.032	32.004	0.0115	Nov 98
	Carbon dioxide	135.220	0.080	134.920	0.0407	Nov 98
	Propane	2.0450	0.0065	2.0528	0.00118	Nov 98
METAS						
Cylinder 103737						
	Carbon monoxide	32.080	0.035	32.106	0.0116	Oct 98
	Carbon dioxide	134.800	0.150	134.880	0.0407	Oct 98
	Propane	2.0450	0.0025	2.0609	0.00118	Oct 98

Lab <i>i</i>	gas	x_i mmol/mol	u_i mmol/mol	$x_{i\text{grav}}$ mmol/mol	$u_{i\text{gravR}}$ mmol/mol	Date of measurement
BNM-LNE						
Cylinder 103727						
	Carbon monoxide	31.690	0.150	31.972	0.0115	Jan 99
	Carbon dioxide	135.370	0.200	135.090	0.0407	Jan 99
	Propane	2.0502	0.0020	2.0532	0.00118	Jan 99
VNIIM						
Cylinder 103728						
	Carbon monoxide	32.280	0.090	31.987	0.0115	Dec 98
	Carbon dioxide	135.000	0.250	135.050	0.0407	Dec 98
	Propane	2.0460	0.0040	2.0537	0.00118	Dec 98
NPL						
Cylinder 103726						
	Carbon monoxide	31.968	0.032	31.953	0.0115	Oct 98
	Carbon dioxide	135.050	0.135	135.130	0.0407	Oct 98
	Propane	2.0582	0.0031	2.0532	0.00118	Oct 98

Key comparison EUROMET.QM-K3

MEASURAND: Amount-of-substance fraction of automotive emission gases:
Carbon monoxide, Carbon dioxide and Propane in Nitrogen

NOMINAL VALUES: Carbon monoxide 32 mmol/mol
Carbon dioxide 135 mmol/mol
Propane 2.05 mmol/mol
Nitrogen balance

$x_{i\text{-EUR}}$: result of measurement carried out by laboratory i

$u_{i\text{-EUR}}$: combined standard uncertainty of $x_{i\text{-EUR}}$

$x_{i\text{grav-EUR}}$: gravimetric value of the gas amount-of-substance fraction in the cylinder received by laboratory i

$u_{i\text{gravR-EUR}}$: combined standard uncertainty of $x_{i\text{grav-EUR}}$

$u_{i\text{gravR-EUR}} = (u_{i\text{grav-EUR}}^2 + u_{i\text{ver-EUR}}^2)^{1/2}$, where $u_{i\text{grav-EUR}}$ and $u_{i\text{ver-EUR}}$ are respectively the combined standard uncertainties of the gravimetric production process and of the analytical verification of the gravimetric value

$u_{i\text{grav-EUR}} = 0.0002 \cdot x_{i\text{grav-EUR}}$ and $u_{i\text{ver-EUR}} = 0.0003 \cdot x_{i\text{grav-EUR}}$, both in mmol/mol, for Carbon monoxide

$u_{i\text{grav-EUR}} = 0.00003 \cdot x_{i\text{grav-EUR}}$ and $u_{i\text{ver-EUR}} = 0.0003 \cdot x_{i\text{grav-EUR}}$, both in mmol/mol, for Carbon dioxide

$u_{i\text{grav-EUR}} = 0.00012 \cdot x_{i\text{grav-EUR}}$ and $u_{i\text{ver-EUR}} = 0.00056 \cdot x_{i\text{grav-EUR}}$, both in mmol/mol, for Propane

Lab i gas	$x_{i\text{-EUR}}$ mmol/mol	$u_{i\text{-EUR}}$ mmol/mol	$x_{i\text{grav-EUR}}$ mmol/mol	$u_{i\text{gravR-EUR}}$ mmol/mol	Date of measurement
SMU					
Cylinder 209534					
Carbon monoxide	31.030	0.047	31.016	0.0112	Jan 00
Carbon dioxide	132.050	0.125	132.021	0.0398	Jan 00
Propane	2.0900	0.0055	2.0856	0.00119	Jan 00
IMGC					
Cylinder 200634					
Carbon monoxide	-	-	-	-	-
Carbon dioxide	131.700	2.550	132.016	0.0398	May 00
Propane	2.0130	0.0360	2.0870	0.00120	May 00
IPQ					
Cylinder 207381					
Carbon monoxide	31.060	0.055	31.033	0.0112	Feb 00
Carbon dioxide	131.850	0.230	131.772	0.0397	Feb 00
Propane	2.0870	0.0025	2.0868	0.00120	Feb 00

Lab i gas	$x_{i\text{-EUR}}$ mmol/mol	$u_{i\text{-EUR}}$ mmol/mol	$x_{i\text{grav-EUR}}$ mmol/mol	$u_{i\text{gravR-EUR}}$ mmol/mol	Date of measurement
CSIR-NML					
Cylinder 200601					
Carbon monoxide	30.780	0.230	31.040	0.0112	Mar 00
Carbon dioxide	132.320	2.170	131.999	0.0398	Mar 00
Propane	-	-	-	-	-
GUM					
Cylinder 207375					
Carbon monoxide	31.050	0.055	31.045	0.0112	Mar 00
Carbon dioxide	132.350	0.055	132.143	0.0398	Mar 00
Propane	2.0870	0.0031	2.0876	0.00120	Mar 00
CMI					
Cylinder 207377					
Carbon monoxide	30.400	2.200	31.052	0.0112	Jan 00
Carbon dioxide	-	-	-	-	-
Propane	2.2100	0.0750	2.0881	0.00120	Jan 00

Key comparison APMP.QM-K3

MEASURAND: Amount-of-substance fraction of automotive emission gases:
Carbon monoxide, Carbon dioxide and Propane in Nitrogen

NOMINAL VALUES: Carbon monoxide 28 mmol/mol
Carbon dioxide 124 mmol/mol
Propane 1.95 mmol/mol
Nitrogen balance

x_{i-APMP} : result of measurement carried out by laboratory *i*

u_{i-APMP} : combined standard uncertainty of x_{i-APMP}

$x_{i\text{grav-APMP}}$: gravimetric value of the gas amount-of-substance fraction in the cylinder received by laboratory *i*

$u_{i\text{gravR-APMP}}$: combined standard uncertainty of $x_{i\text{grav-APMP}}$

$u_{i\text{gravR-APMP}} = (u_{i\text{grav-APMP}}^2 + u_{i\text{ver-APMP}}^2)^{1/2}$, where $u_{i\text{grav-APMP}}$ and $u_{i\text{ver-APMP}}$ are respectively the combined standard uncertainties of the gravimetric production process and of the analytical verification of the gravimetric value.

The relative expanded uncertainty ($k = 2$) linked to the verification process is estimated to be equal to 0.10%.

Lab <i>i</i>	gas	x_{i-APMP} mmol/mol	u_{i-APMP} mmol/mol	$x_{i\text{grav-APMP}}$ mmol/mol	$u_{i\text{gravR-APMP}}$ mmol/mol	Date of measurement
NMIJ						
Cylinder MD2534						
	Carbon monoxide	28.72	0.06	28.72	0.014	May 01
	Carbon dioxide	123.61	0.11	123.55	0.06	May 01
	Propane	1.9339	0.0016	1.9365	0.0010	May 01
CMS/ITRI						
Cylinder MD2524						
	Carbon monoxide	27.79	0.02	27.86	0.014	Oct 00
	Carbon dioxide	124.02	0.05	124.09	0.06	Oct 00
	Propane	1.9400	0.0085	1.9515	0.0010	Oct 00
CSIR-NML						
Cylinder MD2514						
	Carbon monoxide	28.17	0.80	28.11	0.014	Oct 00
	Carbon dioxide	123.22	1.80	122.97	0.06	Oct 00
	Propane	-	-	-	-	-

Lab <i>i</i>	gas	x_{i-APMP} mmol/mol	u_{i-APMP} mmol/mol	$x_{i\text{grav-APMP}}$ mmol/mol	$u_{i\text{gravR-APMP}}$ mmol/mol	Date of measurement
KRISS						
Cylinder MC9940						
	Carbon monoxide	27.55	0.03	27.59	0.014	Jun 01
	Carbon dioxide	124.11	0.07	124.16	0.06	Jun 01
	Propane	1.9547	0.0020	1.9526	0.0010	Jun 01

Key comparison COOMET.QM-K3

MEASURAND: Amount-of-substance fraction of automotive emission gases:
Carbon monoxide, Carbon dioxide and Propane in Nitrogen

NOMINAL VALUES: Carbon monoxide 30 mmol/mol
Carbon dioxide 135 mmol/mol
Propane 2 mmol/mol
Nitrogen balance

$x_{i\text{-COO}}$: result of measurement carried out by laboratory *i*

$U_{\text{Lab } i\text{-COO}}$: expanded uncertainty ($k = 2$) of $x_{i\text{-COO}}$

$x_{i\text{grav-COO}}$: gravimetric value of the gas amount-of-substance fraction in the cylinder received by laboratory *i*

$U_{i\text{gravR-COO}}$: expanded uncertainty ($k = 2$) of $x_{i\text{grav-COO}}$

$U_{i\text{gravR-COO}} / 2 = (u_{i\text{grav-COO}}^2 + u_{i\text{ver-COO}}^2)^{1/2}$, where $u_{i\text{grav-COO}}$ and $u_{i\text{ver-COO}}$ are respectively the combined standard uncertainties of the gravimetric production process and of the analytical verification of the gravimetric value.

Lab <i>i</i> gas	$x_{i\text{-COO}}$	$U_{\text{Lab } i\text{-COO}}$	$x_{i\text{grav-COO}}$	$U_{i\text{gravR-COO}}$	Date of measurement
	/ (10^{-2} mol/mol)				
VNIIM					
Cylinder 6562					
Carbon monoxide	2.980	0.006	2.979	0.002	2005
Carbon dioxide	13.557	0.013	13.545	0.0012	2005
Propane	0.2002	0.0003	0.2001	0.0002	2005
UkrCSM					
Cylinder 0138					
Carbon monoxide	2.951	0.012	2.962	0.002	2005
Carbon dioxide	13.586	0.022	13.600	0.0014	2005
Propane	0.1990	0.0004	0.1991	0.0002	2005
BelGIM					
Cylinder 0128					
Carbon monoxide	2.96	0.02	2.966	0.002	2005
Carbon dioxide	13.6	0.1	13.514	0.0014	2005
Propane	0.198	0.002	0.1984	0.0002	2005

Lab <i>i</i> gas	$x_{i\text{-COO}}$	$U_{\text{Lab } i\text{-COO}}$	$x_{i\text{grav-COO}}$	$U_{i\text{gravR-COO}}$	Date of measurement
	/ (10^{-2} mol/mol)				
BAM					
Cylinder ML 6617					
Carbon monoxide	2.9816	0.0149	2.986	0.002	2005
Carbon dioxide	13.5076	0.0405	13.499	0.0013	2005
Propane	0.2009	0.0012	0.1999	0.0002	2005

Key comparison CCQM-K3

Key comparison reference value: there is no single reference value for this comparison, the value $x_{i\text{grav}}$ is taken as the reference value for laboratory i .

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

$D_i = (x_i - x_{i\text{grav}})$ and U_i , its expanded uncertainty ($k = 2$), both expressed in mmol/mol, $U_i = 2(u_i^2 + u_{i\text{gravR}}^2)^{1/2}$.

The degree of equivalence between two laboratories is given by a pair of terms: $D_{ij} = D_i - D_j = (x_i - x_{i\text{grav}}) - (x_j - x_{j\text{grav}})$ and

U_{ij} , its expanded uncertainty ($k = 2$), both expressed in mmol/mol, $U_{ij} = 2(u_i^2 + u_j^2 + u_{i\text{grav}}^2 + u_{j\text{grav}}^2)^{1/2}$.

Key comparison EUROMET.QM-K3

The gravimetric value $x_{i\text{grav-EUR}}$ is taken as reference value for laboratory i participant in EUROMET.QM-K3.

The degree of equivalence of laboratory i participant in EUROMET.QM-K3 with respect to the reference value is given

by a pair of terms: $D_{i\text{-EUR}} = (x_{i\text{-EUR}} - x_{i\text{grav-EUR}})$ and $U_{i\text{-EUR}}$, its expanded uncertainty ($k = 2$), both expressed in

mmol/mol, $U_{i\text{-EUR}} = 2(u_{i\text{-EUR}}^2 + u_{i\text{gravR-EUR}}^2)^{1/2}$.

Key comparison APMP.QM-K3

The gravimetric value $x_{i\text{grav-APMP}}$ is taken as reference value for laboratory i participant in APMP.QM-K3.

The degree of equivalence of laboratory i participant in APMP.QM-K3 with respect to the reference value is given

by a pair of terms: $D_{i\text{-APMP}} = (x_{i\text{-APMP}} - x_{i\text{grav-APMP}})$ and $U_{i\text{-APMP}}$, its expanded uncertainty ($k = 2$), both expressed in

mmol/mol, $U_{i\text{-APMP}} = 2(u_{i\text{-APMP}}^2 + u_{i\text{gravR-APMP}}^2)^{1/2}$.

Key comparison COOMET.QM-K3

The gravimetric value $x_{i\text{grav-COO}}$ is taken as reference value for laboratory i participant in COOMET.QM-K3.

The degree of equivalence of laboratory i participant in COOMET.QM-K3 with respect to the reference value is given

by a pair of terms: $D_{i\text{-COO}} = (x_{i\text{-COO}} - x_{i\text{grav-COO}})$ and $U_{i\text{-COO}}$, its expanded uncertainty ($k = 2$), both expressed in mmol/mol,

$U_{i\text{-COO}} = (U_{\text{Lab } i\text{-COO}}^2 + U_{i\text{gravR-COO}}^2)^{1/2}$ (since uncertainties are all expanded with $k = 2$). Relative values, expressed in %, are also calculated.

Linking EUROMET.QM-K3, APMP.QM-K3 and COOMET.QM-K3 to CCQM-K3

The regional QM-K3 key comparisons are linked to CCQM-K3 through the gravimetric values.

It follows that the degrees of equivalence with respect to the reference values obtained in the regional QM-K3 key comparisons are

transferred to CCQM-K3 without correction: $D_i = D_{i\text{-RMO}}$ and $U_i = U_{i\text{-RMO}}$, with "RMO" = "EUR" or "APMP" or "COO" according to the case.

The degree of equivalence between two laboratories i and j , one and the other participant in any one of the four comparisons,

is given by a pair of terms: $D_{ij} = D_i - D_j$ and U_{ij} , its expanded uncertainty ($k = 2$), both expressed in mmol/mol,

$U_{ij} = 2(u_i^2 + u_j^2 + u_{i\text{grav}}^2 + u_{j\text{grav}}^2)^{1/2}$, with indexes "-EUR", "-R-APMP", and "-R-COO" when necessary.

These statements make it possible to extend the CCQM-K3 matrices of equivalence to participants in the regional QM-K3 key comparisons.

In the following, not all pair-wise degrees of equivalence are explicitly computed.

Key comparisons EUROMET.QM-K3, APMP.QM-K3, and COOMET.QM-K3 linked to key comparison CCQM-K3

MEASURAND: Amount-of-substance fraction of automotive emission gases:
Carbon monoxide, nominal value ~ 30 mmol/mol

Lab *i* ↓ Lab *j* →

	D_i	U_i	OMH		BAM		NIST		NMI-VSL		NMIJ		NRCCRM		SMU		KRISS		PTB	
	/ (mmol/mol)		D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}
			/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)	
OMH	-0.018	0.038																		
BAM	0.037	0.162			-0.055	0.164	0.002	0.211	0.010	0.125	0.022	0.064	-0.058	0.112	0.207	0.098	-0.003	0.043	-0.044	0.072
NIST	-0.020	0.209	0.055	0.164			0.057	0.263	0.065	0.201	0.077	0.170	-0.003	0.193	0.262	0.185	0.052	0.163	0.011	0.173
NMI-VSL	-0.028	0.122	-0.002	0.211	-0.057	0.263			0.008	0.241	0.020	0.216	-0.060	0.234	0.205	0.228	-0.005	0.210	-0.046	0.218
NMIJ	-0.040	0.059	-0.010	0.125	-0.065	0.201	-0.008	0.241			0.012	0.133	-0.068	0.162	0.197	0.152	-0.013	0.124	-0.054	0.137
NRCCRM	0.040	0.109	-0.022	0.064	-0.077	0.170	-0.020	0.216	-0.012	0.133			-0.080	0.121	0.185	0.107	-0.025	0.062	-0.066	0.085
SMU	-0.225	0.094	0.058	0.112	0.003	0.193	0.060	0.234	0.068	0.162	0.080	0.121			0.265	0.141	0.055	0.111	0.014	0.125
KRISS	-0.015	0.034	-0.207	0.098	-0.262	0.185	-0.205	0.228	-0.197	0.152	-0.185	0.107	-0.265	0.141			-0.210	0.096	-0.251	0.112
PTB	0.026	0.067	0.003	0.043	-0.052	0.163	0.005	0.210	0.013	0.124	0.025	0.062	-0.055	0.111	0.210	0.096			-0.041	0.070
METAS	-0.026	0.074	0.044	0.072	-0.011	0.173	0.046	0.218	0.054	0.137	0.066	0.085	-0.014	0.125	0.251	0.112	0.041	0.070		
BNM-LNE	-0.282	0.301	-0.008	0.078	-0.063	0.176	-0.006	0.220	0.002	0.140	0.014	0.090	-0.066	0.129	0.199	0.116	-0.011	0.077	-0.052	0.096
VNIIM	0.293	0.181	-0.264	0.302	-0.319	0.340	-0.262	0.365	-0.254	0.324	-0.242	0.305	-0.322	0.319	-0.057	0.314	-0.267	0.302	-0.308	0.307
NPL	0.015	0.068	0.311	0.183	0.256	0.242	0.313	0.276	0.321	0.217	0.333	0.189	0.253	0.210	0.518	0.203	0.308	0.183	0.267	0.192
			0.033	0.073	-0.022	0.173	0.035	0.218	0.043	0.137	0.055	0.086	-0.025	0.126	0.240	0.113	0.030	0.071	-0.011	0.092
SMU	0.014	0.096	0.032	0.099	-0.023	0.186	0.034	0.228	0.042	0.153	0.054	0.109	-0.026	0.143			0.029	0.098	-0.012	0.114
IPQ	0.027	0.112	0.045	0.115	-0.010	0.195	0.047	0.236	0.055	0.164	0.067	0.124	-0.013	0.154			0.042	0.114	0.001	0.128
CSIR-NML	-0.260	0.461	-0.242	0.461	-0.297	0.487	-0.240	0.505	-0.232	0.476	-0.220	0.464	-0.300	0.473			-0.245	0.461	-0.286	0.465
GUM	0.005	0.112	0.023	0.115	-0.032	0.195	0.025	0.236	0.033	0.164	0.045	0.124	-0.035	0.154			0.020	0.114	-0.021	0.128
CMI	-0.652	4.400	-0.634	4.400	-0.689	4.403	-0.632	4.405	-0.624	4.402	-0.612	4.400	-0.692	4.401			-0.637	4.400	-0.678	4.400
NMIJ	0.01	0.12																		
CMS/ITRI	-0.07	0.05																		
CSIR-NML	0.06	1.60																		
KRISS	-0.04	0.06																		
VNIIM	0.01	0.06																		
UkrCSM	-0.11	0.12																		
BelGIM	-0.06	0.20																		
BAM	-0.04	0.15																		

$D_i / x_{i \text{ grav}}$	$U_i / x_{i \text{ grav}}$	
/ %		
0.03	0.21	
-0.37	0.41	
-0.20	0.68	
-0.15	0.50	

Participant in CCQM-K3
Participant in EUROMET.QM-K3
Participant in APMP.QM-K3
Participant in COOMET.QM-K3

Key comparisons EUROMET.QM-K3, APMP.QM-K3, and COOMET.QM-K3 linked to key comparison CCQM-K3

MEASURAND: Amount-of-substance fraction of automotive emission gases:

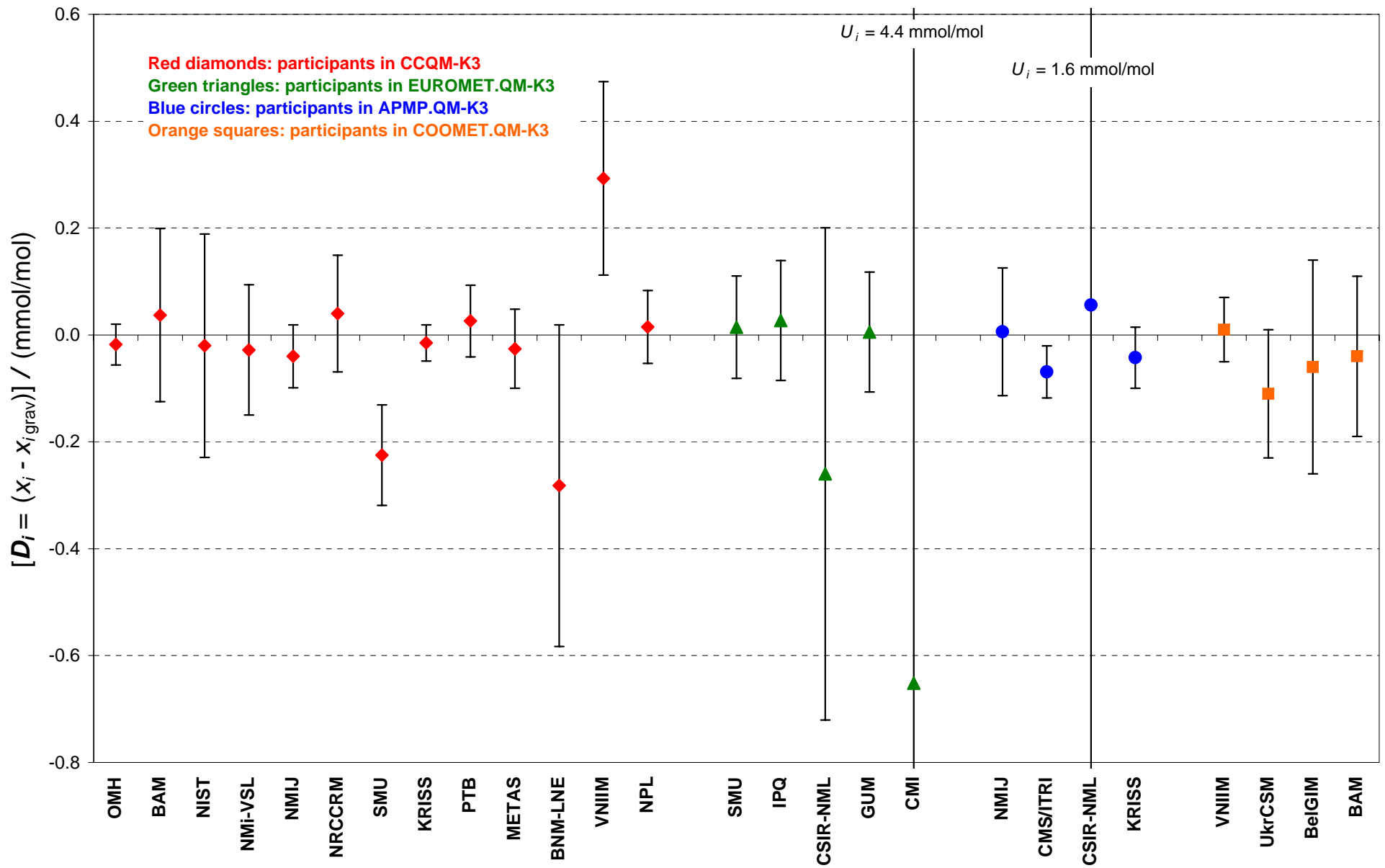
Carbon monoxide, nominal value ~ 30 mmol/mol

Lab <i>i</i>	Lab <i>j</i> →		METAS		BNM-LNE		VNIIM		NPL		SMU		IPQ		CSIR-NML		GUM		CMI	
	<i>D_i</i>	<i>U_i</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>
	/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)	
OMH	-0.018	0.038	0.008	0.078	0.264	0.302	-0.311	0.183	-0.033	0.073	-0.032	0.099	-0.045	0.115	0.242	0.461	-0.023	0.115	0.634	4.400
BAM	0.037	0.162	0.063	0.176	0.319	0.340	-0.256	0.242	0.022	0.173	0.023	0.186	0.010	0.195	0.297	0.487	0.032	0.195	0.689	4.403
NIST	-0.020	0.209	0.006	0.220	0.262	0.365	-0.313	0.276	-0.035	0.218	-0.034	0.228	-0.047	0.236	0.240	0.505	-0.025	0.236	0.632	4.405
NMi-VSL	-0.028	0.122	-0.002	0.140	0.254	0.324	-0.321	0.217	-0.043	0.137	-0.042	0.153	-0.055	0.164	0.232	0.476	-0.033	0.164	0.624	4.402
NMIJ	-0.040	0.059	-0.014	0.090	0.242	0.305	-0.333	0.189	-0.055	0.086	-0.054	0.109	-0.067	0.124	0.220	0.464	-0.045	0.124	0.612	4.400
NRCCRM	0.040	0.109	0.066	0.129	0.322	0.319	-0.253	0.210	0.025	0.126	0.026	0.143	0.013	0.154	0.300	0.473	0.035	0.154	0.692	4.401
SMU	-0.225	0.094	-0.199	0.116	0.057	0.314	-0.518	0.203	-0.240	0.113										
KRISS	-0.015	0.034	0.011	0.077	0.267	0.302	-0.308	0.183	-0.030	0.071	-0.029	0.098	-0.042	0.114	0.245	0.461	-0.020	0.114	0.637	4.400
PTB	0.026	0.067	0.052	0.096	0.308	0.307	-0.267	0.192	0.011	0.092	0.012	0.114	-0.001	0.128	0.286	0.465	0.021	0.128	0.678	4.400
METAS	-0.026	0.074			0.256	0.309	-0.319	0.194	-0.041	0.097	-0.040	0.118	-0.053	0.132	0.234	0.466	-0.031	0.132	0.626	4.401
BNM-LNE	-0.282	0.301	-0.256	0.309			-0.575	0.350	-0.297	0.307	-0.296	0.315	-0.309	0.320	-0.022	0.549	-0.287	0.320	0.370	4.410
VNIIM	0.293	0.181	0.319	0.194	0.575	0.350			0.278	0.192	0.279	0.203	0.266	0.212	0.553	0.494	0.288	0.212	0.945	4.404
NPL	0.015	0.068	0.041	0.097	0.297	0.307	-0.278	0.192			0.001	0.114	-0.012	0.129	0.275	0.465	0.010	0.129	0.667	4.401
SMU	0.014	0.096	0.040	0.118	0.296	0.315	-0.279	0.203	-0.001	0.114			-0.013	0.145	0.275	0.470	0.009	0.145	0.666	4.401
IPQ	0.027	0.112	0.053	0.132	0.309	0.320	-0.266	0.212	0.012	0.129	0.013	0.145			0.287	0.473	0.022	0.157	0.679	4.401
CSIR-NML	-0.260	0.461	-0.234	0.466	0.022	0.549	-0.553	0.494	-0.275	0.465	-0.275	0.470	-0.287	0.473			-0.265	0.473	0.392	4.424
GUM	0.005	0.112	0.031	0.132	0.287	0.320	-0.288	0.212	-0.010	0.129	-0.009	0.145	-0.022	0.157	0.265	0.473			0.657	4.401
CMI	-0.652	4.400	-0.626	4.401	-0.370	4.410	-0.945	4.404	-0.667	4.401	-0.666	4.401	-0.679	4.401	-0.392	4.424	-0.657	4.401		

	NMIJ		CMS/ITRI		CSIR-NML		KRISS	
	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>
	/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)	
NMIJ			0.07	0.13	-0.05	1.60	0.05	0.13
CMS/ITRI	-0.07	0.13			-0.13	1.60	-0.03	0.08
CSIR-NML	0.05	1.60	0.13	1.60			0.10	1.60
KRISS	-0.05	0.13	0.03	0.08	-0.10	1.60		

	VNIIM		UkrCSM		BelGIM		BAM	
	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>
	/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)	
VNIIM			0.12	0.14	0.07	0.21	0.05	0.16
UkrCSM	-0.12	0.14			-0.05	0.24	-0.07	0.19
BelGIM	-0.07	0.21	0.05	0.24			-0.02	0.25
BAM	-0.05	0.16	0.07	0.19	0.02	0.25		

CCQM-K3, EUROMET.QM-K3, APMP.QM-K3, and COOMET.QM-K3: Automotive emission gases
 Degrees of equivalence $[D_i, U_i (k = 2)]$ for Carbon monoxide, Nominal value ~ 30 mmol/mol



Key comparisons EUROMET.QM-K3, APMP.QM-K3, and COOMET.QM-K3 linked to key comparison CCQM-K3

MEASURAND: Amount-of-substance fraction of automotive emission gases:
Carbon dioxide, nominal value ~ 135 mmol/mol

		Lab <i>i</i> ↓		Lab <i>j</i> →																	
		D_i	U_i	OMH		BAM		NIST		NMI-VSL		NMIJ		NRCCRM		SMU		KRISS		PTB	
		/ (mmol/mol)		D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}
OMH		0.15	0.14																		
BAM		0.01	0.70			0.14	0.71														
NIST		0.17	0.24					-0.02	0.25												
NMI-VSL		0.02	0.23							0.13	0.25										
NMIJ		0.01	0.13									0.14	0.15								
NRCCRM		0.06	0.47											0.09	0.48						
SMU		0.71	0.56													-0.56	0.56				
KRISS		-0.02	0.09															0.17	0.12		
PTB		0.30	0.18																	-0.15	0.19
METAS		-0.08	0.31																		
BNM-LNE		0.28	0.41																		
VNIIM		-0.05	0.51																		
NPL		-0.08	0.28																		
SMU		0.03	0.26																		
IMGC		-0.32	5.10																		
IPQ		0.08	0.47																		
CSIR-NML		0.32	4.34																		
GUM		0.21	0.14																		
NMIJ		0.06	0.25																		
CMS/ITRI		-0.07	0.16																		
CSIR-NML		0.25	3.60																		
KRISS		-0.05	0.18																		
VNIIM		0.12	0.13																		
UkrCSM		-0.14	0.22																		
BelGIM		0.86	1.00																		
BAM		0.09	0.41																		

$D_i / x_{i\text{grav}}$	$U_i / x_{i\text{grav}}$	$U_i / I\%$
0.09	0.10	
-0.10	0.16	
0.64	0.74	
0.06	0.30	

	Participant in CCQM-K3
	Participant in EUROMET.QM-K3
	Participant in APMP.QM-K3
	Participant in COOMET.QM-K3

Key comparisons EUROMET.QM-K3, APMP.QM-K3, and COOMET.QM-K3 linked to key comparison CCQM-K3

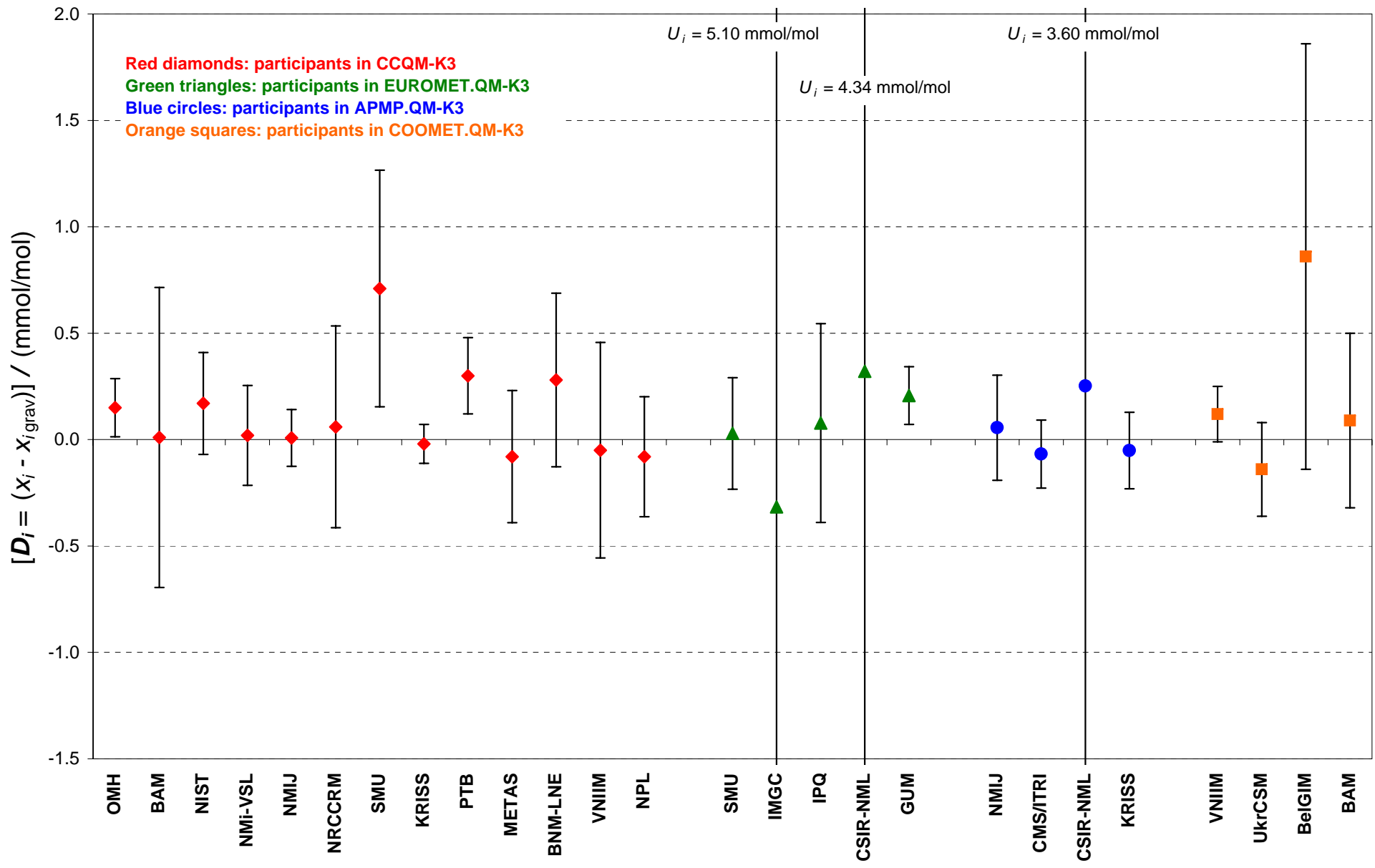
MEASURAND: Amount-of-substance fraction of automotive emission gases:
Carbon dioxide, nominal value ~ 135 mmol/mol

Lab <i>i</i>	Lab <i>j</i> →		METAS		BNM-LNE		VNIIM		NPL		SMU		IMGC		IPQ		CSIR-NML		GUM	
	<i>D_i</i>	<i>U_i</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>
	/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)	
OMH	0.15	0.14	0.23	0.32	-0.13	0.42	0.20	0.51	0.23	0.29	0.12	0.27	0.47	5.10	0.07	0.47	-0.17	4.34	-0.06	0.16
BAM	0.01	0.70	0.09	0.76	-0.27	0.81	0.06	0.86	0.09	0.75	-0.02	0.74	0.33	5.15	-0.07	0.84	-0.31	4.40	-0.20	0.71
NIST	0.17	0.24	0.25	0.38	-0.11	0.46	0.22	0.55	0.25	0.35	0.14	0.34	0.49	5.10	0.09	0.51	-0.15	4.35	-0.04	0.25
NMi-VSL	0.02	0.23	0.10	0.37	-0.26	0.46	0.07	0.55	0.10	0.35	-0.01	0.33	0.34	5.10	-0.06	0.51	-0.30	4.35	-0.19	0.25
NMIJ	0.01	0.13	0.09	0.32	-0.27	0.41	0.06	0.51	0.09	0.29	-0.02	0.27	0.32	5.10	-0.07	0.47	-0.31	4.34	-0.20	0.15
NRCCRM	0.06	0.47	0.14	0.55	-0.22	0.61	0.11	0.68	0.14	0.54	0.03	0.53	0.38	5.12	-0.02	0.66	-0.26	4.37	-0.15	0.48
SMU	0.71	0.56	0.79	0.63	0.43	0.68	0.76	0.74	0.79	0.61										
KRISS	-0.02	0.09	0.06	0.30	-0.30	0.40	0.03	0.50	0.06	0.27	-0.05	0.25	0.30	5.10	-0.10	0.46	-0.34	4.34	-0.23	0.12
PTB	0.30	0.18	0.38	0.34	0.02	0.43	0.35	0.53	0.38	0.31	0.27	0.30	0.62	5.10	0.22	0.49	-0.02	4.34	0.09	0.19
METAS	-0.08	0.31			-0.36	0.50	-0.03	0.58	0.00	0.40	-0.11	0.39	0.24	5.11	-0.16	0.55	-0.40	4.35	-0.29	0.32
BNM-LNE	0.28	0.41	0.36	0.50			0.33	0.64	0.36	0.48	0.25	0.47	0.60	5.12	0.20	0.61	-0.04	4.36	0.07	0.42
VNIIM	-0.05	0.51	0.03	0.58	-0.33	0.64			0.03	0.57	-0.08	0.56	0.27	5.12	-0.13	0.68	-0.37	4.37	-0.26	0.51
NPL	-0.08	0.28	0.00	0.40	-0.36	0.48	-0.03	0.57			-0.11	0.37	0.24	5.11	-0.16	0.53	-0.40	4.35	-0.29	0.29
SMU	0.03	0.26	0.11	0.39	-0.25	0.47	0.08	0.56	0.11	0.37			0.34	5.11	-0.05	0.52	-0.29	4.35	-0.18	0.27
IMGC	-0.32	5.10	-0.24	5.11	-0.60	5.12	-0.27	5.12	-0.24	5.11	-0.34	5.11			-0.39	5.12	-0.64	6.70	-0.52	5.10
IPQ	0.08	0.47	0.16	0.55	-0.20	0.61	0.13	0.68	0.16	0.53	0.05	0.52	0.39	5.12			-0.24	4.36	-0.13	0.47
CSIR-NML	0.32	4.34	0.40	4.35	0.04	4.36	0.37	4.37	0.40	4.35	0.29	4.35	0.64	6.70	0.24	4.36			0.11	4.34
GUM	0.21	0.14	0.29	0.32	-0.07	0.42	0.26	0.51	0.29	0.29	0.18	0.27	0.52	5.10	0.13	0.47	-0.11	4.34		

	NMIJ		CMS/ITRI		CSIR-NML		KRISS	
	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>
	/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)	
NMIJ			0.12	0.29	-0.20	3.61	0.11	0.31
CMS/ITRI	-0.12	0.29			-0.32	3.61	-0.02	0.24
CSIR-NML	0.20	3.61	0.32	3.61			0.30	3.61
KRISS	-0.11	0.31	0.02	0.24	-0.30	3.61		

	VNIIM		UkrCSM		BelGIM		BAM	
	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>
	/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)	
VNIIM			0.26	0.26	-0.74	1.01	0.03	0.43
UkrCSM	-0.26	0.26			-1.00	1.02	-0.23	0.46
BelGIM	0.74	1.01	1.00	1.02			0.77	1.08
BAM	-0.03	0.43	0.23	0.46	-0.77	1.08		

CCQM-K3, EUROMET.QM-K3, APMP.QM-K3, and COOMET.QM-K3: Automotive emission gases
Degrees of equivalence $[D_i, U_i (k = 2)]$ for Carbon dioxide, Nominal value ~ 135 mmol/mol



Key comparisons EUROMET.QM-K3, APMP.QM-K3, and COOMET.QM-K3 linked to key comparison CCQM-K3

MEASURAND: Amount-of-substance fraction of automotive emission gases:
Propane, nominal value ~ 2 mmol/mol

		Lab <i>i</i> ↓		Lab <i>j</i> →		OMH		BAM		NIST		NMI-VSL		NMIJ		NRCCRM		SMU		KRISS		PTB	
		D_i	U_i	D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}
		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)		/ (mmol/mol)	
OMH		-0.0006	0.0034																				
BAM		0.0091	0.0103	0.0097	0.0103																		
NIST		0.0006	0.0139	0.0012	0.0140	0.0085	0.0170																
NMI-VSL		0.0000	0.0040	0.0006	0.0041	-0.0091	0.0105	-0.0006	0.0141														
NMIJ		0.0000	0.0030	0.0006	0.0031	-0.0091	0.0102	-0.0006	0.0139	0.0000	0.0037												
NRCCRM		-0.0030	0.0071	-0.0024	0.0071	-0.0121	0.0120	-0.0036	0.0153	-0.0030	0.0074	-0.0030	0.0069										
SMU		0.0022	0.0301	0.0028	0.0301	-0.0069	0.0316	0.0016	0.0330	0.0022	0.0302	0.0022	0.0301	0.0052	0.0307								
KRISS		0.0013	0.0032	0.0019	0.0033	-0.0078	0.0103	0.0007	0.0139	0.0013	0.0039	0.0013	0.0029	0.0043	0.0071	-0.0009	0.0301						
PTB		-0.0078	0.0132	-0.0072	0.0132	-0.0169	0.0164	-0.0084	0.0189	-0.0078	0.0134	-0.0078	0.0131	-0.0048	0.0146	-0.0100	0.0327	-0.0091	0.0132				
METAS		-0.0159	0.0055	-0.0153	0.0056	-0.0250	0.0112	-0.0165	0.0146	-0.0159	0.0060	-0.0159	0.0054	-0.0129	0.0084	-0.0181	0.0304	-0.0172	0.0055	-0.0081	0.0139		
BNM-LNE		-0.0030	0.0046	-0.0024	0.0047	-0.0121	0.0108	-0.0036	0.0143	-0.0030	0.0052	-0.0030	0.0044	0.0000	0.0078	-0.0052	0.0303	-0.0043	0.0046	0.0048	0.0136		
VNIIM		-0.0077	0.0083	-0.0071	0.0084	-0.0168	0.0128	-0.0083	0.0159	-0.0077	0.0086	-0.0077	0.0082	-0.0047	0.0104	-0.0099	0.0311	-0.0090	0.0083	0.0001	0.0153		
NPL		0.0050	0.0066	0.0056	0.0067	-0.0041	0.0118	0.0044	0.0151	0.0050	0.0070	0.0050	0.0065	0.0080	0.0091	0.0028	0.0306	0.0037	0.0066	0.0128	0.0144		
SMU		0.0044	0.0113	0.0050	0.0113	-0.0047	0.0149	0.0038	0.0176	0.0044	0.0115	0.0044	0.0112	0.0074	0.0129			0.0031	0.0112	0.0122	0.0170		
IMGC		-0.0740	0.0720	-0.0734	0.0720	-0.0831	0.0727	-0.0746	0.0733	-0.0740	0.0721	-0.0740	0.0720	-0.0710	0.0723			-0.0753	0.0720	-0.0662	0.0732		
IPQ		0.0002	0.0055	0.0008	0.0056	-0.0089	0.0112	-0.0004	0.0146	0.0002	0.0060	0.0002	0.0054	0.0032	0.0084			-0.0011	0.0055	0.0080	0.0139		
GUM		-0.0006	0.0066	0.0000	0.0066	-0.0097	0.0117	-0.0012	0.0150	-0.0006	0.0069	-0.0006	0.0064	0.0024	0.0091			-0.0019	0.0065	0.0072	0.0144		
CMI		0.1219	0.1500	0.1225	0.1500	0.1128	0.1503	0.1213	0.1506	0.1219	0.1500	0.1219	0.1500	0.1249	0.1501			0.1206	0.1500	0.1297	0.1506		
NMIJ		-0.0026	0.0037																				
CMS/ITRI		-0.0115	0.0171																				
KRISS		0.0021	0.0045																				
VNIIM		0.001	0.004																				
UkrCSM		-0.001	0.004																				
BelGIM		-0.004	0.020																				
BAM		0.010	0.012																				

$D_i / x_{i\text{grav}}$	$U_i / x_{i\text{grav}}$
/ %	
0.05	0.18
-0.05	0.22
-0.20	1.01
0.50	0.61

- Participant in CCQM-K3
- Participant in EUROMET.QM-K3
- Participant in APMP.QM-K3
- Participant in COOMET.QM-K3

Key comparisons EUROMET.QM-K3, APMP.QM-K3, and COOMET.QM-K3 linked to key comparison CCQM-K3

MEASURAND: Amount-of-substance fraction of automotive emission gases:

Propane, nominal value ~ 2 mmol/mol

Lab <i>i</i>	Lab <i>j</i> →		METAS		BNM-LNE		VNIIM		NPL		SMU		IMGC		IPQ		GUM		CMI	
	D_i	U_i	D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}
OMH	-0.0006	0.0034	0.0153	0.0056	0.0024	0.0047	0.0071	0.0084	-0.0056	0.0067	-0.0050	0.0113	0.0734	0.0720	-0.0008	0.0056	0.0000	0.0066	-0.1225	0.1500
BAM	0.0091	0.0103	0.0250	0.0112	0.0121	0.0108	0.0168	0.0128	0.0041	0.0118	0.0047	0.0149	0.0831	0.0727	0.0089	0.0112	0.0097	0.0117	-0.1128	0.1503
NIST	0.0006	0.0139	0.0165	0.0146	0.0036	0.0143	0.0083	0.0159	-0.0044	0.0151	-0.0038	0.0176	0.0746	0.0733	0.0004	0.0146	0.0012	0.0150	-0.1213	0.1506
NMi-VSL	0.0000	0.0040	0.0159	0.0060	0.0030	0.0052	0.0077	0.0086	-0.0050	0.0070	-0.0044	0.0115	0.0740	0.0721	-0.0002	0.0060	0.0006	0.0069	-0.1219	0.1500
NMIJ	0.0000	0.0030	0.0159	0.0054	0.0030	0.0044	0.0077	0.0082	-0.0050	0.0065	-0.0044	0.0112	0.0740	0.0720	-0.0002	0.0054	0.0006	0.0064	-0.1219	0.1500
NRCCRM	-0.0030	0.0071	0.0129	0.0084	0.0000	0.0078	0.0047	0.0104	-0.0080	0.0091	-0.0074	0.0129	0.0710	0.0723	-0.0032	0.0084	-0.0024	0.0091	-0.1249	0.1501
SMU	0.0022	0.0301	0.0181	0.0304	0.0052	0.0303	0.0099	0.0311	-0.0028	0.0306										
KRISS	0.0013	0.0032	0.0172	0.0055	0.0043	0.0046	0.0090	0.0083	-0.0037	0.0066	-0.0031	0.0112	0.0753	0.0720	0.0011	0.0055	0.0019	0.0065	-0.1206	0.1500
PTB	-0.0078	0.0132	0.0081	0.0139	-0.0048	0.0136	-0.0001	0.0153	-0.0128	0.0144	-0.0122	0.0170	0.0662	0.0732	-0.0080	0.0139	-0.0072	0.0144	-0.1297	0.1506
METAS	-0.0159	0.0055			-0.0129	0.0064	-0.0082	0.0095	-0.0209	0.0080	-0.0203	0.0121	0.0581	0.0722	-0.0161	0.0071	-0.0153	0.0079	-0.1378	0.1501
BNM-LNE	-0.0030	0.0046	0.0129	0.0064			0.0047	0.0090	-0.0080	0.0074	-0.0074	0.0117	0.0710	0.0721	-0.0032	0.0064	-0.0024	0.0073	-0.1249	0.1501
VNIIM	-0.0077	0.0083	0.0082	0.0095	-0.0047	0.0090			-0.0127	0.0101	-0.0121	0.0136	0.0663	0.0724	-0.0079	0.0095	-0.0071	0.0101	-0.1296	0.1502
NPL	0.0050	0.0066	0.0209	0.0080	0.0080	0.0074	0.0127	0.0101			0.0006	0.0126	0.0790	0.0723	0.0048	0.0080	0.0056	0.0087	-0.1169	0.1501
SMU	0.0044	0.0113	0.0203	0.0121	0.0074	0.0117	0.0121	0.0136	-0.0006	0.0126			0.0784	0.0728	0.0042	0.0121	0.0050	0.0126	-0.1175	0.1504
IMGC	-0.0740	0.0720	-0.0581	0.0722	-0.0710	0.0721	-0.0663	0.0724	-0.0790	0.0723	-0.0784	0.0728			-0.0741	0.0722	-0.0734	0.0723	-0.1959	0.1664
IPQ	0.0002	0.0055	0.0161	0.0071	0.0032	0.0064	0.0079	0.0095	-0.0048	0.0080	-0.0042	0.0121	0.0741	0.0722			0.0007	0.0079	-0.1218	0.1501
GUM	-0.0006	0.0066	0.0153	0.0079	0.0024	0.0073	0.0071	0.0101	-0.0056	0.0087	-0.0050	0.0126	0.0734	0.0723	-0.0007	0.0079			-0.1225	0.1501
CMI	0.1219	0.1500	0.1378	0.1501	0.1249	0.1501	0.1296	0.1502	0.1169	0.1501	0.1175	0.1504	0.1959	0.1664	0.1218	0.1501	0.1225	0.1501		

	NMIJ		CMS/ITRI		KRISS	
	D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}
NMIJ			0.0089	0.0175	-0.0047	0.0058
CMS/ITRI	-0.0089	0.0175			-0.0136	0.0177
KRISS	0.0047	0.0058	0.0136	0.0177		

	VNIIM		UkrCSM		BelGIM		BAM	
	D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}	D_{ij}	U_{ij}
VNIIM			0.002	0.006	0.005	0.020	-0.009	0.013
UkrCSM	-0.002	0.006			0.003	0.021	-0.011	0.013
BelGIM	-0.005	0.020	-0.003	0.021			-0.014	0.023
BAM	0.009	0.013	0.011	0.013	0.014	0.023		

CCQM-K3, EUROMET.QM-K3, APMP.QM-K3, and COOMET.QM-K3: Automotive emission gases
 Degrees of equivalence $[D_i, U_i (k = 2)]$ for Propane, Nominal value ~ 2 mmol/mol

