Final report

CCM.V-K2.1 Comparison

Abstract

This report describes CCM key comparison in capillary viscometry at six National Metrology Institutes (NMIs), which was carried out between October 2008 and January 2009.

The comparison is a follow-up of CCM.V-K2 key comparison carried out in 2006-2007. The comparison is carried out on request of laboratories that were not able to participate to the CCM.V-K2 key comparison or reported unsatisfactory results. The objective was to compare viscosity measurements made at 20 °C, 60 °C and 100 °C using a standard fluid with nominal viscosities at these temperatures of 1300, 150 and 40 mm^2s^{-1}, respectively.

For 20 and 100 °C, the results from two participants, PTB and Cannon, were used to link the measurement results of this key comparison to those of CCM.V-K2 key comparison and thus calculate the degrees of equivalence with the KCRV of CCM.V-K2. Since in CCM.V-K2 key comparison no measurements were carried out at 60 °C, at this temperature no linkage could be provided. Also no reference value could be computed at 60 °C, because there are only three participants with independent measurement scales, one of which has withdrawn a clearly outlying result at this temperature.

For 20 and 100 °C, none of the reported results show a significant difference from the CCM.V-K2 KCRV.

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1. Introduction

The organization of the CCM.V-K2.1 comparison on viscosity was planned at the CIPM Working Group on Viscosity meeting held in 2008 at the BIPM in Paris, France. Members agreed that all laboratories eligible under the rules of Mutual Recognition Arrangement (MRA) could participate in the key comparison. VSL[1] (Netherlands) agreed to be the pilot laboratory for the comparison, with the Physikalisch – Technische Bundesanstalt PTB (Germany) offering assistance as a working party.

The comparison is a follow-up of CCM.V-K2 key comparison carried out in 2006-2007 [1]. The comparison is carried out on request of laboratories that were not able to participate to the CCM.V-K2 key comparison or reported unsatisfactory results. The objective is to compare viscosity measurements made at 20 °C, 60 °C and 100 °C using a standard fluid designated as Liquid A.

Certain participants have participated satisfactory to the CCM.V-K2 key comparison. These participants also performed a calibration program of primary viscometers beginning with doubly distilled water at 20.00 °C (ISO 3666-1998) [2] and stepping up to higher viscosities in a dependent progression. Results from these participants, *i.e.*, PTB and Cannon, will contribute to the reference values obtained from this key comparison and thus provide a link to the CCM.V-K2 key comparison. The non-contributing participants have not (satisfactorily) participated to the CCM.V-K2 key comparison.

The results of this key comparison will be of interest for the entries concerning viscosity in the Calibration and Measurement Capability (CMC) tables.

2. List of participants

Mr. Christian BUCHNER Bundesamt fur Eich und Vermessungswesen (Federal Office of Metrology and Surveying), Masse und verwandte Größen (Mass and Related Quantities) Arltgasse 35 A1160 Wien	BEV	Austria
Dr. Mostafa MEKAWY Thermometry Lab National Institute for Standard 4 Tersa Street El Haram Giza	NIS	Egypt
Mrs. Deona JONKER National Metrology Institute of South Africa Meiring Naudé Road Brummeria Pretoria	NMISA	South Africa
Mrs. Inge van ANDEL[2] VSL B.V. PO Box 654, 2600 AR Delft Thijsseweg 11, 2629 JA Delft	VSL	The Netherlands

[1] From 1st March, 2009, NMi Van Swinden Laboratorium is renamed to VSL.
[2] New contact person from 1st November, 2009.

Mr. Thomas ZUBLER Cannon Instrument Company, National Institute of Standards and Technology 2139 High Tech Rd. State College, PA 16803	NIST/CANNON	United States
Dr. Henning WOLF Physikalisch-Technische Bundesanstalt, Braunschweig und Berlin Bundesallee 100 38116 Braunschweig	PTB	Germany

3. Viscosity scales of the participants

The first key comparison, CCM.V-K1 [3] established the validity of the laboratory viscosity scales and their step up procedures from the intrinsic standard value of water (1.0034 mm²/s) [2]. Additional discussions about the viscosity scales of several participants can be found in the first key comparison.

4. Liquid sample

The Physikalisch–Technische Bundesanstalt provided the participants with a sample of Newtonian standard liquid, poly-α-olefine, designate liquid A for measurement.

The pilot laboratory provided the following data for the sample:

Table 4-1 Standard liquid A material parameters

Temperature (°C)	Nominal viscosity (mm^2/s)	Temp. coeff. viscosity (K^{-1})	Density (kg/m^3)	Temp. coeff. density (K^{-1})	Surface tension (mN/m)	Temp. coeff. surf. tens. (K^{-1})
20	1300	-0.0672	845.64	-0.0007127	30.2	-0.062
60	150	-0.0414	821.76	-0.000706	27.7	-0.062
100	40	-0.0280	798.34	-0.0006992	25.2	-0.062

The long term stability of the kinematic viscosity is better than 0.1 % over a 6 month period.

5. Organization of the comparison

Table 5-1 Timetable

Date	Who	What
October 7th, 2008	Pilot laboratory	Mailing of the data sheets, the timetable, and the technical report to the participants
October 6th, 2008	Working party	Shipment of the standard liquids to the participants
October 31st, 2008	All participants	Start of the comparison measurements
December 2nd, 2008	All participants	Finishing of the comparison measurements
December 11th, 2008	All participants	Submission of the results to the pilot laboratory
January 30th, 2009	Pilot laboratory	Submission draft A report to the participants
November 25th, 2009	Pilot laboratory	Submission draft B report to the participants
December 15 th, 2009	Pilot laboratory	Submission final report to WG Viscosity

6. Comments on the comparison

At the start of the comparison all participants indicated to report results for measurements at all temperatures. Due to breakdown of the oil bath, NIS, however, indicated not to be able to report results for measurement at 100 °C.

After draft A the participants indicated the need for a reference value at 60 °C even though no linkage to CCM.V-K2 could be provided. Unfortunately, one of the participants, VSL, which normally would have contributed to the KCRV, had to withdraw the results at 60 °C. Thus it proved to be impossible to compute a sufficient robust KCRV at this temperature (see section 8).

7. Evaluation of the measurement results at 20 °C and 100 °C

As a first step, to correct for differences in the working temperatures, the reported viscosity values have been normalized to the nominal temperatures according to:

$$V_i = V_0 \mathrm{e}^{b(T_n - T_0)} \tag{1}$$

where:

V_i is the temperature corrected (normalized) kinematic viscosity result for participant *i,* in mm^2s^{-1}
V_0 is the reported kinematic viscosity result for participant *i,* in mm^2s^{-1}
b is the viscosity temperature coefficient for liquid A listed in the third column of table 4-1, in K^{-1}
T_n is the nominal temperature, in K
T_0 is the working temperature reported by the participant *i*, in K

As mentioned in section 1, for the evaluation the results were linked to CCM.V-K2 through the results of PTB and Cannon. To calculate the degrees of equivalence with the KCRV of CCM.V-K2, the following formula applies:

$$D_i = V_i - RV_{K2.1} \tag{2}$$

where:

D_i is the degree of equivalence for laboratory *i*, in mm^2s^{-1}
$RV_{K2.1}$ is the reference value of the current key-comparison, CCM.V-K2.1, in mm^2s^{-1}

For linking purposes, it is assumed that the difference between the average of the results of the linking laboratories in the current comparison and $RV_{K2.1}$ is equal to the difference between the average of the results of those laboratories in CCM.V-K2 and $KCRV_{K2}$. Since the uncertainties reported by these laboratories are significantly different (they differ a factor of two to three) the weighted mean of the results is taken. Therefore:

$$\overline{V}_{K2.1} - RV_{K2.1} = \overline{V}_{K2} - KCRV_{K2} \tag{3}$$

where:

$\overline{V}_{K2.1}$ and $\overline{V}_{K2}$, listed in table 9-1, are the weighted means of the temperature corrected (normalized) kinematic viscosity results of the linking laboratories in CCM.V-K2.1 and CCM.V-K2, respectively, in mm^2s^{-1}

The weighted mean for CCM.V-K2.1 is calculated according to:

$$\overline{V}_{K2.1} = \left(V_{Cannon} / u^2_{Cannon} + V_{PTB} / u^2_{PTB}\right) / \left(1/u^2_{Cannon} + 1/u^2_{PTB}\right)\Big|_{K2.1} \tag{4}$$

where V_{Cannon} and V_{PTB}, are temperature corrected (normalized) kinematic viscosity results of Cannon and PTB, respectively, for CCM.V-K2.1, in mm^2s^{-1}
and u_{Cannon} and u_{PTB} their uncertainties (k=1), see table 9-1

The weighted mean for CCM.V-K2 is calculated likewise.

By combining equations (2) and (3), the degree of equivalence can be calculated from:

$$D_i = V_i + \overline{V}_{K2} - \overline{V}_{K2.1} - KCRV_{K2} \quad (5)$$

The uncertainty, u_i, in the degree of equivalence for lab i is calculated from:

$$u_i^2 = u_{V_i}^2 + u_{\overline{V}_{K2}}^2 + u_{\overline{V}_{K2.1}}^2 + u_{KCRV_{K2}}^2 \quad (6)$$

where:

u_{V_i} is the uncertainty (k=1) in the temperature corrected (normalized) kinematic viscosity result for participant i, in mm^2s^{-1}
$u_{\overline{V}_{K2}}$ and $u_{\overline{V}_{K2.1}}$ are the uncertainties (k=1) in the weighted mean of temperature corrected (normalized) kinematic viscosity results of the linking laboratories in CCM.V-K2.1 and CCM.V-K2, respectively, in mm^2s^{-1} (see table 9-1)
$u_{KCRV_{K2}}$, is the uncertainty (k=1) of the key comparison reference value of CCM.V-K2 (see table 9-1)

The uncertainty in the weighted mean for CCM.V-K2.1 is calculated according to:

$$u_{\overline{V}_{K2.1}}^2 = 1/\left(1/u_{Cannon}^2 + 1/u_{PTB}^2\right)\Big|_{K2.1} \quad (7)$$

The uncertainty in the weighted mean for CCM.V-K2 is calculated likewise.

8. Evaluation of the measurement results at 60 °C

Also the reported results for the measurements at 60 °C were corrected for differences in the working temperatures. The same formula (1) as described in section 7 was applied.

In order to compute a key comparison reference value for 60 °C sufficient results of laboratories with own measurement scales are required. For this comparison that would be PTB, Cannon and VSL. Unfortunately one of the measurements at 60 °C obtained by VSL was withdrawn because it was a clear outlier. Further work at VSL has shown that the probably explanation of this result has been identified as insufficient cleaning of the viscosimeter.

A KCRV based on the results of the two remaining participants with independent measurement scales is not sufficiently robust, thus no KCRV could be computed at 60 °C. The results of the participants however may still serve some purpose either now or in the future. As they have been carried out under the rigorous guidelines of the CIPM MRA, they have definitely metrological value.

9. Results of the comparison

The reported measurement results are listed in appendix **Error! Reference source not found.** and the reported uncertainty budgets are reported in appendix **Error! Reference source not found.**.

The measurement results are compiled in Tables A1-1 to A1-3 and Figures A1-1 to A1-2 in Appendix A1. In these tables, the data in bold font are the results as provided by the

participants (kinematic viscosity V_0, temperature and relative expanded uncertainty, U_r)[3]. The temperature corrected (normalized) kinematic viscosity result for each participant is listed in column V_i (mm^2s^{-1}). The expanded uncertainty in the value of the degree of equivalence is listed in column U_i. Furthermore, in these tables for each participant a value for the calculated "normalized error" is listed in column E_n. The value for E_n is calculated according to:

$$E_n = D_i / U_i \tag{8}$$

with the expanded uncertainty at a 95% confidence level:

$$U_i = 2u_i \tag{9}$$

The values of the parameters for calculation of the degrees of equivalence at 20 and 100 °C are listed in table 9-1.

Table 9-1 Values of the parameters and their uncertainties for calculation of the degrees of equivalence.

Parameter	Measurements at 20 °C		Measurements at 100 °C	
	Value (mm^2s^{-1})	u (k=1) (mm^2s^{-1})	Value (mm^2s^{-1})	u (k=1) (mm^2s^{-1})
V_{Cannon}^{K2} [1]	1367.8	2.6	41.534	0.054
V_{PTB}^{K2} [1]	1368.0	0.8	41.602	0.017
$\overline{V}_{K2}$	1368.0	0.8	41.596	0.016
$KCRV_{K2}$ [1]	1368.8	0.4	41.622	0.023
$V_{Cannon}^{K2.1}$	1287.7	2.4	39.860	0.043
$V_{PTB}^{K2.1}$	1285.5	1.0	39.934	0.022
$\overline{V}_{K2.1}$	1285.9	0.9	39.919	0.020

Apart from the values for the Degree of Equivalence with the KCRV's, also the values of the Degree of Equivalence between two laboratories, D_{ij}, have been calculated. D_{ij} is defined as the difference in results obtained by the two laboratories:

$$D_{ij} = V_i - V_j \tag{10}$$

and the expanded uncertainty of those values at a 95% confidence level:

$$U_{ij} = 2\left(u_i^2 + u_j^2\right)^{1/2} \tag{11}$$

The results are given in Tables A1-4 and A1-5 .

[3] The highest values for the U_r reported by each participant are listed in Tables A1-1 to A1-3. These values have also been used for further calculations.

10. References

1. CCM.V-K2 Comparison, C. Patrick Maggi, David Trowbridge, M Thomas Zubler
2. ISO TR 3666: Viscosity of Water (1998)
3. CCM.V-K1 Intercomparison, Günther Klingenberg and Harro Bauer PTB

11. Appendices

Appendix A1 – Summary of Degrees of Equivalence and uncertainties, with charts

Table A1-1 Results of the measurements at 20 °C

	V_0 (mm^2s^{-1})	Temp. (°C)	V_i (mm^2s^{-1})	U_r (k=2) (%)	u (k=1) (mm^2s^{-1})	D_i (mm^2s^{-1})	U_i (k=2) (mm^2s^{-1})	E_n
PTB	**1285.48**	**20.0005**	1285.53	**0.160**	1.03			
Cannon	**1287.15**	**20.0060**	1287.67	**0.368**	2.37			
VSL	**1284.23**	**20.0000**	1284.23	**0.373**	2.40	-2.45	5.44	-0.45
NIS	**1289.69**	**20.0000**	1289.69	**2.385**	15.38	3.01	30.86	0.10
NMISA	**1282.59**	**20.0400**	1286.04	**2.253**	14.45	-0.64	29.08	-0.02
BEV	**1287.80**	**19.9940**	1287.28	**0.280**	1.80	0.60	4.42	0.14

Table A1-2 Results of the measurements at 60 °C

	V_0 (mm^2s^{-1})	Temp. (°C)	V_i (mm^2s^{-1})	U_r (k=2) (%)	u (k=1) (mm^2s^{-1})
PTB	**155.010**	**60.000**	155.009	**0.120**	0.093
Cannon	**154.901**	**60.006**	154.939	**0.293**	0.227
VSL	Results withdrawn				
NIS	**155.524**	**60.000**	155.524	**2.493**	1.938
NMISA	**155.426**	**59.955**	155.137	**0.406**	0.316
BEV	**155.300**	**59.999**	155.294	**0.270**	0.210

Table A1-3 Results of the measurements at 100 °C

	V_0 (mm^2s^{-1})	Temp. (°C)	V_i (mm^2s^{-1})	U_r (k=2) (%)	u (k=1) (mm^2s^{-1})	D_i (mm^2s^{-1})	U_i (k=2) (mm^2s^{-1})	E_n
PTB	**39.9329**	**100.0006**	39.9336	**0.110**	0.0220			
Cannon	**39.8546**	**100.0050**	39.8602	**0.217**	0.0433			
VSL	**40.0016**	**100.0000**	40.0016	**0.226**	0.0451	0.0568	0.1134	0.50
NMISA	**39.9676**	**100.0100**	39.9788	**0.362**	0.0723	0.0341	0.1600	0.21
BEV	**39.9581**	**100.0020**	39.9603	**0.490**	0.0979	0.0156	0.2075	0.08

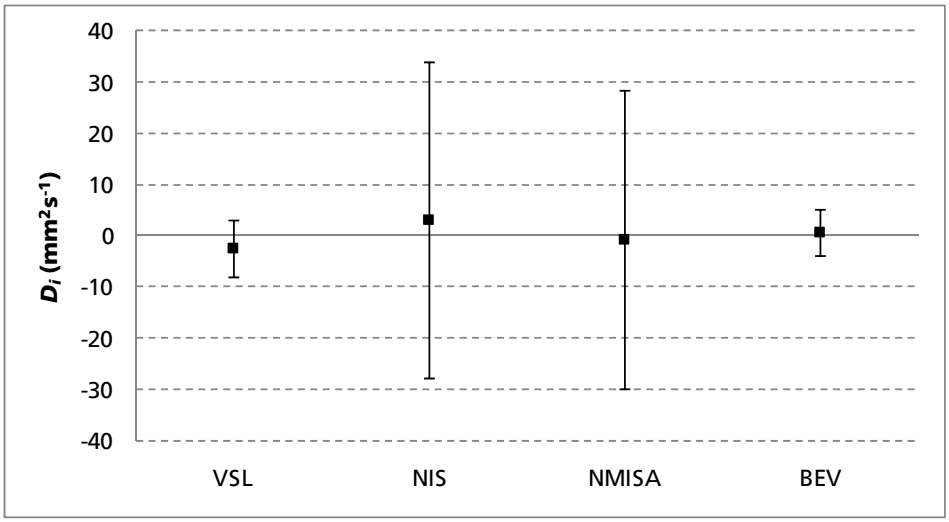

Figure A1-1 Degrees of equivalence for the measurements at 20 °C

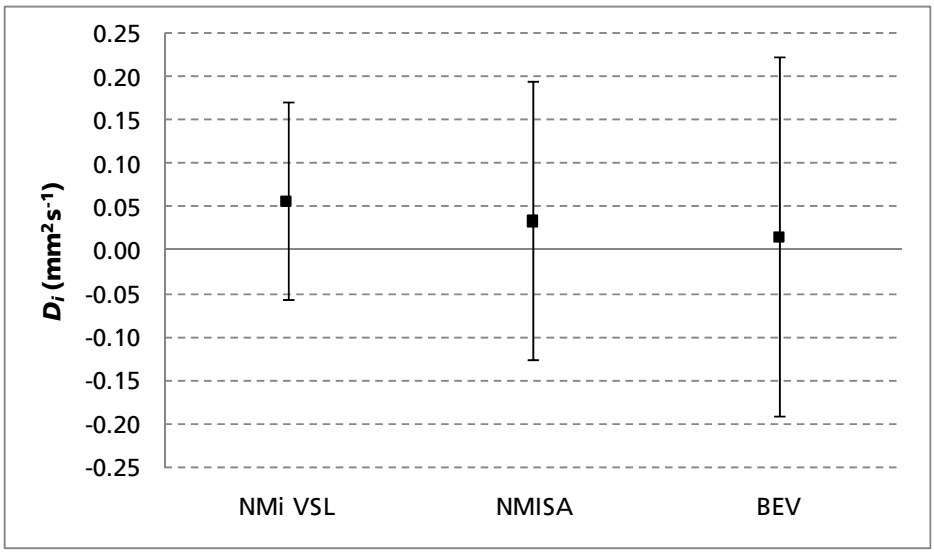

Figure A1-2 Degrees of equivalence for the measurements at 100 °C

Table A1-4 Degrees of equivalence, in mm^2s^{-1}, between institutes for measurement results at 20 °C

Lab *j* →

Lab *i* ↓

	PTB		Cannon		VSL		NIS		NMISA		BEV	
	D_{ij}	U_{ij} (k=2)	D_{ij}	U_{ij} (k=2)	D_{ij}	U_{ij} (k=2)	D_{ij}	U_{ij} (k=2)	D_{ij}	U_{ij} (k=2)	D_{ij}	U_{ij} (k=2)
PTB			-2.1	5.2	1.3	5.2	-4.2	31	-0.5	29	-1.8	4.2
Cannon	2.1	5.2			3.4	6.7	-2.0	31	1.6	29	0.4	6.0
VSL	-1.3	5.2	-3.4	6.7			-5.5	31	-1.8	29	-3.1	6.0
NIS	4.2	31	2.0	31	5.5	31			3.7	42	2.4	31
NMISA	0.5	29	-1.6	29	1.8	29	-3.7	42			-1.2	29
BEV	1.8	4.2	-0.4	6.0	3.1	6.0	-2.4	31	1.2	29		

Table A1-5 Degrees of equivalence, in mm^2s^{-1}, between institutes for measurement results at 100 °C

Lab *j* →

Lab *i* ↓

	PTB		Cannon		VSL		NMISA		BEV	
	D_{ij}	U_{ij} (k=2)	D_{ij}	U_{ij} (k=2)	D_{ij}	U_{ij} (k=2)	D_{ij}	U_{ij} (k=2)	D_{ij}	U_{ij} (k=2)
PTB			0.07	0.10	-0.07	0.10	-0.05	0.15	-0.03	0.20
Cannon	-0.07	0.10			-0.14	0.13	-0.12	0.17	-0.10	0.21
VSL	0.07	0.10	0.14	0.13			0.02	0.17	0.04	0.22
NMISA	0.05	0.15	0.12	0.17	-0.02	0.17			0.02	0.24
BEV	0.03	0.20	0.10	0.21	-0.04	0.22	-0.02	0.24		

Appendix A2 – Technical protocol

Technical Protocol for the CCM Key Comparison of the Viscosity

CCM.V – K2.1

Pilot Laboratory: NMi Van Swinden Laboratorium B.V. (M. van Son)

Working Party: Physikalisch–Technische Bundesanstalt (H. Wolf)

Outline of the CCM key comparison of the viscosity

This key comparison, CCM.V-K2.1, has been undertaken by the CCM Working Group on Viscosity to compare the viscosity determinations of participating laboratories. The comparison is a follow-up of CCM.V-K2 key comparison carried out in 2006-2007. The comparison is carried out on request of laboratories that were not able to participate to the CCM.V-K2 key comparison or reported unsatisfactory results. The objective is to compare viscosity measurements made at 20 °C, 60 °C and 100 °C using a standard fluid designated as Liquid A.

The following laboratories have indicated to participate to the comparison:

Mr. Christian BUCHNER Bundesamt fur Eich und Vermessungswesen (Federal Office of Metrology and Surveying), Masse und verwandte Größen (Mass and Related Quantities) Arltgasse 35 A1160 Wien	BEV	Austria
Dr. Mostafa MEKAWY Thermometry Lab National Institute for Standard 4 Tersa Street El Haram Giza	NIS	Egypt
Mrs. Deona JONKER National Metrology Institute of South Africa Meiring Naudé Road Brummeria Pretoria	NMISA	South Africa
Dr. Michel VAN SON NMi Van Swinden Laboratorium B.V. PO Box 654, 2500 AR Delft Thijsseweg 11, 2629 JA Delft	NMi VSL	The Netherlands
Mr. Thomas ZUBLER Cannon Instrument Company, National Institute of Standards and Technology 2139 High Tech Rd.	NIST/CANNON	United States

State College, PA 16803		
Dr. Henning WOLF Physikalisch-Technische Bundesanstalt, Braunschweig und Berlin Bundesallee 100 38116 Braunschweig	PTB	Germany

All participants intend to report results for 20 °C, 60 °C and 100 °C.

Certain participants have participated satisfactory to the CCM.V-K2 key comparison. These participants also performed a calibration program of primary viscometers beginning with water at 20.00 °C (ISO 3666-1998) [**Error! Reference source not found.**] and stepping up to higher viscosities in a dependent progression. Results from these participants, *i.e.*, PTB and Cannon, will contribute to the reference values obtained from this key comparison and thus provide a link to the CCM.V-K2 key comparison. The non-contributing participants have not (satisfactorily) participated to the CCM.V-K2 key comparison and/or will be providing viscosities determined from viscometers calibrated by other metrology institutes.

The results of this key comparison will be of interest for the entries concerning viscosity in the Calibration and Measurement Capability (CMC) tables.

Purpose of this document

The purpose of this document is to provide the participating laboratories with instructions for the handling of the liquid samples and to report on the measurement results and the measuring procedure.

It is important that all instructions given in this document be followed. This will ensure that the measurement data are obtained under comparable conditions and are presented in the same format. Any deviation from the instructions has to be reported to the pilot laboratory.

Sample and sample handling

The measurements are to be carried out on a sample of standard liquid provided by the Physikalisch–Technische Bundesanstalt (Standard liquid A). The sample is a poly-α-olefine, not labelled as dangerous goods.

Sample characteristics:

Temperature (°C)	Nominal viscosity (mm^2/s)	Temp. coeff. viscosity (K^{-1})	Density (kg/m^3)	Temp. coeff. density (K^{-1})	Surface tension (mN/m)	Temp. coeff. surf. tens. (K^{-1})
20	1300	-0.0672	845.64	-0.0007127	30.2	-0.062
60	150	-0.0414	821.76	-0.000706	27.7	-0.062
100	40	-0.0280	798.34	-0.0006992	25.2	-0.062

The long term stability of the kinematic viscosity is better than 0.1 % over a 6 month period.

Exposure to bright light and high temperatures should be avoided. The sealed glass bottles should not be opened before the measurements are started. The oil may be heated to 70 °C to facilitate filling of the viscometers.

Format for reporting the measurement results

For reporting your results, it is required to use the templates that are distributed by the pilot laboratory. Please use:

- Report_ Form_1_A_20°C, for measurements at 20°C
- Report_Form_1_ A_60°C, for measurements at 60°C
- Report_ Form _1_A_100°C, for measurements at 100°C

Uncertainty of measurement

All of the report forms (1A 20°C, 1A 60°C, 1A 100°C) give a list of main components of the uncertainty budget. Please add any additional component occurring in your measurements. Do not include a term for a potential long-term drift of the viscosity.

The uncertainty of the viscosity is to be given as one standard uncertainty and in addition as expanded uncertainty U_{95} for a confidence level of 95%. This is obtained by combining the individual standard uncertainties obtained from Type A and Type B evaluations. The uncertainty evaluation should include a list of all influence quantities, their values and standard uncertainties, together with their degrees of freedom. The combined standard uncertainty, as well as the effective degrees of freedom ν_{eff} of the combined standard uncertainty u_c and the t-factor $t_{95}(\nu_{eff})$ taken from the t-distribution for a 95% confidence level must be stated. The expanded uncertainty is given as $U_{95} = t_{95}(\nu_{eff}) \cdot u_c$. The uncertainties are to be calculated and reported according to ISO "Guide to the Expression of Uncertainty in Measurement" [**Error! Reference source not found.**].

Details of viscosity measurement

Give the mathematical model equations for calculating the viscosity of the liquid samples. (Example: $\nu = \frac{g}{g_{cal}} C(t - t_{KE}) c_S$ In this equation, ν is the kinematic viscosity in mm²/s, g is the acceleration of free fall at the point of measurement in m²/s, g_{cal} is the acceleration of free fall at the point of calibration, C is the viscometer constant in mm²/s², t is the flow time in s, t_{KET} the kinetic energy correction in s, and c_S the surface tension correction factor.) Describe how the standard uncertainties of the individual influence quantities of Report Form 1 in the uncertainty of the viscosity were estimated. It is important to know in what way the participants calibrated the viscometers used in this inter-comparison.

The participants providing viscosities determined from viscometers calibrated by other metrology institutes should provide the source of the calibration certificate.

Please give references to publications concerning your viscosity scale. If possible, send a copy of the publication to the pilot laboratory.

Reporting deadline

The reports are to be sent to the pilot laboratory as soon as possible and five weeks after start of the measurements at the latest. A result is not considered complete if no associated uncertainty supported by a complete uncertainty budget is given.

Laboratories are kindly requested to report their results well before the deadline. Results received after the deadline will not be processed and included in the report. In case of foreseeable delays, participants are kindly requested to report such delays to the pilot laboratory with an indication whether results are to be expected and within what time frame. The new date communicated cannot be regarded as a new deadline, unless the pilot laboratory submits a new deadline for reporting results.

A request for correction of submitted results may only be granted if the request is sent to the pilot laboratory before reporting deadline.

Confidentiality

The results are confidential until all the participants have completed their measurements and all the results have been received (or until the deadline for receipt of the results is over).

References

[1] ISO/TR 3666:1998(E), Viscosity of water

[2] Guide to the expression of Uncertainty in Measurement, corrected and reprinted 1995, International Organization of Standardization (Geneva, Switzerland), ISBN 92 67 10188 9

Appendix A3 – Original timetable

October 6th, 2008 (pilot laboratory): Mailing of the data sheets, the timetable, and the technical report to the participants

October 6th, 2008 (working party): Shipment of the standard liquids to the participants

October 31st, 2008 (all participants): Start of the comparison measurements

November 21st, 2008 (all participants): Finishing of the comparison measurements

December 1st, 2008 (all participants): Submission of the results to the pilot laboratory

December 19th, 2008 (pilot laboratory): Submission draft A report to the participants

March 9th, 2009 (BIPM): Submission of draft B report