

Key comparison CCQM-K12 and CCQM-K12.2

MEASURAND: Mass fraction of creatinine in human serum
Material I (physiological range)

x_i : result of measurement carried out by laboratory i

u_i : combined standard uncertainty of x_i

CCQM-K12

Lab i	x_i / ($\mu\text{g/g}$)	u_i / ($\mu\text{g/g}$)
IRMM	8.360	0.106
KRISS	8.186	0.080
LGC	8.193	0.008
NIST	8.277	0.032
PTB	8.211	0.029

CCQM-K12.2

Lab i	x_i / ($\mu\text{g/g}$)	u_i / ($\mu\text{g/g}$)
HSA	7.350	0.040
INMETRO	7.830	0.170
KRISS	7.529	0.046
LNE	7.400	0.057
NIMT	7.440	0.094
NMIJ	7.430	0.050
NIST	7.670	0.073
PTB	7.640	0.060
UME	7.477	0.027
VNIIM	7.475	0.059

Key comparison CCQM-K12 and CCQM-K12.2

MEASURAND: Mass fraction of creatinine in human serum
Material I (physiological range)

The key comparison reference value calculated as the mean of the participant results, excluding IRMM is: $x_R = 8.217 \mu\text{g/g}$.

The expanded uncertainty of the key comparison reference value at a 95 % level of confidence is: $U_R = 0.066 \mu\text{g/g}$.

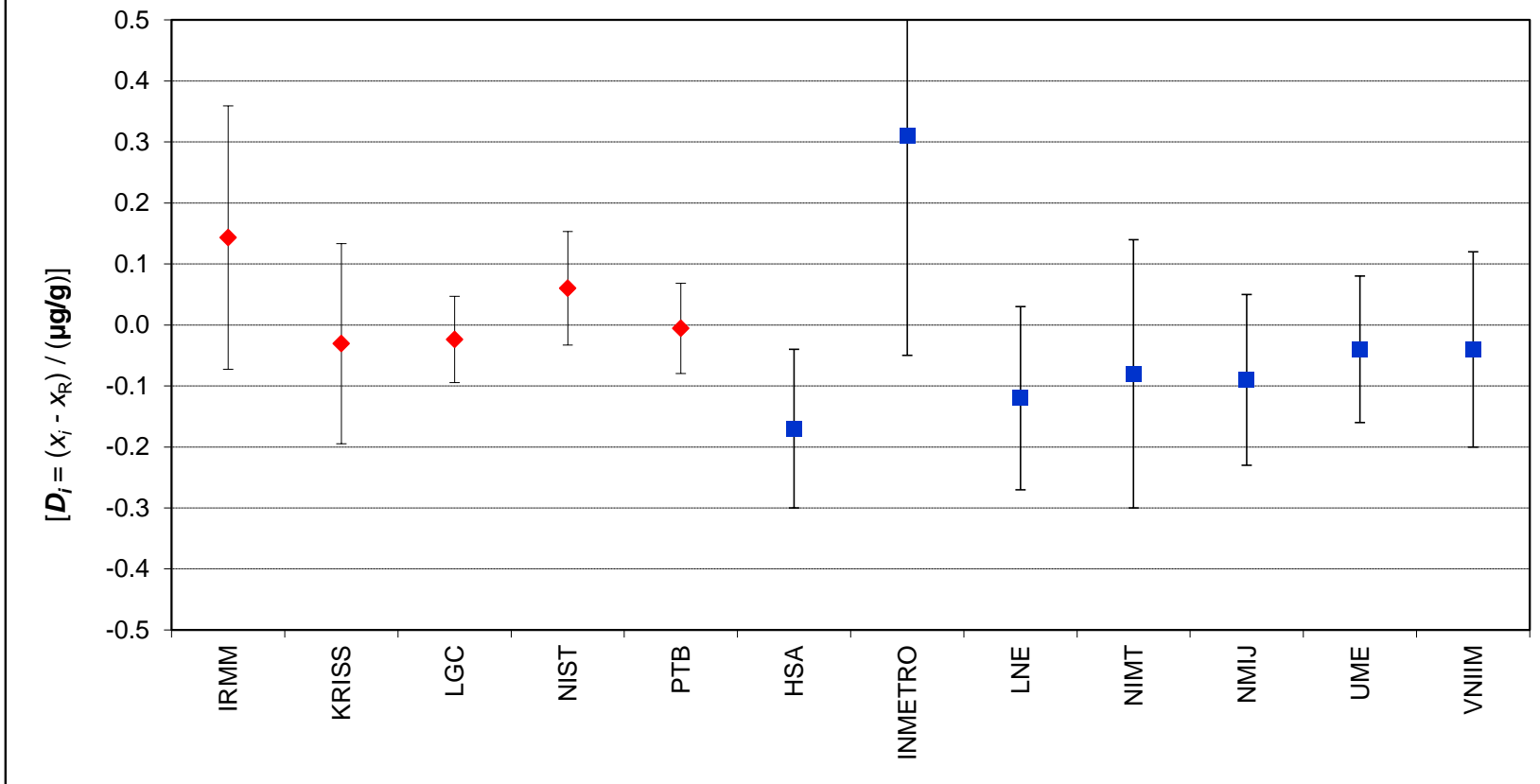
The degree of equivalence of each laboratory with respect to the reference value is given by a pair of terms: $D_i = (x_i - x_R)$ and U_i , its expanded uncertainty corresponding to a 95% level of confidence, both expressed in $\mu\text{g/g}$.

Linking CCQM-K12.2 to CCQM-K12

An independent key comparison reference value was assigned from the mean, standard deviation, and pooled standard uncertainty of the results reported by the three reference laboratories and the participants.

	D_i / ($\mu\text{g/g}$)	U_i / ($\mu\text{g/g}$)
IRMM	0.14	0.22
KRISS	-0.03	0.16
LGC	-0.02	0.07
NIST	0.06	0.09
PTB	-0.01	0.07
HSA	-0.17	0.13
INMETRO	0.31	0.36
LNE	-0.12	0.15
NIMT	-0.08	0.22
NMIJ	-0.09	0.14
UME	-0.04	0.12
VNIIM	-0.04	0.16

CCQM-K12 and CCQM-K12.2 Creatinine in Human Serum 7 µg/g to 8 µg/g (Material I)
 Degrees of equivalence D_i and expanded uncertainty at a 95% level of confidence U_i



Red diamonds: CCQM-K12

Blue squares: CCQM-K12.2

CCQM-K12 and EURAMET.QM-K12

Key comparison CCQM-K12

MEASURAND: Mass fraction of creatinine in human serum
Material II (elevated range)

x_i : result of measurement carried out by laboratory i
 u_i : combined standard uncertainty of x_i

Lab i	x_i / ($\mu\text{g/g}$)	u_i / ($\mu\text{g/g}$)
IRMM	18.720	0.2396
KRISS	18.539	0.1627
LGC	18.614	0.0316
NIST	18.708	0.0722
PTB	18.718	0.0650

Key comparison EURAMET.QM-K12

MEASURAND: Mass fraction of creatinine in human serum

$x_{i\text{-EUR}}$: result of measurement carried out by laboratory i participant in EURAMET.QM-K12
 $u_{i\text{-EUR}}$: combined standard uncertainty of $x_{i\text{-EUR}}$

Material A - high level

Lab i	$x_{i\text{-EUR}}$ / ($\mu\text{g/g}$)	$u_{i\text{-EUR}}$ / ($\mu\text{g/g}$)
LGC	53.50	0.27
LNE	54.04	0.22
HSA	54.24	0.29
EXHM/GCSL-EIM	54.509	0.697
PTB	55.06	0.41

Material B - low level

Lab i	$x_{i\text{-EUR}}$ / ($\mu\text{g/g}$)	$u_{i\text{-EUR}}$ / ($\mu\text{g/g}$)
LGC	37.71	0.12
LNE	37.70	0.22
HSA	37.94	0.22
EXHM/GCSL-EIM	38.438	0.4534
PTB	38.28	0.29

Key comparison CCQM-K12

MEASURAND: Mass fraction of creatinine in human serum
Material II (elevated range)

The key comparison reference value calculated as the mean of the participant results, excluding IRMM is: $x_R = 18.645 \mu\text{g/g}$.
The expanded uncertainty of the key comparison reference value at a 95 % level of confidence is: $U_R = 0.135 \mu\text{g/g}$.

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

$D_i = (x_i - x_R)$ and U_i , its expanded uncertainty corresponding to a 95% level of confidence, both expressed in $\mu\text{g/g}$.

D_i and U_i are also given in relative terms.

The degree of equivalence between two laboratories is given by a pair of terms:

$D_{ij} = D_i - D_j = (x_i - x_R) - (x_j - x_R) = x_i - x_j$ and U_{ij} , its expanded uncertainty corresponding to a 95% level of confidence, both expressed in $\mu\text{g/g}$.

Linking EURAMET.QM-K12 to key comparison CCQM-K12

The linkage is obtained through the common participation of PTB and LGC in both key comparisons and is explained on page 14 of the EURAMET.QM-K12 Final Report. The set of results obtained for Material II in CCQM-K12 was used to link the results obtained for both material A and B in EURAMET.QM-K12, as this was closer in mass fraction nominal value. It leads to the computation of the degrees of equivalence of participants in EURAMET.QM-K12 relative to the CCQM-K12 reference value, and the D_i and U_i values are given in relative terms.

No pair-wise degrees of equivalence involving participants in EURAMET.QM-K12 only have been computed.

Degrees of equivalence D_i and U_i expressed in relative terms

Lab i ↓	D_i/x_R / %	U_i/x_R / %
IRMM	0.40	2.61
KRISS	-0.57	1.78
LGC	-0.16	0.67
NIST	0.34	1.10
PTB	0.39	0.86
LGC	-1.42	1.38
LNE	-0.42	1.25
HSA	-0.06	1.43
EXHM/GCSL-EIM	0.44	2.74
PTB	1.46	1.78
LGC	-0.80	1.01
LNE	-0.82	1.40
HSA	-0.19	1.38
EXHM/GCSL-EIM	1.12	2.51
PTB	0.70	1.72

Black indicates participants in CCQM-K12


Blue indicates participants in EURAMET.QM-K12 (Material A)

Green indicates participants in EURAMET.QM-K12 (Material B)

Key comparison CCQM-K12

MEASURAND: Mass fraction of creatinine in human serum
Material II (elevated range)

Matrix of equivalence in absolute terms

Lab *j* 

Lab *i*

	D_i / (µg/g)	U_i / (µg/g)
IRMM	0.075	0.487
KRISS	-0.106	0.331
LGC	-0.031	0.125
NIST	0.063	0.205
PTB	0.073	0.161

IRMM		KRISS		LGC		NIST		PTB	
D_{ij} / (µg/g)	U_{ij} / (µg/g)	D_{ij} / (µg/g)	U_{ij} / (µg/g)	D_{ij} / (µg/g)	U_{ij} / (µg/g)	D_{ij} / (µg/g)	U_{ij} / (µg/g)	D_{ij} / (µg/g)	U_{ij} / (µg/g)
		0.181	0.574	0.106	0.484	0.012	0.501	0.002	0.496
-0.181	0.574			-0.075	0.326	-0.169	0.353	-0.179	0.345
-0.106	0.484	0.075	0.326			-0.094	0.203	-0.104	0.145
-0.012	0.501	0.169	0.353	0.094	0.203			-0.010	0.214
-0.002	0.496	0.179	0.345	0.104	0.145	0.010	0.214		

CCQM-K12 and EURAMET.QM-K12 Creatinine in Human Serum (Material II)

Degrees of equivalence D_i and expanded uncertainty at a 95% level of confidence U_i expressed in relative terms

