Final Report
CCM.V-K3: CCM Key Comparison of Viscosity

Y. Fujita[1], T. Zubler[2], J. Mastropierro[2], S. Trujillo[3], I Cekiel[4], D. Malta[5], S. Lorefice[6], P. Ballereau[7], P. A. Meury[7], Z. Zhang[8], H. Wolf[9], D. Trochta[10], O. Sakarya[11], I. Van Andel[12], C. Buchner[13], I. Spohr[14], A. Furtado[14], B. Lugadiru[15], M. Mekawy[16], D. Jonker[17], A. Kumar[18], Z. Anuar[19]

Abstract

This report describes the third CCM key comparison in capillary viscometry at twelve National Metrology Institutes (NMIs), which was carried out between October 2012 and February 2013. Seven NMIs, which do not maintain an independent viscosity scale, also took part in this comparison. Three samples of Newtonian liquids with nominal kinematic viscosities of 6 mm^2/s at 15 °C and 5 mm²/s at 20 °C, 2000 mm²/s at 20 °C and 500 mm²/s at 40 °C, and 160000 mm²/s at 20 °C and 25000 mm²/s at 40 °C prepared by NMIJ were provided to each of the NMIs. For each of these liquids at two temperatures, total number of 98 measurements was carried out and from the results of viscosity measurements, the key comparison reference values (KCRVs) for six data sets were determined. The degrees of equivalences was evaluated by difference from the KCRV and, with a few exceptions, these differences were almost equal to or less than expanded uncertainties, showing a good equivalencies of capabilities at the participating NMIs for the viscosity measurements in wide range of viscosities covered from 5 mm²/s to 160000 mm²/s.

.

[1] National Metrology Institute of Japan, National Institute of Advanced Industrial Science and Technology, NMIJ/AIST, Japan
[2] Cannon Instrument Company, National Institute of Standards and Technology, NIST/CANNON, USA
[3] Centro Nacional de Metrología, CENAM, Mexico
[4] Central Office of Measures - Glowny Urzad Mia, GUM, Poland
[5] Instituto Nacional de Metrologia, Qualidade e Tecnologia, INMETRO, Brazil
[6] Istituto Nazionale di Ricerca Metrologica, INRIM, Italy
[7] Laboratoire national de métrologie et d'essais, LNE, France
[8] National Institute of Metrology, NIM, China
[9] Physikalisch-Technische Bundesanstalt, PTB, Germany
[10] Slovenský metrologický ústav, SMU, Slovakia
[11] TÜBİTAK Ulusal Metroloji Enstitüsü, UME, Turkey
[12] VSL B. V., VSL, The Netherlands
[13] Bundesamt für Eich- und Vermessungswesen, BEV, Austria
[14] Instituto Português da Qualidade, IPQ, Portugal
[15] Kenya Bureau of Standards, KEBS, Kenya
[16] National Institute for Standard, NIS, Egypt
[17] National Metrology Institute of South Africa, NMISA, South Africa
[18] National Physical Laboratory, NPLI, India
[19] National Metrology Laboratory, SIRIM Berhad, Malaysia (now, National Metrology Institute of Malaysia (NMIM))

Table of Contents

1. Introduction

Many national metrology institute (NMIs) and related laboratories are responsible for the viscosity standard and associated services, particularly regarding the provision of the certificated viscosity value of a standard liquid determined by using glass capillary viscometers calibrated on their maintained viscosity scales. To check their viscosity scales and capabilities of viscosity measurement, in the past two key comparisons, CCM.V-K1 [2] and CCM.V-K2 [3], the comparisons of the viscosity measurements in the viscosity range from 5 mm^2/s to 40000 mm^2/s at the temperatures from -40 °C to 150 °C have been carried out.

The organization of the third key comparison on viscosity was planned at the meeting of CCM Working Group on Viscosity held in 2011 at the BIPM. Members agreed that all laboratories eligible under the rules of Mutual Recognition Arrangement (MRA) could participate in the key comparison. NMIJ (Japan) agreed to be the pilot laboratory for the comparison, with PTB (Germany) offering assistance as a working party.

The main objectives of this comparison are:

- To compare viscosity measurements at middle temperatures in wide range of viscosities covered from 5 mm^2/s to 160000 mm^2/s using three standard liquids designated as A, B, and C, respectively.
- To compare viscosity measurement of high viscosity using liquid C with the viscosity of 160000 mm^2/s that is to be the extension of viscosity range carried out in the previous key comparison.
- To compare viscosity measurement of middle viscosity using the liquid B with the viscosity of 2000 mm^2/s.
- To compare viscosity measurement of low viscosity using the liquid A with the viscosity of 5 mm^2/s, where the measurement at 15 °C is made only for the liquid A.

Twelve laboratories maintaining an independent viscosity scale and seven laboratories with a scale calibrated by other NMIs participated in this key comparison. The KCRVs were established from the results submitted by those laboratories maintaining an independent viscosity scale.

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

Laboratory	Acronym	Country	Contact Person
Laboratories maintaining an independent viscosity scale			
Cannon Instrument Company, National Institute of Standards and Technology	NIST/CANNON	USA	Thomas ZUBLER Joseph MASTROPIERRO
Centro Nacional de Metrología	CENAM	Mexico	Sonia TRUJILLO
Central Office of Measures	GUM	Poland	Izabela CEKIEL
Instituto Nacional de Metrologia, Qualidade e Tecnologia	INMETRO	Brazil	Dalni MALTA
Istituto Nazionale di Ricerca Metrologica	INRIM	Italy	Salvatore LOREFICE
Laboratoire national de métrologie et d'essais	LNE	France	Patrick BALLEREAU Paul-André MEURY
National Institute of Metrology	NIM	China	Zhengdong ZHANG
National Metrology Institute of Japan / National Institute of Advanced Industrial Science and Technology	NMIJ/AIST	Japan	Yoshitaka FUJITA
Physikalisch-Technische Bundesanstalt	PTB	Germany	Henning WOLF
Slovenský metrologický ústav	SMU	Slovakia	Dušan TROCHTA
TÜBİTAK Ulusal Metroloji Enstitüsü	UME	Turkey	Orhan SAKARYA
VSL B.V.	VSL	The Netherlands	Inge van ANDEL
Laboratories with a scale based on other NMIs			
Bundesamt für Eich- und Vermessungswesen	BEV	Austria	Christian BUCHNER
Instituto Português da Qualidade	IPQ	Portugal	Isabel SPOHR Andreia FURTADO
Kenya Bureau of Standards	KEBS	Kenya	Beatrice LUGADIRU
National Institute for Standard	NIS	Egypt	Mostafa MEKAWY
National Metrology Institute of South Africa	NMISA	South Africa	Deona JONKER
National Physical Laboratory	NPLI	India	Anil KUMAR
National Metrology Laboratory	SIRIM Berhad	Malaysia	Zulkhairi ANUAR

3. Viscosity scales of the participants

The first key comparison, CCM.V-K1 [2] established the validity of the viscosity scales of participating laboratories maintained independently based on the viscosity of water (1.0034 mm²/s) [1].

After the past two key comparisons [2,3], CENAM and INMETRO have become a laboratory maintaining the Independent viscosity scale.

4. Liquid samples

The NMIJ as the pilot laboratory provided participating laboratories with samples of Newtonian standard liquids for the measurement. Of the three standard liquids prepared, the standard liquid A of low viscosity is mineral oil, the liquid B of middle viscosity is mineral oil with a mixture of small amount of polybutene, and the liquid C is polybutene. The sample bottles that are necessary for the measurements were supplied to each participant based on its answer to the questionnaire about the number of 500ml bottles to be used for the measurements for each liquid. None of the liquids is labeled as dangerous goods. The rate of viscosity change in 1 year are 0.03 % for liquid A, 0.05 % for liquid B, and 0.07 % for liquid C, respectively, which are described in the Japanese Industrial Standard (JIS) Z8809.

The pilot laboratory disseminated following data for the sample.

Table 4-1. Material parameters of the standard liquids

Liquid sample	Temperature / °C	Nominal kinematic viscosity / mm^2s^{-1}	Temperature coefficient of viscosity / K^{-1}	Density / gcm^{-3}	Standard uncertainty / gcm^{-3}	Surface tension / mNm^{-1}	Standard uncertainty / mNm^{-1}
Standard liquid A	15	6	0.028	0.81243	0.00012	28.50	0.19
	20	5	0.027	0.80900	0.00012	28.07	0.18
Standard liquid B	20	2000	0.082	0.88127	0.00013	32.83	0.18
	40	500	0.063	0.86920	0.00018	31.04	0.22
Standard liquid C	20	160000	0.101	0.89632	0.00018	32.45	0.48
	40	25000	0.083	0.88514	0.00019	31.40	0.36

5. Organization of the comparison

Table 5-1. Chronology of the measurements

Date	Who	What
October 24th , 2012	Pilot laboratory	Shipment of the standard liquids, the data sheets, the timetable, and the technical report to the participants
November 5th , 2012	All participants	Start of the comparison measurements

January 18th , 2013	All participants	Finishing of the comparison measurements
February 15th , 2013	All participants	Submission of the results to the pilot laboratory
February 13th , 2015	Pilot laboratory	Submission draft A report to the participants

6. Comments on the comparison

The samples arrived at the participant's laboratories between October 10th and December 11th, 2012. As Cannon depleted the original bottle of Liquid C due to multiple attempts to overcome the problem of the bubble formation in high viscosity liquid, a second bottle of Liquid C was shipped on December, 2012 so that extensional measurement was carried out to obtain the results of Liquid C at 20 °C.

Before submission of first Draft A report, several participants were asked to verify their submitted results: The INRIM and NPLI were informed that their results appeared to be discrepant based on the obvious identifying of discrepancy in Procedure A of Cox [4]. The BEV informed mistakes of not filling out the results of the second viscometer in the report form. As the updated results of two viscometers were not submitted, the results of one viscometer were used as their results in this report. The INMETRO updated their expanded uncertainties with corrected values as they were mixed up the relative value and absolute value. As further review for correction of their results was needed, the tentative values of uncertainties were used to calculate the reference values in the first Draft A report.

After submission of first Draft A, the INRIM offered their intention of withdrawing their results of Liquid A at 15 °C, Liquid A at 20 °C, Liquid C at 20 °C and Liquid C at 40 °C that are obviously identified to be discrepant with the explanation in which the cause of their anomaly was thought to be due to a contamination of test liquids caused by cleaning problem of the viscometers used. The INRIM also explained that the problem was figured out and their outliers were judged to be withdrawn at the time when informed about the discrepant from pilot laboratory but it was mistakenly thought that the withdrawing was already done before distributing Draft A due to misunderstanding in the communication with the pilot laboratory. This explanation was also reported at the WGDV meeting held in 2015 and thus, above four results were withdrawn in the second Draft A.

The INMETRO updated their kinematic viscosities and expanded uncertainties with corrected values and explained that the change of the values was attributed to their mistake in the calculation of the kinematic viscosity and the uncertainty involving the temperature coefficient of kinematic viscosity. In the updated results, kinematic viscosities were slightly decreased by about 0.004 % for liquid A and about 0.02 % for liquid B and liquid C, while the associated uncertainties were expanded to about 1.7 times for liquid A, 2 to 3 times for liquid B and 3.3 to 3.4 times for liquid C, respectively, of the values in first Draft A.

7. Results of the comparison

The reported results of measurement by the participating institutes are listed in Table 7-1 to Table 7-6. The viscosity ν at the nominal temperature was obtained by correcting the reported results of the viscosity ν_0 at the measurement temperature T and the standard uncertainty u was derived from the reported value of relative expanded uncertainty U_{r95}.

Table 7-1 to Table 7-6 also shows the results of the evaluation of comparison data for the calculation of the reference value. As informed in the technical protocol, the key comparison reference value was derived from the results reported by participants maintaining an independent viscosity scale and calculated according to the guidelines of Cox [4] and it is applied to the individual data set on each temperature of each liquid sample. Procedure A was performed by applying the chi-squared test to carry out an overall consistency check of the results. The test results indicated that three results of Liquid B at 40 °C, Liquid C at 20 °C and Liquid C at 40 °C were inconsistent as the right-tailed probabilities of the chi-squared distribution with their associated observed chi-squared values χ^2_{obs} and degrees of freedom were smaller than 0.05, although their values of the probabilities were close to 0.05. As for the rest of the results of Liquid A at 15 °C, Liquid A at 20 °C and Liquid B at 40 °C, the consistency check did not fail and thus the weighted mean y of the results was adopted as the reference value x_{ref}.

The difference of viscosity of laboratory i from the reference value, $d_i = x_i - x_{ref}$, and its standard uncertainty $u(d_i) = \sqrt{u^2(x_i) - u^2(x_{ref})}$ in Procedure A is given in the table. Using these values, $|d_i| - 2u(d_i)$ was calculated and it shows discrepancy of the measurement. To the laboratory having obviously large positive value of $|d_i| - 2u(d_i)$, only the fact of the existence of data sets that appear to be discrepant was informed.

Procedure B was performed for the inconsistent results and the median is used to calculate the reference value in the Monte-Carlo method, where 100000 trials were performed for the sampling. The coverage interval at the 95 % level of confidence, $U_{95}(x_{ref})$, was obtained exploratory from the distribution sampled by the Monte-Carlo trials. Considering the asymmetric distribution, $U_{95}(x_{ref})$ was expressed as two values with “lower” and “upper” which mean endpoints of that interval. U_i^{L} and U_i^{U} described below are used for the same meaning as them. The reference values and expanded uncertainties for six data sets are summarized in Table A1 in Appendix A1.

The degrees of equivalence of each laboratory with respect to the reference value d_i and its expanded uncertainty U_i in Procedure A or U_i^{L} and U_i^{U} in Procedure B are given in Table A2-1 to Table A2-6 in Appendix A2. In their tables, the degrees of equivalence between two laboratories, D_{ij} and its expanded uncertainty, U_{ij}, are also given. The graphical representations of them are also shown in Figure A1-1 to Figure A1-6.

Table 7-1. Results of the measurements for Liquid A at 15 °C

	Participants	ν_0/(mm^2/s)	T /℃	ν/(mm^2/s)	U_{r95}	u/(mm^2/s)	Procedure A		
							d_i / (mm^2/s)	$u(d_i)$ /(mm^2/s)	$\lvert d_i\rvert$-2u(d$_i$)
Independent Scale	Cannon	5.5805	14.9998	5.5805	0.00101	0.0028	-0.0028	0.0027	-0.0027
	CENAM	5.5780	15.0000	5.5780	0.00201	0.0056	-0.0053	0.0056	-0.0059
	GUM	5.5861	15.0000	5.5861	0.00122	0.0034	0.0028	0.0033	-0.0038
	INMETRO	5.5829	15.0013	5.5831	0.00090	0.0025	-0.0002	0.0024	-0.0046
	INRIM								
	LNE	5.5825	15.0054	5.5834	0.00215	0.0060	0.0001	0.0060	-0.0119
	NIM								
	NMIJ/AIST	5.5837	14.9994	5.5836	0.00043	0.0012	0.0003	0.0010	-0.0016
	PTB	5.5854	15.0000	5.5854	0.00054	0.0015	0.0022	0.0013	-0.0005
	SMU	5.5906	15.0000	5.5906	0.00156	0.0044	0.0074	0.0043	-0.0013
	UME	5.5808	15.0010	5.5809	0.00060	0.0017	-0.0023	0.0015	-0.0007
	VSL	5.5776	15.0000	5.5776	0.00131	0.0037	-0.0057	0.0036	-0.0015
	BEV	5.5890	15.0016	5.5893	0.00380	0.0106	0.0060	0.0106	-0.0152
	IPQ	5.5885	14.9551	5.5815	0.00159	0.0044	-0.0018	0.0044	-0.0070
	KEBS								
	NIS	5.5981	15.0001	5.5981	0.04500	0.1260	0.0148	0.1260	-0.2371
	NMISA	5.5753	15.0684	5.5860	0.00360	0.0101	0.0027	0.0100	-0.0173
	NPLI	5.5630	15.0050	5.5638	0.00320	0.0089	-0.0195	0.0089	0.0017
	SIRIM								

Procedure A					
	Weighted Mean y	5.5833			
	Standard uncertainty $u(y)$	0.0007			
	χ^2_{obs}	11.951			
	ν	9			
	Pr{$\chi^2(\nu) > \chi^2_{obs}$}	0.22	(>0.05)	not failing	
	Accept y as reference vale x_{ref}				
	Expanded uncertainty $U_{95}(x_{ref})$	0.0014			
Procedure B					
	Median(MC) x_{ref}				
	Standard uncertainty $u(x_{ref})$				
	Expanded uncertainty $U_{95}(x_{ref})$		(Lower)		(Upper)

Table 7-2. Results of the measurements for Liquid A at 20 °C

	Participants	ν_0/(mm^2/s)	T /℃	ν/(mm^2/s)	U_{r95}	u/(mm^2/s)	Procedure A		
							d_i / (mm^2/s)	$u(d_i)$ /(mm^2/s)	$\lvert d_i\rvert$-2u(d$_i$)
Independent Scale	Cannon	4.8742	20.0001	4.8743	0.00091	0.0022	0.0006	0.0021	-0.0037
	CENAM	4.8720	20.0000	4.8720	0.00203	0.0049	-0.0017	0.0049	-0.0082
	GUM	4.8763	20.0000	4.8763	0.00096	0.0023	0.0026	0.0023	-0.0019
	INMETRO	4.8724	20.0011	4.8726	0.00089	0.0022	-0.0011	0.0021	-0.0031
	INRIM								
	LNE	4.8747	20.0015	4.8749	0.00251	0.0061	0.0013	0.0061	-0.0109
	NIM	4.8734	20.0000	4.8734	0.00110	0.0027	-0.0003	0.0026	-0.0050
	NMIJ/AIST	4.8735	20.0009	4.8736	0.00042	0.0010	0.0000	0.0008	-0.0017
	PTB	4.8753	20.0000	4.8753	0.00053	0.0013	0.0017	0.0012	-0.0006
	SMU	4.8802	20.0000	4.8802	0.00156	0.0038	0.0066	0.0038	-0.0010
	UME	4.8709	20.0000	4.8709	0.00059	0.0014	-0.0027	0.0013	0.0001
	VSL	4.8694	20.0000	4.8694	0.00132	0.0032	-0.0043	0.0032	-0.0020
	BEV	4.8799	20.0026	4.8802	0.00320	0.0078	0.0066	0.0078	-0.0090
	IPQ	4.8702	20.0179	4.8725	0.00159	0.0039	-0.0011	0.0038	-0.0066
	KEBS	4.8753	20.0000	4.8753	0.00422	0.0103	0.0017	0.0103	-0.0189
	NIS	4.8863	20.0001	4.8863	0.04501	0.1100	0.0127	0.1100	-0.2073
	NMISA	4.8687	20.0625	4.8769	0.00310	0.0076	0.0032	0.0075	-0.0118
	NPLI	4.8281	20.0150	4.8301	0.00320	0.0077	-0.0436	0.0077	0.0282
	SIRIM	4.8729	20.0040	4.8735	0.00164	0.0040	-0.0002	0.0040	-0.0077

Procedure A					
	Weighted Mean y	4.8737			
	Standard uncertainty $u(y)$	0.0006			
	χ^2_{obs}	11.887			
	ν	10			
	Pr{$\chi^2(\nu) > \chi^2_{obs}$}	0.29	(>0.05)	not failing	
	Accept y as reference vale x_{ref}				
	Expanded uncertainty $U_{95}(x_{ref})$	0.0012			
Procedure B					
	Median(MC) x_{ref}				
	Standard uncertainty $u(x_{ref})$				
	Expanded uncertainty $U_{95}(x_{ref})$		(Lower)		(Upper)

Table 7-3. Results of the measurements for Liquid B at 20 °C

	Participants	ν_0/(mm^2/s)	T /℃	ν/(mm^2/s)	U_{r95}	u/(mm^2/s)	Procedure A		
							d_i / (mm^2/s)	$u(d_i)$ /(mm^2/s)	$\lvert d_i\rvert$-2u(d$_i$)
Independent Scale	Cannon	1975.5	20.0013	1975.7	0.0025	2.5	3.2	2.4	-1.6
	CENAM	1971.4	20.0000	1971.4	0.0024	2.4	-1.0	2.3	-3.6
	GUM	1973.9	20.0001	1973.9	0.0026	2.6	1.5	2.6	-3.6
	INMETRO	1971.0	20.0021	1971.3	0.0015	1.5	-1.1	1.4	-1.7
	INRIM	1974.3	20.0013	1974.5	0.0017	1.7	2.1	1.6	-1.1
	LNE	1974.8	20.0061	1975.8	0.0056	5.5	3.3	5.5	-7.6
	NIM	1973.7	20.0000	1973.7	0.0020	2.0	1.3	1.9	-2.6
	NMIJ/AIST	1971.1	20.0003	1971.1	0.0009	0.9	-1.3	0.8	-0.3
	PTB	1971.6	20.0000	1971.6	0.0012	1.2	-0.8	1.1	-1.3
	SMU	1975.0	20.0000	1975.0	0.0033	3.2	2.6	3.2	-3.8
	UME	1973.6	19.9990	1973.5	0.0013	1.2	1.0	1.1	-1.2
	VSL	1972.4	20.0000	1972.4	0.0027	2.6	0.0	2.6	-5.1
	BEV	1975.3	19.9987	1975.1	0.0053	5.2	2.7	5.2	-7.8
	IPQ	1962.0	20.0198	1965.2	0.0046	4.5	-7.2	4.5	-1.7
	KEBS	1968.6	20.0000	1968.6	0.0051	5.0	-3.8	5.0	-6.2
	NIS	1977.8	20.0001	1977.8	0.0450	44.5	5.4	44.5	-83.7
	NMISA	1961.1	20.0634	1971.3	0.0226	22.3	-1.2	22.3	-43.4
	NPLI	1673.9	20.0100	1675.3	0.0037	3.1	-297.1	3.1	291.0
	SIRIM								

Procedure A					
	Weighted Mean y	1972.4			
	Standard uncertainty $u(y)$	0.48			
	χ^2_{obs}	9.11			
	ν	11			
	Pr{$\chi^2(\nu) > \chi^2_{obs}$}	0.61	(>0.05)	not failing	
	Accept y as reference vale x_{ref}				
	Expanded uncertainty $U_{95}(x_{ref})$	0.95			
Procedure B					
	Median(MC) x_{ref}				
	Standard uncertainty $u(x_{ref})$				
	Expanded uncertainty $U_{95}(x_{ref})$		(Lower)		(Upper)

Table 7-4. Results of the measurements for Liquid B at 40 °C

	Participants	ν_0/(mm^2/s)	T /℃	ν/(mm^2/s)	U_{r95}	u/(mm^2/s)	Procedure A		
							d_i / (mm^2/s)	$u(d_i)$ /(mm^2/s)	$\lvert d_i\rvert$-2u(d$_i$)
Independent Scale	Cannon	474.07	40.0033	474.17	0.0020	0.47	1.50	0.46	0.59
	CENAM	472.61	40.0000	472.61	0.0022	0.52	-0.05	0.51	-0.98
	GUM	472.37	40.0003	472.38	0.0020	0.46	-0.29	0.45	-0.62
	INMETRO	472.31	39.9967	472.21	0.0015	0.34	-0.45	0.33	-0.21
	INRIM	473.38	39.9991	473.36	0.0018	0.43	0.69	0.42	-0.15
	LNE	473.37	39.9953	473.23	0.0034	0.80	0.56	0.79	-1.02
	NIM	473.38	40.0000	473.38	0.0016	0.38	0.71	0.36	-0.01
	NMIJ/AIST	472.54	40.0016	472.59	0.0009	0.21	-0.08	0.18	-0.29
	PTB	472.44	40.0000	472.44	0.0011	0.26	-0.23	0.23	-0.24
	SMU	471.97	40.0000	471.97	0.0031	0.72	-0.70	0.72	-0.73
	UME	472.58	39.9978	472.52	0.0011	0.26	-0.15	0.24	-0.33
	VSL	472.08	40.0000	472.08	0.0021	0.50	-0.58	0.49	-0.39
	BEV	473.76	39.9955	473.62	0.0067	1.59	0.96	1.58	-2.21
	IPQ	469.97	40.0705	472.06	0.0029	0.69	-0.61	0.68	-0.76
	KEBS	471.73	40.0000	471.73	0.0050	1.17	-0.94	1.17	-1.39
	NIS	474.79	40.0002	474.80	0.0452	10.72	2.13	10.72	-19.31
	NMISA	472.56	40.0064	472.75	0.0072	1.70	0.09	1.70	-3.31
	NPLI	454.79	40.0050	454.94	0.0037	0.84	-17.73	0.84	16.06
	SIRIM	473.34	40.0010	473.37	0.0030	0.71	0.70	0.71	-0.71

Procedure A					
	Weighted Mean y	472.67			
	Standard uncertainty $u(y)$	0.10			
	χ^2_{obs}	22.58			
	ν	11			
	Pr{$\chi^2(\nu) > \chi^2_{obs}$}	0.02	(<0.05)	failing	
Procedure B					
	Median(MC) x_{ref}	472.62	(Reference value)		
	Standard uncertainty $u(x_{ref})$	0.15			
	Expanded uncertainty $U_{95}(x_{ref})$	0.29	(Lower)	0.31	(Upper)

Table 7-5. Results of the measurements for Liquid C at 20 °C

	Participants	ν_0/(mm^2/s)	T /℃	ν/(mm^2/s)	U_{r95}	u/(mm^2/s)	Procedure A		
							d_i / (mm^2/s)	$u(d_i)$ /(mm^2/s)	$\lvert d_i\rvert$-2u(d$_i$)
Independent Scale	Cannon	154654	20.0079	154777	0.0031	242	251	233	-215
	CENAM	154661	20.0000	154661	0.0043	332	134	325	-515
	GUM								
	INMETRO	154170	20.0020	154201	0.0018	140	-325	122	81
	INRIM								
	LNE	154326	20.0122	154515	0.0066	508	-11	504	-996
	NIM								
	NMIJ/AIST	154793	19.9999	154792	0.0017	134	266	116	35
	PTB	154427	20.0000	154427	0.0015	113	-99	91	-82
	SMU	155178	20.0000	155178	0.0051	394	651	389	-126
	UME								
	VSL								
	BEV	155022	19.9977	154986	0.0036	279	460	271	-82
	IPQ								
	KEBS								
	NIS	155180	20.0001	155182	0.0458	3552	655	3552	-6448
	NMISA								
	NPLI								
	SIRIM								

Procedure A					
	Weighted Mean y	154526			
	Standard uncertainty $u(y)$	67			
	χ^2_{obs}	14			
	ν	6			
	Pr{$\chi^2(\nu) > \chi^2_{obs}$}	0.03	(<0.05)	failing	
Procedure B					
	Median(MC) x_{ref}	154639	(Reference value)		
	Standard uncertainty $u(x_{ref})$	147			
	Expanded uncertainty $U_{95}(x_{ref})$	278	(Lower)	284	(Upper)

Table 7-6. Results of the measurements for Liquid C at 40 °C

	Participants	ν_0/(mm^2/s)	T /℃	ν/(mm^2/s)	U_{r95}	u/(mm^2/s)	Procedure A		
							d_i / (mm^2/s)	$u(d_i)$ /(mm^2/s)	$\lvert d_i\rvert$-2u(d$_i$)
Independent Scale	Cannon	25137	40.0028	25143	0.0031	39	98	38	22
	CENAM	25111	40.0000	25111	0.0043	54	66	53	-41
	GUM	25033	40.0004	25034	0.0032	39	-11	39	-67
	INMETRO	25055	39.9969	25048	0.0018	23	4	21	-39
	INRIM								
	LNE	25064	40.0004	25065	0.0066	83	20	83	-145
	NIM	25000	40.0000	25000	0.0032	40	-45	39	-33
	NMIJ/AIST	25069	40.0000	25069	0.0013	16	24	14	-4
	PTB	25025	40.0000	25025	0.0014	17	-20	15	-10
	SMU	25128	40.0000	25128	0.0053	66	83	65	-48
	UME	25003	40.0004	25004	0.0016	21	-41	19	3
	VSL	25018	40.0000	25018	0.0042	53	-27	52	-78
	BEV	25118	40.0010	25120	0.0100	126	76	125	-175
	IPQ								
	KEBS								
	NIS	25205	40.0002	25206	0.0464	585	161	585	-1009
	NMISA	25582	40.0070	25596	0.0588	753	552	752	-953
	NPLI								
	SIRIM	25003	39.9965	24996	0.0045	57	-49	56	-63

Procedure A					
	Weighted Mean y	25045			
	Standard uncertainty $u(y)$	8			
	χ^2_{obs}	19			
	ν	10			
	Pr{$\chi^2(\nu) > \chi^2_{obs}$}	0.04	(<0.05)	failing	
Procedure B					
	Median(MC) x_{ref}	25050	(Reference value)		
	Standard uncertainty $u(x_{ref})$	16			
	Expanded uncertainty $U_{95}(x_{ref})$	31	(Lower)	31	(Upper)

References

[1] ISO TR 3666: Viscosity of water 1998

[2] CCM.V-K1 intercomparison in capillary viscometry, G. Klingenberg and H. Bauer, 2004, Metrologia, **41**, Tech. Suppl.,07001

[3] Final report on CCM.V-K2 comparison, C. P. Maggi, D. Trowbridge, M T. Zubler, Metrologia, 2009, **46**,Tech. Suppl., 07003

[4] The Evaluation of Key Comparison Data, M. G. Cox, Metrologia, 2002, 39, 589-595

Appendices

Appendix A1 Summary of reference value

Table A1. Reference values for the measurements in CCM.V-K3

Liquid samples	Temperature / °C	Reference value x_{ref} / mm^2s^{-1}	Expanded uncertainty $U_{95}(x_{ref})$ / mm^2s^{-1}	Procedure
Standard liquid A	15	5.5833	0.0014	A
Standard liquid A	20	4.8737	0.0012	A
Standard liquid B	20	1972.4	0.95	A
Standard liquid B	40	472.62	0.29 0.31	B
Standard liquid C	20	154639	284 278	B
Standard liquid C	40	25050	31 31	B

Appendix A2 Summary of degrees of equivalence

Table A2-1. Degrees of equivalence between laboratories, in mm^2s^{-1}, for the measurement of Liquid A at 15 °C.

Lab *i* ⇩	d_i	U_i	Lab *j* ⇨ Cannon		CENAM		GUM		INMETRO		LNE		NMIJ/AIST		PTB		SMU		UME		VSL	
			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}
Cannon	-0.0028	0.0055			0.0025	0.0125	-0.0056	0.0088	-0.0026	0.0076	-0.0029	0.0133	-0.0031	0.0061	-0.0050	0.0064	-0.0102	0.0104	-0.0005	0.0065	0.0029	0.0092
CENAM	-0.0053	0.0111	-0.0025	0.0125			-0.0081	0.0131	-0.0051	0.0123	-0.0054	0.0164	-0.0056	0.0115	-0.0074	0.0116	-0.0126	0.0142	-0.0029	0.0117	0.0004	0.0134
GUM	0.0028	0.0067	0.0056	0.0088	0.0081	0.0131			0.0030	0.0085	0.0027	0.0138	0.0025	0.0072	0.0007	0.0075	-0.0045	0.0111	0.0052	0.0076	0.0085	0.0100
INMETRO	-0.0002	0.0048	0.0026	0.0076	0.0051	0.0123	-0.0030	0.0085			-0.0003	0.0130	-0.0005	0.0056	-0.0024	0.0059	-0.0076	0.0101	0.0021	0.0060	0.0055	0.0089
LNE	0.0001	0.0120	0.0029	0.0133	0.0054	0.0164	-0.0027	0.0138	0.0003	0.0130			-0.0003	0.0123	-0.0021	0.0124	-0.0073	0.0149	0.0024	0.0125	0.0058	0.0141
NMIJ/AIST	0.0003	0.0020	0.0031	0.0061	0.0056	0.0115	-0.0025	0.0072	0.0005	0.0056	0.0003	0.0123			-0.0018	0.0039	-0.0070	0.0091	0.0027	0.0041	0.0060	0.0077
PTB	0.0022	0.0027	0.0050	0.0064	0.0074	0.0116	-0.0007	0.0075	0.0024	0.0059	0.0021	0.0124	0.0018	0.0039			-0.0052	0.0093	0.0045	0.0045	0.0079	0.0079
SMU	0.0074	0.0086	0.0102	0.0104	0.0126	0.0142	0.0045	0.0111	0.0076	0.0101	0.0073	0.0149	0.0070	0.0091	0.0052	0.0093			0.0097	0.0094	0.0131	0.0114
UME	-0.0023	0.0030	0.0005	0.0065	0.0029	0.0117	-0.0052	0.0076	-0.0021	0.0060	-0.0024	0.0125	-0.0027	0.0041	-0.0045	0.0045	-0.0097	0.0094			0.0034	0.0080
VSL	-0.0057	0.0072	-0.0029	0.0092	-0.0004	0.0134	-0.0085	0.0100	-0.0055	0.0089	-0.0058	0.0141	-0.0060	0.0077	-0.0079	0.0079	-0.0131	0.0114	-0.0034	0.0080		
BEV	0.0060	0.0212	0.0088	0.0220	0.0113	0.0240	0.0032	0.0223	0.0062	0.0218	0.0059	0.0244	0.0056	0.0214	0.0038	0.0215	-0.0014	0.0230	0.0083	0.0215	0.0117	0.0225
IPQ	-0.0018	0.0088	0.0010	0.0105	0.0035	0.0143	-0.0046	0.0112	-0.0016	0.0102	-0.0018	0.0150	-0.0021	0.0092	-0.0039	0.0094	-0.0091	0.0125	0.0006	0.0095	0.0039	0.0115
NIS	0.0148	0.2519	0.0176	0.2520	0.0201	0.2522	0.0120	0.2520	0.0151	0.2520	0.0148	0.2522	0.0145	0.2519	0.0127	0.2519	0.0075	0.2521	0.0172	0.2519	0.0205	0.2520
NMISA	0.0027	0.0201	0.0055	0.0209	0.0080	0.0230	-0.0001	0.0212	0.0029	0.0207	0.0026	0.0234	0.0024	0.0203	0.0006	0.0203	-0.0046	0.0219	0.0051	0.0204	0.0084	0.0214
NPLI	-0.0195	0.0177	-0.0167	0.0187	-0.0142	0.0210	-0.0223	0.0191	-0.0193	0.0185	-0.0196	0.0215	-0.0198	0.0180	-0.0217	0.0181	-0.0268	0.0198	-0.0172	0.0181	-0.0138	0.0192

	d_i	U_i	BEV		IPQ		NIS		NMISA		NPLI	
			d_{ij}	U_{ij}	d_{ij}	U_{ij}	d_{ij}	U_{ij}	d_{ij}	U_{ij}	d_{ij}	U_{ij}
Cannon	-0.0028	0.0055	-0.0088	0.0220	-0.0010	0.0105	-0.0176	0.2520	-0.0055	0.0209	0.0167	0.0187
CENAM	-0.0053	0.0111	-0.0113	0.0240	-0.0035	0.0143	-0.0201	0.2522	-0.0080	0.0230	0.0142	0.0210
GUM	0.0028	0.0067	-0.0032	0.0223	0.0046	0.0112	-0.0120	0.2520	0.0001	0.0212	0.0223	0.0191
INMETRO	-0.0002	0.0048	-0.0062	0.0218	0.0016	0.0102	-0.0151	0.2520	-0.0029	0.0207	0.0193	0.0185
LNE	0.0001	0.0120	-0.0059	0.0244	0.0018	0.0150	-0.0148	0.2522	-0.0026	0.0234	0.0196	0.0215
NMIJ/AIST	0.0003	0.0020	-0.0056	0.0214	0.0021	0.0092	-0.0145	0.2519	-0.0024	0.0203	0.0198	0.0180
PTB	0.0022	0.0027	-0.0038	0.0215	0.0039	0.0094	-0.0127	0.2519	-0.0006	0.0203	0.0217	0.0181
SMU	0.0074	0.0086	0.0014	0.0230	0.0091	0.0125	-0.0075	0.2521	0.0046	0.0219	0.0268	0.0198
UME	-0.0023	0.0030	-0.0083	0.0215	-0.0006	0.0095	-0.0172	0.2519	-0.0051	0.0204	0.0172	0.0181
VSL	-0.0057	0.0072	-0.0117	0.0225	-0.0039	0.0115	-0.0205	0.2520	-0.0084	0.0214	0.0138	0.0192
BEV	0.0060	0.0212			0.0077	0.0230	-0.0089	0.2528	0.0033	0.0292	0.0255	0.0277
IPQ	-0.0018	0.0088	-0.0077	0.0230			-0.0166	0.2521	-0.0045	0.0220	0.0177	0.0199
NIS	0.0148	0.2519	0.0089	0.2528	0.0166	0.2521			0.0121	0.2527	0.0343	0.2526
NMISA	0.0027	0.0201	-0.0033	0.0292	0.0045	0.0220	-0.0121	0.2527			0.0222	0.0269
NPLI	-0.0195	0.0177	-0.0255	0.0277	-0.0177	0.0199	-0.0343	0.2526	-0.0222	0.0269		

Table A2-2. Degrees of equivalence between laboratories, in mm^2s^{-1}, for the measurement of Liquid A at 20 °C.

Lab *i* ⇩ / Lab *j* ⇨	d_i	U_i	Cannon		CENAM		GUM		INMETRO		LNE		NIM		NMIJ/AIST		PTB		SMU		UME	
			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}
Cannon	0.0006	0.0043			0.0023	0.0108	-0.0020	0.0065	0.0017	0.0062	-0.0007	0.0130	0.0009	0.0070	0.0006	0.0049	-0.0011	0.0051	-0.0060	0.0088	0.0033	0.0053
CENAM	-0.0017	0.0098	-0.0023	0.0108			-0.0043	0.0109	-0.0006	0.0108	-0.0029	0.0157	-0.0014	0.0112	-0.0016	0.0101	-0.0033	0.0102	-0.0082	0.0125	0.0011	0.0103
GUM	0.0026	0.0045	0.0020	0.0065	0.0043	0.0109			0.0037	0.0064	0.0014	0.0131	0.0029	0.0071	0.0027	0.0051	0.0009	0.0053	-0.0039	0.0089	0.0054	0.0055
INMETRO	-0.0011	0.0042	-0.0017	0.0062	0.0006	0.0108	-0.0037	0.0064			-0.0024	0.0130	-0.0008	0.0069	-0.0011	0.0048	-0.0028	0.0050	-0.0077	0.0088	0.0016	0.0052
LNE	0.0013	0.0122	0.0007	0.0130	0.0029	0.0157	-0.0014	0.0131	0.0024	0.0130			0.0015	0.0133	0.0013	0.0124	-0.0004	0.0125	-0.0053	0.0144	0.0040	0.0126
NIM	-0.0003	0.0052	-0.0009	0.0070	0.0014	0.0112	-0.0029	0.0071	0.0008	0.0069	-0.0015	0.0133			-0.0002	0.0057	-0.0019	0.0060	-0.0068	0.0093	0.0025	0.0061
NMIJ/AIST	0.0000	0.0017	-0.0006	0.0049	0.0016	0.0101	-0.0027	0.0051	0.0011	0.0048	-0.0013	0.0124	0.0002	0.0057			-0.0017	0.0033	-0.0066	0.0079	0.0027	0.0035
PTB	0.0017	0.0023	0.0011	0.0051	0.0033	0.0102	-0.0009	0.0053	0.0028	0.0050	0.0004	0.0125	0.0019	0.0060	0.0017	0.0033			-0.0049	0.0080	0.0044	0.0038
SMU	0.0066	0.0075	0.0060	0.0088	0.0082	0.0125	0.0039	0.0089	0.0077	0.0088	0.0053	0.0144	0.0068	0.0093	0.0066	0.0079	0.0049	0.0080			0.0093	0.0081
UME	-0.0027	0.0026	-0.0033	0.0053	-0.0011	0.0103	-0.0054	0.0055	-0.0016	0.0052	-0.0040	0.0126	-0.0025	0.0061	-0.0027	0.0035	-0.0044	0.0038	-0.0093	0.0081		
VSL	-0.0043	0.0063	-0.0049	0.0078	-0.0026	0.0118	-0.0069	0.0080	-0.0032	0.0078	-0.0056	0.0138	-0.0040	0.0084	-0.0043	0.0068	-0.0060	0.0069	-0.0109	0.0100	-0.0016	0.0070
BEV	0.0066	0.0156	0.0060	0.0162	0.0082	0.0185	0.0039	0.0163	0.0077	0.0162	0.0053	0.0198	0.0068	0.0165	0.0066	0.0158	0.0049	0.0158	0.0000	0.0174	0.0093	0.0159
IPQ	-0.0011	0.0077	-0.0017	0.0089	0.0005	0.0126	-0.0037	0.0091	0.0000	0.0089	-0.0024	0.0145	-0.0009	0.0094	-0.0011	0.0080	-0.0028	0.0082	-0.0077	0.0109	0.0016	0.0083
KEBS	0.0017	0.0205	0.0011	0.0210	0.0033	0.0228	-0.0010	0.0211	0.0027	0.0210	0.0004	0.0239	0.0019	0.0213	0.0017	0.0207	0.0000	0.0207	-0.0049	0.0219	0.0044	0.0208
NIS	0.0127	0.2199	0.0121	0.2200	0.0143	0.2202	0.0100	0.2200	0.0138	0.2200	0.0114	0.2203	0.0129	0.2200	0.0127	0.2199	0.0110	0.2199	0.0061	0.2201	0.0154	0.2200
NMISA	0.0032	0.0151	0.0026	0.0158	0.0049	0.0181	0.0006	0.0158	0.0043	0.0157	0.0020	0.0194	0.0035	0.0160	0.0033	0.0153	0.0015	0.0153	-0.0033	0.0169	0.0060	0.0154
NPLI	-0.0436	0.0154	-0.0442	0.0161	-0.0419	0.0183	-0.0462	0.0161	-0.0425	0.0161	-0.0449	0.0197	-0.0433	0.0164	-0.0436	0.0156	-0.0453	0.0157	-0.0502	0.0172	-0.0409	0.0157
SIRIM	-0.0002	0.0079	-0.0008	0.0092	0.0015	0.0127	-0.0028	0.0093	0.0009	0.0091	-0.0015	0.0146	0.0001	0.0096	-0.0002	0.0083	-0.0019	0.0084	-0.0068	0.0111	0.0025	0.0085

	d_i	U_i	VSL		BEV		IPQ		KEBS		NIS		NMISA		NPLI		SIRIM	
			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}
Cannon	0.0006	0.0043	0.0049	0.0078	-0.0060	0.0162	0.0017	0.0089	-0.0011	0.0210	-0.0121	0.2200	-0.0026	0.0158	0.0442	0.0161	0.0008	0.0092
CENAM	-0.0017	0.0098	0.0026	0.0118	-0.0082	0.0185	-0.0005	0.0126	-0.0033	0.0228	-0.0143	0.2202	-0.0049	0.0181	0.0419	0.0183	-0.0015	0.0127
GUM	0.0026	0.0045	0.0069	0.0080	-0.0039	0.0163	0.0037	0.0091	0.0010	0.0211	-0.0100	0.2200	-0.0006	0.0158	0.0462	0.0161	0.0028	0.0093
INMETRO	-0.0011	0.0042	0.0032	0.0078	-0.0077	0.0162	0.0000	0.0089	-0.0027	0.0210	-0.0138	0.2200	-0.0043	0.0157	0.0425	0.0161	-0.0009	0.0091
LNE	0.0013	0.0122	0.0056	0.0138	-0.0053	0.0198	0.0024	0.0145	-0.0004	0.0239	-0.0114	0.2203	-0.0020	0.0194	0.0449	0.0197	0.0015	0.0146
NIM	-0.0003	0.0052	0.0040	0.0084	-0.0068	0.0165	0.0009	0.0094	-0.0019	0.0213	-0.0129	0.2200	-0.0035	0.0160	0.0433	0.0164	-0.0001	0.0096
NMIJ/AIST	0.0000	0.0017	0.0043	0.0068	-0.0066	0.0158	0.0011	0.0080	-0.0017	0.0207	-0.0127	0.2199	-0.0033	0.0153	0.0436	0.0156	0.0002	0.0083
PTB	0.0017	0.0023	0.0060	0.0069	-0.0049	0.0158	0.0028	0.0082	0.0000	0.0207	-0.0110	0.2199	-0.0015	0.0153	0.0453	0.0157	0.0019	0.0084
SMU	0.0066	0.0075	0.0109	0.0100	0.0000	0.0174	0.0077	0.0109	0.0049	0.0219	-0.0061	0.2201	0.0033	0.0169	0.0502	0.0172	0.0068	0.0111
UME	-0.0027	0.0026	0.0016	0.0070	-0.0093	0.0159	-0.0016	0.0083	-0.0044	0.0208	-0.0154	0.2200	-0.0060	0.0154	0.0409	0.0157	-0.0025	0.0085
VSL	-0.0043	0.0063			-0.0109	0.0169	-0.0032	0.0101	-0.0059	0.0216	-0.0170	0.2200	-0.0075	0.0164	0.0393	0.0167	-0.0041	0.0103
BEV	0.0066	0.0156	0.0109	0.0169			0.0077	0.0174	0.0049	0.0258	-0.0061	0.2205	0.0033	0.0217	0.0502	0.0220	0.0068	0.0176
IPQ	-0.0011	0.0077	0.0032	0.0101	-0.0077	0.0174			-0.0028	0.0220	-0.0138	0.2201	-0.0043	0.0170	0.0425	0.0173	-0.0009	0.0112
KEBS	0.0017	0.0205	0.0059	0.0216	-0.0049	0.0258	0.0028	0.0220			-0.0110	0.2209	-0.0016	0.0255	0.0453	0.0257	0.0019	0.0221
NIS	0.0127	0.2199	0.0170	0.2200	0.0061	0.2205	0.0138	0.2201	0.0110	0.2209			0.0094	0.2205	0.0563	0.2205	0.0129	0.2201
NMISA	0.0032	0.0151	0.0075	0.0164	-0.0033	0.0217	0.0043	0.0170	0.0016	0.0255	-0.0094	0.2205			0.0468	0.0216	0.0034	0.0171
NPLI	-0.0436	0.0154	-0.0393	0.0167	-0.0502	0.0220	-0.0425	0.0173	-0.0453	0.0257	-0.0563	0.2205	-0.0468	0.0216			-0.0434	0.0174
SIRIM	-0.0002	0.0079	0.0041	0.0103	-0.0068	0.0176	0.0009	0.0112	-0.0019	0.0221	-0.0129	0.2201	-0.0034	0.0171	0.0434	0.0174		

Table A2-3. Degrees of equivalence between laboratories, in mm^2s^{-1}, for the measurement of Liquid B at 20 °C.

Lab *i* ⇩	d_i	U_i	Lab *j* ⇨ Cannon		CENAM		GUM		INMETRO		INRIM		LNE		NIM		NMIJ/AIST		PTB		SMU	
			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}
Cannon	3.2	4.8			4.3	6.8	1.8	7.2	4.4	5.7	1.2	6.0	-0.1	12.1	2.0	6.3	4.6	5.2	4.1	5.4	0.7	8.1
CENAM	-1.0	4.6	-4.3	6.8			-2.5	7.0	0.1	5.6	-3.1	5.8	-4.4	12.0	-2.3	6.2	0.3	5.1	-0.2	5.3	-3.6	8.0
GUM	1.5	5.1	-1.8	7.2	2.5	7.0			2.6	6.0	-0.6	6.2	-1.9	12.2	0.2	6.5	2.8	5.5	2.3	5.7	-1.1	8.3
INMETRO	-1.1	2.8	-4.4	5.7	-0.1	5.6	-2.6	6.0			-3.2	4.5	-4.5	11.4	-2.4	4.9	0.2	3.5	-0.3	3.8	-3.7	7.1
INRIM	2.1	3.2	-1.2	6.0	3.1	5.8	0.6	6.2	3.2	4.5			-1.2	11.5	0.8	5.2	3.4	3.8	2.9	4.1	-0.5	7.3
LNE	3.3	11.0	0.1	12.1	4.4	12.0	1.9	12.2	4.5	11.4	1.2	11.5			2.1	11.7	4.7	11.2	4.2	11.3	0.8	12.7
NIM	1.3	3.8	-2.0	6.3	2.3	6.2	-0.2	6.5	2.4	4.9	-0.8	5.2	-2.1	11.7			2.6	4.4	2.1	4.6	-1.3	7.5
NMIJ/AIST	-1.3	1.6	-4.6	5.2	-0.3	5.1	-2.8	5.5	-0.2	3.5	-3.4	3.8	-4.7	11.2	-2.6	4.4			-0.5	3.0	-3.9	6.7
PTB	-0.8	2.1	-4.1	5.4	0.2	5.3	-2.3	5.7	0.3	3.8	-2.9	4.1	-4.2	11.3	-2.1	4.6	0.5	3.0			-3.4	6.8
SMU	2.6	6.4	-0.7	8.1	3.6	8.0	1.1	8.3	3.7	7.1	0.5	7.3	-0.8	12.7	1.3	7.5	3.9	6.7	3.4	6.8		
UME	1.0	2.3	-2.2	5.5	2.1	5.3	-0.4	5.8	2.2	3.9	-1.1	4.2	-2.3	11.3	-0.2	4.7	2.4	3.1	1.9	3.4	-1.5	6.9
VSL	0.0	5.2	-3.3	7.2	1.0	7.1	-1.5	7.4	1.1	6.0	-2.1	6.2	-3.4	12.2	-1.3	6.6	1.3	5.6	0.8	5.7	-2.6	8.3
BEV	2.7	10.4	-0.6	11.6	3.7	11.5	1.2	11.7	3.8	10.9	0.6	11.0	-0.7	15.2	1.4	11.2	4.0	10.6	3.5	10.7	0.1	12.3
IPQ	-7.2	8.9	-10.5	10.2	-6.2	10.1	-8.7	10.4	-6.1	9.5	-9.3	9.6	-10.6	14.2	-8.5	9.8	-5.9	9.2	-6.4	9.3	-9.8	11.0
KEBS	-3.8	10.0	-7.1	11.2	-2.8	11.1	-5.3	11.3	-2.7	10.5	-5.9	10.6	-7.2	14.9	-5.1	10.8	-2.5	10.2	-3.0	10.3	-6.4	12.0
NIS	5.4	89.1	2.1	89.2	6.4	89.2	3.9	89.2	6.5	89.1	3.3	89.1	2.0	89.7	4.1	89.2	6.7	89.1	6.2	89.1	2.8	89.3
NMISA	-1.2	44.5	-4.4	44.8	-0.2	44.8	-2.6	44.9	0.0	44.6	-3.3	44.7	-4.5	45.9	-2.4	44.7	0.2	44.6	-0.3	44.6	-3.7	45.0
NPLI	-297.1	6.1	-300.4	7.9	-296.1	7.8	-298.6	8.1	-296.0	6.9	-299.2	7.0	-300.5	12.6	-298.4	7.3	-295.8	6.5	-296.3	6.6	-299.7	8.9

	d_i	U_i	UME		VSL		BEV		IPQ		KEBS		NIS		NMISA		NPLI	
			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}
Cannon	3.2	4.8	2.2	5.5	3.3	7.2	0.6	11.6	10.5	10.2	7.1	11.2	-2.1	89.2	4.4	44.8	300.4	7.9
CENAM	-1.0	4.6	-2.1	5.3	-1.0	7.1	-3.7	11.5	6.2	10.1	2.8	11.1	-6.4	89.2	0.2	44.8	296.1	7.8
GUM	1.5	5.1	0.4	5.8	1.5	7.4	-1.2	11.7	8.7	10.4	5.3	11.3	-3.9	89.2	2.6	44.9	298.6	8.1
INMETRO	-1.1	2.8	-2.2	3.9	-1.1	6.0	-3.8	10.9	6.1	9.5	2.7	10.5	-6.5	89.1	0.0	44.6	296.0	6.9
INRIM	2.1	3.2	1.1	4.2	2.1	6.2	-0.6	11.0	9.3	9.6	5.9	10.6	-3.3	89.1	3.3	44.7	299.2	7.0
LNE	3.3	11.0	2.3	11.3	3.4	12.2	0.7	15.2	10.6	14.2	7.2	14.9	-2.0	89.7	4.5	45.9	300.5	12.6
NIM	1.3	3.8	0.2	4.7	1.3	6.6	-1.4	11.2	8.5	9.8	5.1	10.8	-4.1	89.2	2.4	44.7	298.4	7.3
NMIJ/AIST	-1.3	1.6	-2.4	3.1	-1.3	5.6	-4.0	10.6	5.9	9.2	2.5	10.2	-6.7	89.1	-0.2	44.6	295.8	6.5
PTB	-0.8	2.1	-1.9	3.4	-0.8	5.7	-3.5	10.7	6.4	9.3	3.0	10.3	-6.2	89.1	0.3	44.6	296.3	6.6
SMU	2.6	6.4	1.5	6.9	2.6	8.3	-0.1	12.3	9.8	11.0	6.4	12.0	-2.8	89.3	3.7	45.0	299.7	8.9
UME	1.0	2.3			1.1	5.8	-1.6	10.8	8.3	9.3	4.9	10.4	-4.3	89.1	2.2	44.6	298.2	6.7
VSL	0.0	5.2	-1.1	5.8			-2.7	11.7	7.2	10.4	3.8	11.4	-5.4	89.2	1.1	44.9	297.1	8.1
BEV	2.7	10.4	1.6	10.8	2.7	11.7			9.9	13.8	6.5	14.5	-2.7	89.7	3.8	45.8	299.8	12.2
IPQ	-7.2	8.9	-8.3	9.3	-7.2	10.4	-9.9	13.8			-3.4	13.5	-12.6	89.5	-6.1	45.4	289.9	10.9
KEBS	-3.8	10.0	-4.9	10.4	-3.8	11.4	-6.5	14.5	3.4	13.5			-9.2	89.6	-2.7	45.7	293.3	11.8
NIS	5.4	89.1	4.3	89.1	5.4	89.2	2.7	89.7	12.6	89.5	9.2	89.6			6.5	99.6	302.5	89.3
NMISA	-1.2	44.5	-2.2	44.6	-1.1	44.9	-3.8	45.8	6.1	45.4	2.7	45.7	-6.5	99.6			296.0	45.0
NPLI	-297.1	6.1	-298.2	6.7	-297.1	8.1	-299.8	12.2	-289.9	10.9	-293.3	11.8	-302.5	89.3	-296.0	45.0		

Table A2-4. Degrees of equivalence between laboratories, in mm^2s^{-1}, for the measurement of Liquid B at 40 °C.

Lab *i* ⇩ / Lab *j* ⇨	d_i	U_i^L	U_i^U	Cannon		CENAM		GUM		INMETRO		INRIM		LNE		NIM		NMIJ/AIST		PTB		SMU	
				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}
Cannon	1.55	0.96	0.95			1.56	1.38	1.79	1.29	1.95	1.14	0.81	1.25	0.94	1.82	0.79	1.18	1.58	1.00	1.73	1.04	2.20	1.69
CENAM	-0.01	1.00	1.02	-1.56	1.38			0.23	1.37	0.40	1.23	-0.74	1.33	-0.62	1.87	-0.77	1.27	0.03	1.11	0.17	1.14	0.65	1.75
GUM	-0.24	0.91	0.88	-1.79	1.29	-0.23	1.37			0.16	1.13	-0.98	1.24	-0.85	1.81	-1.00	1.17	-0.21	1.00	-0.06	1.04	0.41	1.68
INMETRO	-0.40	0.73	0.63	-1.95	1.14	-0.40	1.23	-0.16	1.13			-1.14	1.08	-1.01	1.71	-1.17	1.00	-0.37	0.79	-0.23	0.84	0.25	1.57
INRIM	0.74	0.80	0.88	-0.81	1.25	0.74	1.33	0.98	1.24	1.14	1.08			0.13	1.78	-0.02	1.13	0.77	0.94	0.92	0.99	1.39	1.65
LNE	0.60	1.44	1.55	-0.94	1.82	0.62	1.87	0.85	1.81	1.01	1.71	-0.13	1.78			-0.15	1.73	0.64	1.62	0.79	1.65	1.26	2.11
NIM	0.76	0.75	0.78	-0.79	1.18	0.77	1.27	1.00	1.17	1.17	1.00	0.02	1.13	0.15	1.73			0.79	0.85	0.94	0.89	1.41	1.60
NMIJ/AIST	-0.03	0.48	0.45	-1.58	1.00	-0.03	1.11	0.21	1.00	0.37	0.79	-0.77	0.94	-0.64	1.62	-0.79	0.85			0.15	0.65	0.62	1.47
PTB	-0.18	0.56	0.49	-1.73	1.04	-0.17	1.14	0.06	1.04	0.23	0.84	-0.92	0.99	-0.79	1.65	-0.94	0.89	-0.15	0.65			0.47	1.50
SMU	-0.65	1.42	1.34	-2.20	1.69	-0.65	1.75	-0.41	1.68	-0.25	1.57	-1.39	1.65	-1.26	2.11	-1.41	1.60	-0.62	1.47	-0.47	1.50		
UME	-0.09	0.54	0.50	-1.65	1.05	-0.09	1.15	0.14	1.04	0.30	0.85	-0.84	0.99	-0.71	1.65	-0.86	0.90	-0.07	0.66	0.08	0.72	0.55	1.51
VSL	-0.54	1.00	0.90	-2.08	1.34	-0.53	1.42	-0.29	1.33	-0.13	1.19	-1.27	1.29	-1.14	1.85	-1.30	1.23	-0.50	1.06	-0.36	1.10	0.12	1.72
BEV	1.01	3.13	3.14	-0.54	3.24	1.01	3.28	1.24	3.24	1.41	3.18	0.27	3.22	0.39	3.48	0.24	3.20	1.04	3.14	1.18	3.15	1.66	3.42
IPQ	-0.56	1.39	1.39	-2.11	1.63	-0.55	1.70	-0.32	1.63	-0.15	1.51	-1.30	1.59	-1.17	2.07	-1.32	1.54	-0.53	1.41	-0.38	1.44	0.09	1.96
KEBS	-0.89	2.30	2.30	-2.44	2.47	-0.88	2.51	-0.65	2.47	-0.49	2.39	-1.63	2.45	-1.50	2.78	-1.65	2.41	-0.86	2.33	-0.71	2.35	-0.24	2.70
NIS	2.18	21.09	21.05	0.63	21.04	2.19	21.04	2.42	21.04	2.58	21.03	1.44	21.03	1.57	21.08	1.42	21.03	2.21	21.02	2.36	21.02	2.83	21.06
NMISA	0.13	3.34	3.34	-1.42	3.46	0.14	3.49	0.37	3.46	0.54	3.40	-0.60	3.44	-0.48	3.69	-0.63	3.42	0.16	3.36	0.31	3.37	0.79	3.62
NPLI	-17.68	1.67	1.67	-19.23	1.89	-17.68	1.94	-17.44	1.88	-17.28	1.78	-18.42	1.86	-18.29	2.28	-18.44	1.81	-17.65	1.70	-17.50	1.72	-17.03	2.17
SIRIM	0.75	1.43	1.43	-0.80	1.67	0.75	1.74	0.99	1.67	1.15	1.55	0.01	1.64	0.14	2.10	-0.01	1.58	0.78	1.46	0.93	1.48	1.40	1.99

	d_i	U_i^L	U_i^U	UME		VSL		BEV		IPQ		KEBS		NIS		NMISA		NPLI		SIRIM	
				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}
Cannon	1.55	0.96	0.95	1.65	1.05	2.08	1.34	0.54	3.24	2.11	1.63	2.44	2.47	-0.63	21.04	1.42	3.46	19.23	1.89	0.80	1.67
CENAM	-0.01	1.00	1.02	0.09	1.15	0.53	1.42	-1.01	3.28	0.55	1.70	0.88	2.51	-2.19	21.04	-0.14	3.49	17.68	1.94	-0.75	1.74
GUM	-0.24	0.91	0.88	-0.14	1.04	0.29	1.33	-1.24	3.24	0.32	1.63	0.65	2.47	-2.42	21.04	-0.37	3.46	17.44	1.88	-0.99	1.67
INMETRO	-0.40	0.73	0.63	-0.30	0.85	0.13	1.19	-1.41	3.18	0.15	1.51	0.49	2.39	-2.58	21.03	-0.54	3.40	17.28	1.78	-1.15	1.55
INRIM	0.74	0.80	0.88	0.84	0.99	1.27	1.29	-0.27	3.22	1.30	1.59	1.63	2.45	-1.44	21.03	0.60	3.44	18.42	1.86	-0.01	1.64
LNE	0.60	1.44	1.55	0.71	1.65	1.14	1.85	-0.39	3.48	1.17	2.07	1.50	2.78	-1.57	21.08	0.48	3.69	18.29	2.28	-0.14	2.10
NIM	0.76	0.75	0.78	0.86	0.90	1.30	1.23	-0.24	3.20	1.32	1.54	1.65	2.41	-1.42	21.03	0.63	3.42	18.44	1.81	0.01	1.58
NMIJ/AIST	-0.03	0.48	0.45	0.07	0.66	0.50	1.06	-1.04	3.14	0.53	1.41	0.86	2.33	-2.21	21.02	-0.16	3.36	17.65	1.70	-0.78	1.46
PTB	-0.18	0.56	0.49	-0.08	0.72	0.36	1.10	-1.18	3.15	0.38	1.44	0.71	2.35	-2.36	21.02	-0.31	3.37	17.50	1.72	-0.93	1.48
SMU	-0.65	1.42	1.34	-0.55	1.51	-0.12	1.72	-1.66	3.42	-0.09	1.96	0.24	2.70	-2.83	21.06	-0.79	3.62	17.03	2.17	-1.40	1.99
UME	-0.09	0.54	0.50			0.43	1.10	-1.10	3.15	0.46	1.44	0.79	2.35	-2.28	21.02	-0.23	3.38	17.58	1.73	-0.85	1.49
VSL	-0.54	1.00	0.90	-0.43	1.10			-1.54	3.26	0.02	1.67	0.36	2.49	-2.71	21.04	-0.67	3.48	17.15	1.92	-1.28	1.70
BEV	1.01	3.13	3.14	1.10	3.15	1.54	3.26			1.56	3.39	1.90	3.86	-1.18	21.25	0.87	4.56	18.69	3.52	0.26	3.41
IPQ	-0.56	1.39	1.39	-0.46	1.44	-0.02	1.67	-1.56	3.39			0.33	2.66	-2.74	21.06	-0.69	3.60	17.12	2.13	-1.31	1.94
KEBS	-0.89	2.30	2.30	-0.79	2.35	-0.36	2.49	-1.90	3.86	-0.33	2.66			-3.07	21.14	-1.02	4.05	16.79	2.82	-1.64	2.69
NIS	2.18	21.09	21.05	2.28	21.02	2.71	21.04	1.18	21.25	2.74	21.06	3.07	21.14			2.05	21.28	19.86	21.08	1.43	21.06
NMISA	0.13	3.34	3.34	0.23	3.38	0.67	3.48	-0.87	4.56	0.69	3.60	1.02	4.05	-2.05	21.28			17.82	3.72	-0.62	3.62
NPLI	-17.68	1.67	1.67	-17.58	1.73	-17.15	1.92	-18.69	3.52	-17.12	2.13	-16.79	2.82	-19.86	21.08	-17.82	3.72			-18.43	2.16
SIRIM	0.75	1.43	1.43	0.85	1.49	1.28	1.70	-0.26	3.41	1.31	1.94	1.64	2.69	-1.43	21.06	0.62	3.62	18.43	2.16		

Table A2-5. Degrees of equivalence between laboratories, in mm^2s^{-1}, for the measurement of Liquid C at 20 °C.

Lab *i* ⇩	d_i	U_i^L	U_i^U	Lab *j* ⇨ Cannon		CENAM		INMETRO		LNE		NMIJ/AIST		PTB		SMU		BEV		NIS	
				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}
Cannon	142	428	513			116	805	545	479	-3633	617	262	1103	-15	542	350	524	-400	907	-209	724
CENAM	17	617	612	-116	805			429	653	-3750	760	145	1189	-131	701	234	687	-517	1010	-325	850
INMETRO	-436	393	397	-545	479	-429	653			-4178	399	-283	998	-560	269	-195	229	-945	775	-754	550
LNE	-117	929	907	3633	617	3750	760	4178	399			3895	1071	3619	473	3983	452	3233	868	3424	674
NMIJ/AIST	154	283	396	-262	1103	-145	1189	283	998	-3895	1071			-277	1030	88	1020	-662	1261	-471	1136
PTB	-209	360	219	15	542	131	701	560	269	-3619	473	277	1030			365	343	-386	816	-194	606
SMU	538	674	808	-350	524	-234	687	195	229	-3983	452	-88	1020	-365	343			-751	804	-559	590
BEV	348	616	616	400	907	517	1010	945	775	-3233	868	662	1261	386	816	751	804			192	947
NIS	544	6984	6984	209	724	325	850	754	550	-3424	674	471	1136	194	606	559	590	-192	947		

Table A2-6. Degrees of equivalence between laboratories, in mm^2s^{-1}, for the measurement of Liquid C at 40 °C.

Lab *i* ⇩				Lab *j* ⇨ Cannon		CENAM		GUM		INMETRO		LNE		NIM		NMIJ/AIST		PTB		SMU		UME	
	d_i	U_i^L	U_i^U	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}
Cannon	93	81	81			33	130	109	108	95	88	78	180	143	109	74	82	118	83	15	150	139	86
CENAM	61	98	107	-33	130			76	131	62	114	45	194	111	131	42	110	85	110	-18	167	106	113
GUM	-15	78	73	-109	108	-76	131			-14	89	-31	181	34	110	-34	83	9	84	-94	151	30	87
INMETRO	-1	50	49	-95	88	-62	114	14	89			-17	169	48	90	-20	55	23	56	-80	137	44	60
LNE	15	158	159	-78	180	-45	194	31	181	17	169			65	181	-4	166	40	167	-63	208	61	168
NIM	-50	83	71	-143	109	-111	131	-34	110	-48	90	-65	181			-69	84	-25	85	-128	151	-4	88
NMIJ/AIST	20	33	44	-74	82	-42	110	34	83	20	55	4	166	69	84			44	46	-60	133	65	51
PTB	-24	46	35	-118	83	-85	110	-9	84	-23	56	-40	167	25	85	-44	46			-103	134	21	52
SMU	79	124	137	-15	150	18	167	94	151	80	137	63	208	128	151	60	133	103	134			124	135
UME	-45	51	45	-139	86	-106	113	-30	87	-44	60	-61	168	4	88	-65	51	-21	52	-124	135		
VSL	-32	104	98	-125	129	-93	148	-16	129	-30	113	-47	193	18	130	-51	108	-7	109	-110	166	14	111
BEV	71	249	247	-23	258	10	268	86	258	72	250	55	295	120	258	52	248	95	248	-8	278	116	249
NIS	156	1141	1146	63	1150	95	1152	172	1150	157	1148	141	1159	206	1150	137	1148	181	1148	78	1154	202	1148
NMISA	547	1474	1477	453	1477	486	1479	562	1477	548	1476	531	1484	596	1477	528	1475	571	1475	468	1481	592	1475
SIRIM	-54	115	115	-147	135	-115	153	-39	135	-53	120	-69	197	-4	136	-73	115	-29	116	-133	170	-9	118

				VSL		BEV		NIS		NMISA		SIRIM	
	d_i	U_i^L	U_i^U	d_{ij}	U_{ij}	d_{ij}	U_{ij}	d_{ij}	U_{ij}	d_{ij}	U_{ij}	d_{ij}	U_{ij}
Cannon	93	81	81	125	129	23	258	-63	1150	-453	1477	147	135
CENAM	61	98	107	93	148	-10	268	-95	1152	-486	1479	115	153
GUM	-15	78	73	16	129	-86	258	-172	1150	-562	1477	39	135
INMETRO	-1	50	49	30	113	-72	250	-157	1148	-548	1476	53	120
LNE	15	158	159	47	193	-55	295	-141	1159	-531	1484	69	197
NIM	-50	83	71	-18	130	-120	258	-206	1150	-596	1477	4	136
NMIJ/AIST	20	33	44	51	108	-52	248	-137	1148	-528	1475	73	115
PTB	-24	46	35	7	109	-95	248	-181	1148	-571	1475	29	116
SMU	79	124	137	110	166	8	278	-78	1154	-468	1481	133	170
UME	-45	51	45	-14	111	-116	249	-202	1148	-592	1475	9	118
VSL	-32	104	98			-102	267	-188	1152	-578	1479	22	152
BEV	71	249	247	102	267			-85	1173	-476	1495	125	270
NIS	156	1141	1146	188	1152	85	1173			-390	1869	210	1152
NMISA	547	1474	1477	578	1479	476	1495	390	1869			601	1479
SIRIM	-54	115	115	-22	152	-125	270	-210	1152	-601	1479		

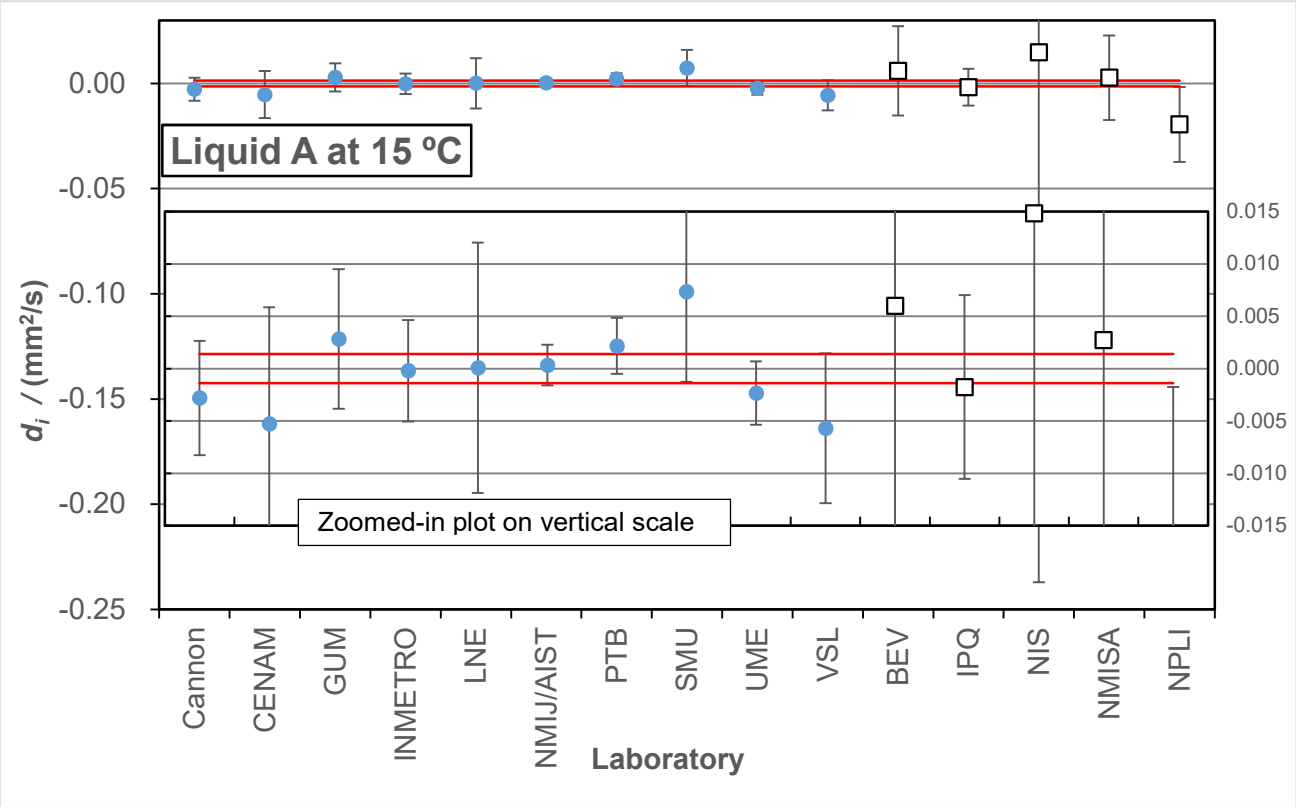

Fig.A1-1. Degrees of equivalence of each laboratory with respect to the reference value for the measurements of Liquid A at 15 ºC. The distance between two red lines express the expanded uncertainty of the reference value.

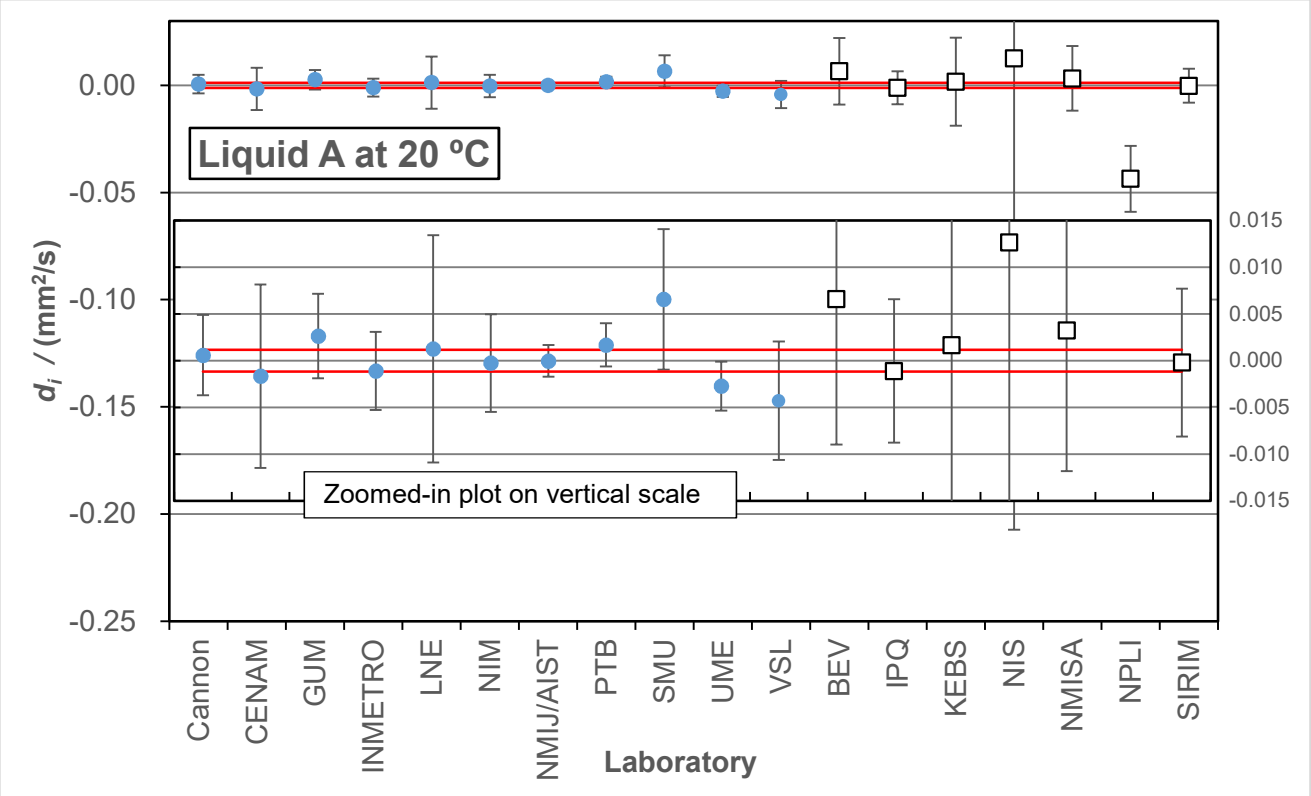

Fig.A1-2. Degrees of equivalence of each laboratory with respect to the reference value for the measurements of Liquid A at 20 ºC. The distance between two red lines express the expanded uncertainty of the reference value.

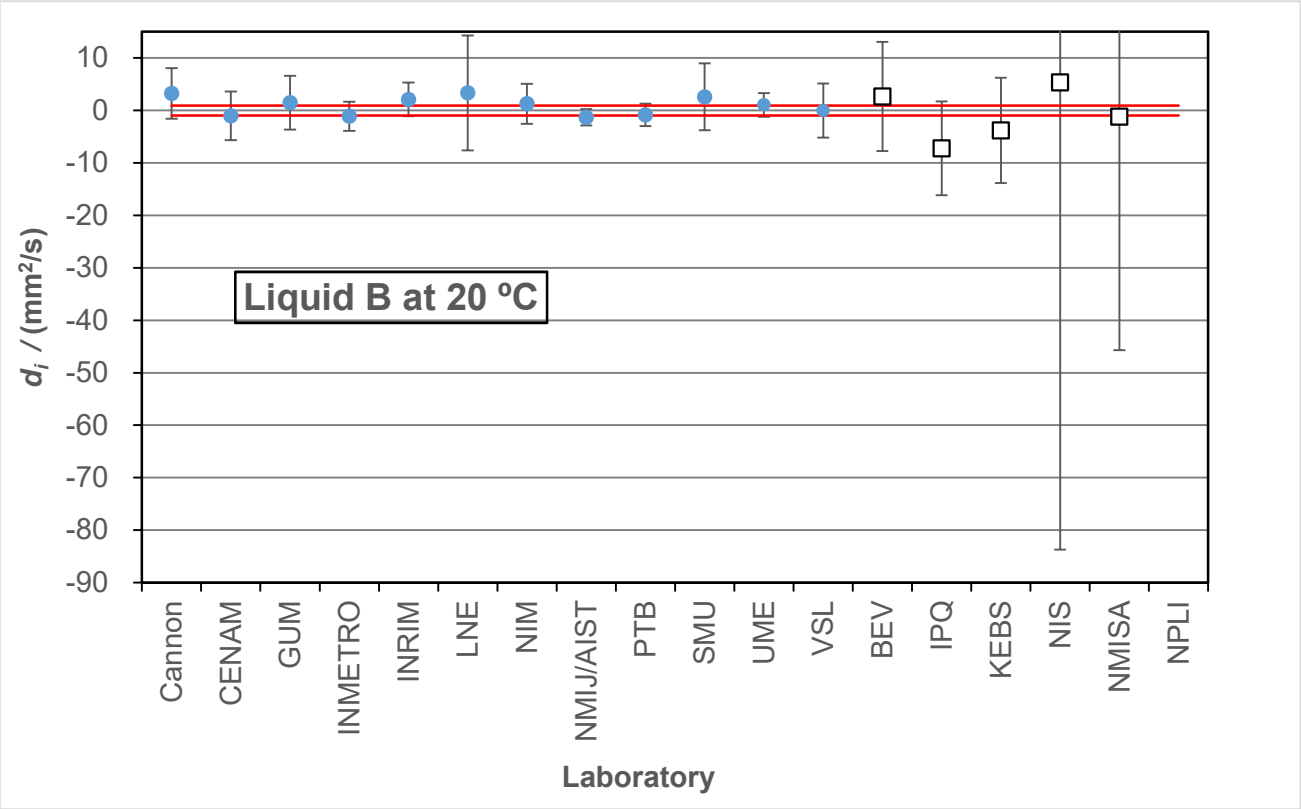

Fig.A1-3. Degrees of equivalence of each laboratory with respect to the reference value for the measurements of Liquid B at 20 ºC. The distance between two red lines express the expanded uncertainty of the reference value.

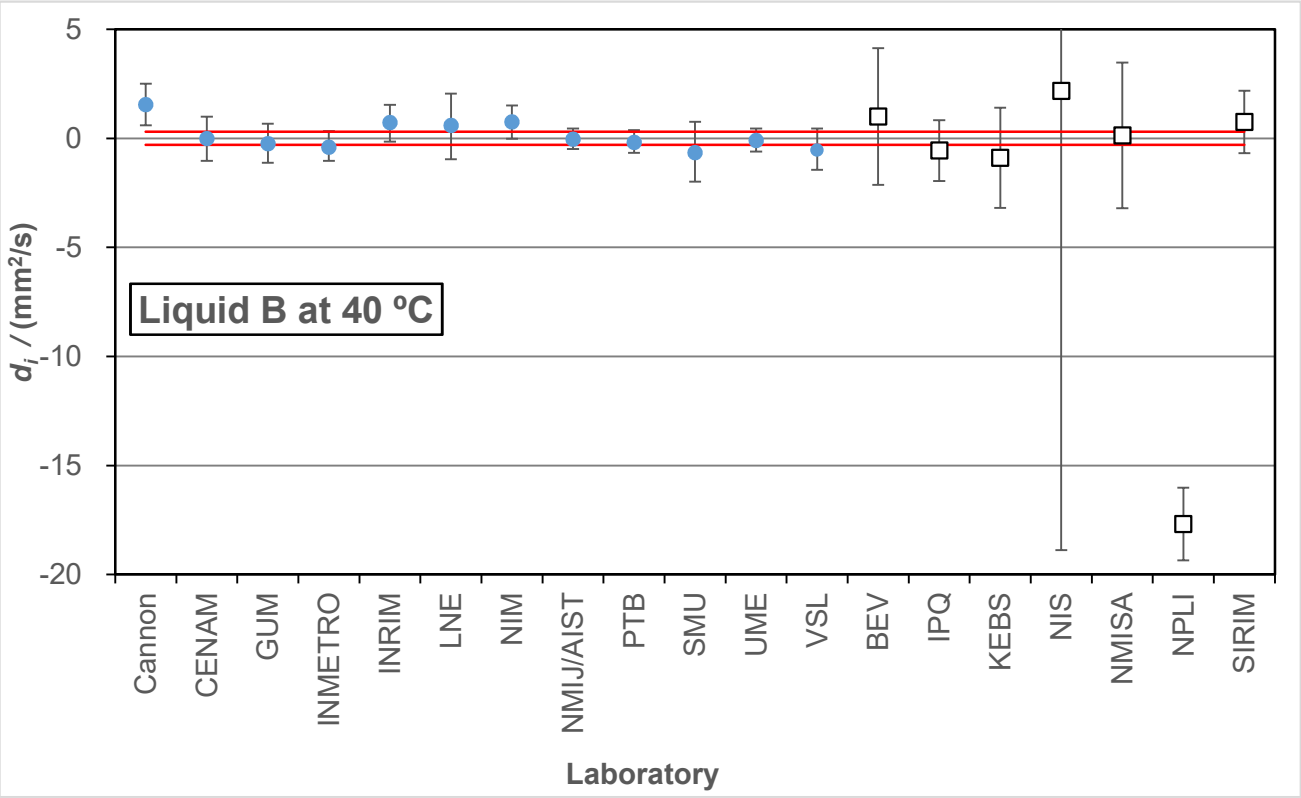

Fig.A1-4. Degrees of equivalence of each laboratory with respect to the reference value for the measurements of Liquid B at 40 ºC. The distance between two red lines express the expanded uncertainty of the reference value.

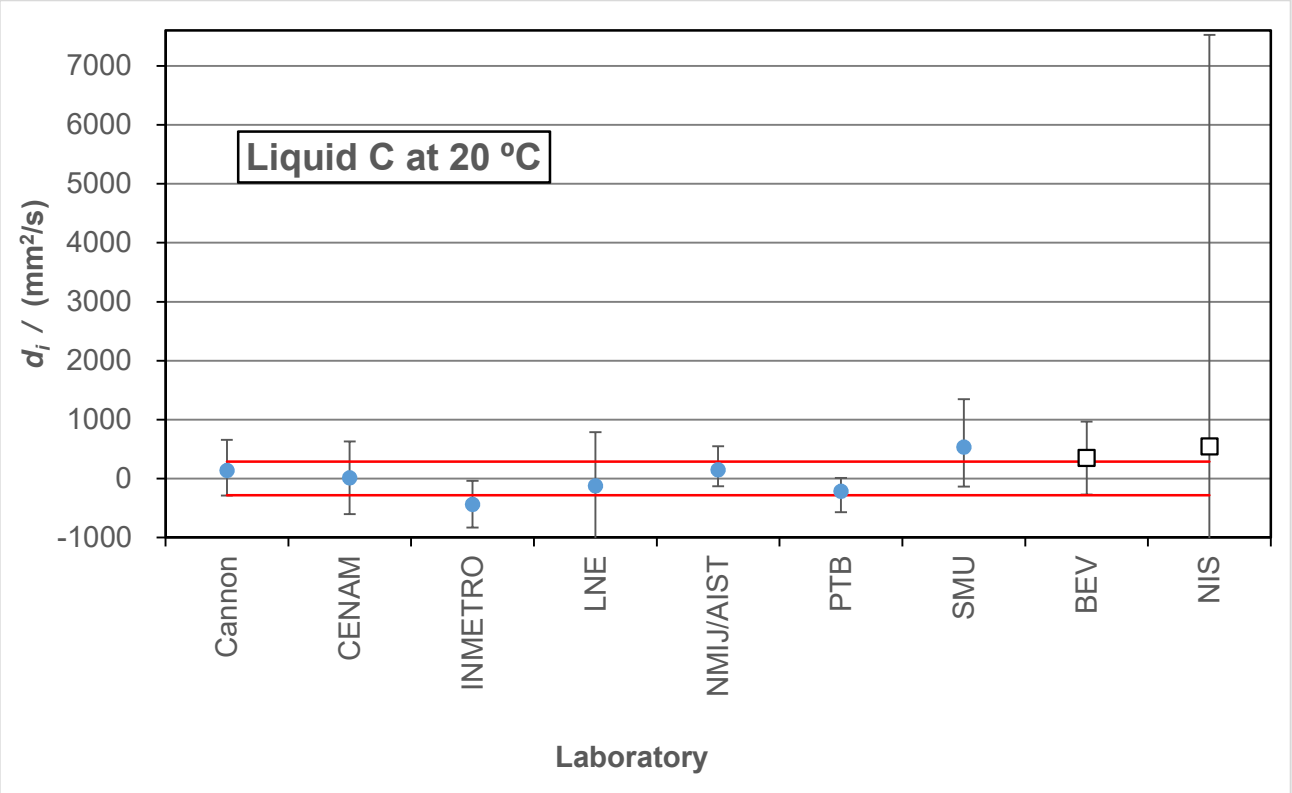

Fig.A1-5. Degrees of equivalence of each laboratory with respect to the reference value for the measurements of Liquid C at 20 ºC. The distance between two red lines express the expanded uncertainty of the reference value.

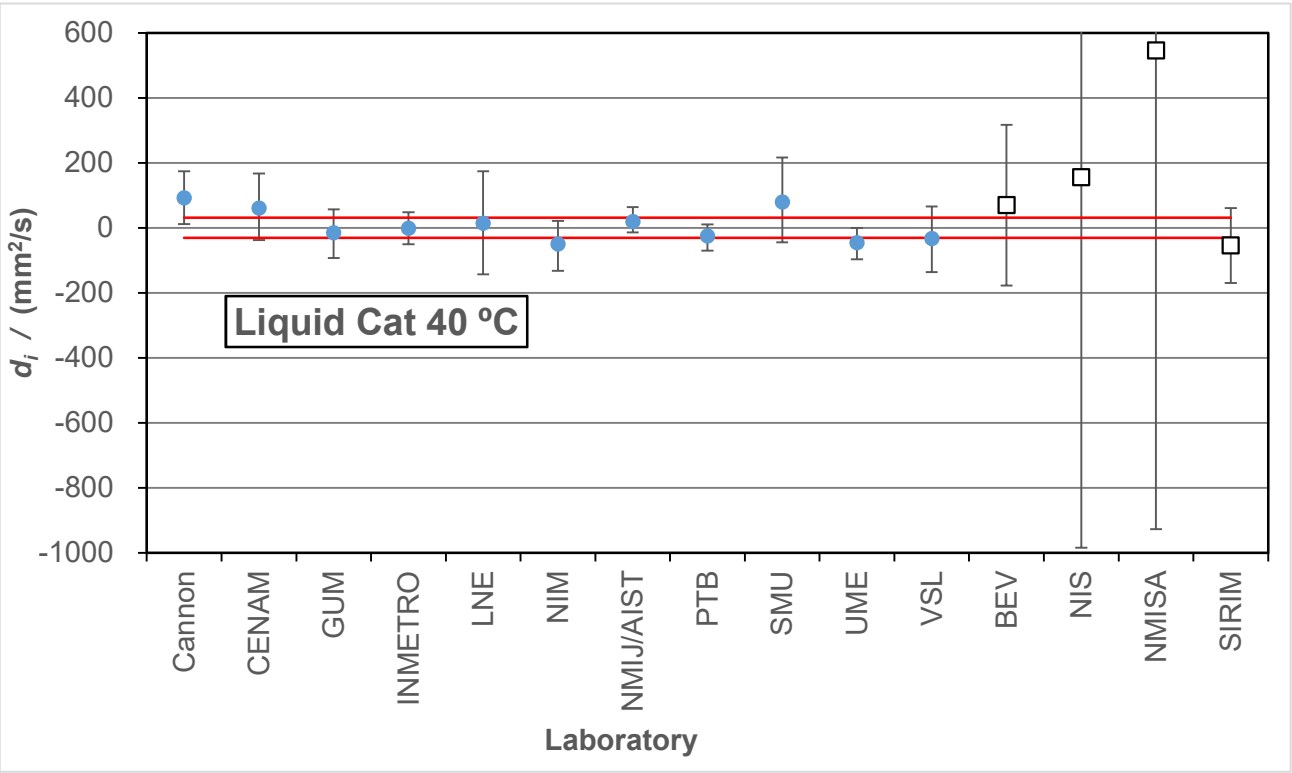

Fig.A1-6. Degrees of equivalence of each laboratory with respect to the reference value for the measurements of Liquid C at 40 ºC. The distance between two red lines express the expanded uncertainty of the reference value.

Appendix A3 Technical protocol

Technical Protocol for the CCM Key Comparison of the Viscosity CCM.V – K3

Pilot Laboratory: National Metrology Institute of Japan, National Institute of Advanced Industrial Science and Technology NMIJ / AIST (Y. Fujita)

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

Outline of the CCM key comparison of the viscosity

CCM.V-K3 is the CIPM key comparison undertaken by the CCM Working Group on Viscosity. The aim of this comparison is to evaluate the equivalence of the viscosity determinations of participating laboratories.

As decided by the meeting of the CCM Working Group on Viscosity held at May 2011, the NMIJ is the Pilot Laboratory for this comparison and three standard liquids with the viscosities of around 5 mm^2/s, 2000 mm^2/s and 160000 mm^2/s at 20 °C are to be measured. The main objectives of this comparison are:

- To compare viscosity measurements at middle temperatures in wide range of viscosities covered from 5 mm^2/s to 160000 mm^2/s using three standard liquids designated as A, B, and C, respectively.
- To compare viscosity measurement of high viscosity using Liquid C with the viscosity of 160000 mm^2/s that is to be the extension of viscosity range carried out in the previous key comparison.
- To compare viscosity measurement of middle viscosity using the liquid B.
- To compare viscosity measurement of low viscosity using the liquid A, where the measurement at 15 °C is made only for the liquid A.

Certain participants have performed a calibration program of primary viscometers beginning with water at 20.00 ºC (ISO 3666-1998) [1] and stepping up to higher viscosities in a dependent progression. Results from these participants will contribute to the reference value obtained from this inter-comparison. The non-contributing participants will be providing viscosities determined from viscometers calibrated by other metrology institutes. The results of this inter-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.

Liquid samples

The measurements are to be carried out on samples of three standard liquids provided by NMIJ as the pilot laboratory. The standard liquid A is mineral oil, the liquid B is mineral oil with a mixture of small amount of polybutene, and the liquid C is polybutene. None of the liquids is labeled as dangerous goods.

Standard liquid A:

approximate kinematic viscosity: 6 mm²/s at 15 °C and 5 mm²/s at 20 °C
density: 0.81243 g/cm³ at 15 °C and 0.80900 g/cm³ at 20 °C
surface tension: 28.50 mN/m at 15 °C and 28.07 mN/m at 20 °C

Standard liquid B:

approximate kinematic viscosity: 2000 mm²/s at 20 °C and 500 mm²/s at 40 °C density: 0.88127 g/cm³ at 20 °C and 0.86920 g/cm³ at 40 °C
surface tension: 32.83 mN/m at 20 °C and 31.04 mN/m at 40 °C

Standard liquid C:

approximate kinematic viscosity: 160000 mm²/s at 20 °C and 25000 mm²/s at 40°C
density: 0.89632 g/cm³ at 20 °C and 0.88514 g/cm³ at 40 °C
surface tension: 32.45 mN/m at 20 °C and 31.40 mN/m at 40 °C

For all standard liquids, the long term stability of the kinematic viscosity is better than 0.1% over 6 month. Exposure to bright light and high temperatures should be avoided. The sealed glass bottles should not be opened before the measurements are started. Except for standard liquid A, the oils may be heated to 60 °C to facilitate filling of the viscometers.

Format for reporting the measurement results

The information is to be given for each liquid and target temperature. Please use the following report forms of work sheets in the Excel file, ReportFrom.xls, enclosed with this technical Protocol:

A_15°C for standard liquid A, 15 °C
A_20°C for standard liquid A, 20 °C
B_20°C for standard liquid B, 20 °C
B_40°C for standard liquid B, 40 °C

C_20°C for standard liquid C, 20 °C
C_40°C for standard liquid C, 40 °C

Uncertainty of measurement

All of the report forms (A_15 °C, A_20 °C, B_20 °C, B_40 °C, C_20 °C, C_40 °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 $t_{95}\,(\nu_{\mathrm{eff}})$ taken from the t-distribution for a 95% confidence level must be stated. The expanded uncertainty is given as $U_{95} = t_{95}\,(\nu_{\mathrm{eff}}) \cdot u_{\mathrm{c}}$. The uncertainties are to be calculated and reported according to ISO "Guide to the Expression of Uncertainty in Measurement" [2].

Details of viscosity measurement

Give the mathematical model equations for calculating the viscosity of the liquid samples. (Example: $\nu = \frac{g}{g_{\mathrm{cal}}} C(t - t_{\mathrm{KE}})c_{\mathrm{S}}$ 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_{KE} 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 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.

Concerning the additional participants whose viscometers are not calibrated independently, it is important to know 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.

Deadline

The reports are to be sent to the Pilot laboratory as soon as possible and four weeks after the measurements are completed at the latest (last two weeks of this year and first week of next year are excluded). A result is not considered complete if no associated uncertainty supported by a complete uncertainty budget is given. 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).

Key comparison reference value

The key comparison reference value is derived from the results reported by participants maintaining an independent viscosity scale. It is planned that the reference value will be calculated in the same way as the last key comparison, CCM.V-K2 [3]. This means that the method used to determine the reference value is based on the procedures according to the guidelines of Ref. 4 and it is applied to the individual data set on each temperature of each liquid sample.

[1] ISO TR 3666: Viscosity of water 1998

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

[3] Final report on CCM.V-K2 comparison, C. P. Maggi, D. Trowbridge, M T. Zubler, *Metrologia*, 2009, **46**,Tech. Suppl., 07003

[4] The Evaluation of Key Comparison Data, M. G. Cox, *Metrologia*, 2002, **39**, 589-595

Timetable

Oct 1st, 2012 (pilot laboratory): E-mailing the invitation with the technical protocol to all WG members and guests

Oct 17th, 2012 (pilot laboratory): Shipment of the standard liquids to the participants

Nov 5th, 2012: Start of comparison measurements

Dec 7th, 2012: Finishing of the comparison measurements

Jan 25th, 2013 (all participants): Submission of the results to the pilot laboratory

April, 2013 (pilot laboratory): Submission draft report A to the participants

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 15 °C**

Name of participating laboratory	Cannon Instrument Company
Country	USA

MEASUREMENT **STANDARD LIQUID A, 15 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	26/ October 2012	
Remarks on the liquid (package, seals)	Good Condition	
Date of test	16/ November 2012	
Nominal measuring temperature	15	°C
Temperature measuring instrument (type)	Fluke 1594A w/ SPRT	
Time measuring device (type)	Cannon Digital Timer	
Type of viscometer	Cannon-Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	100/B772		100/B773	
Capillary length (nominal)	90	mm	90	mm
Flow volume (nominal)	3.1	cm³	3.1	cm³
Viscometer constant	0.014957	mm²/s²	0.015816	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	23.00	°C
Air pressure	984.00	hPa
Relative humidity	25.00	%

participating lab (abbreviation), standard liquid	Cannon	A, 15 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 15 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	373.140	15.004	352.840	15.004
First filling, efflux time 2, temperature 2	373.060	15.004	352.730	15.004
First filling, efflux time 3, temperature 3	373.040	15.001	352.900	15.001
First filling, efflux time 4, temperature 4	373.140	14.995	352.870	14.995
First filling, efflux time 5, temperature 5	373.000	14.996	352.860	14.996
Mean value	373.076	15.000	352.840	15.000
Second filling, efflux time 1, temperature 1	373.130	14.997	352.830	14.997
Second filling, efflux time 2, temperature 2	373.190	15.000	352.780	15.000
Second filling, efflux time 3, temperature 3	373.110	14.994	352.890	14.994
Second filling, efflux time 4, temperature 4	373.060	15.000	352.730	15.000
Second filling, efflux time 5, temperature 5	373.290	15.007	352.830	15.007
Mean value	373.156	15.000	352.812	15.000
Overall mean value	373.116	15.000	352.826	15.000

Mean value of viscosity of the two viscometers*	5.58050	mm²/s
Mean value of the temperature	15.000	°C

*Please do not correct the result to target temperature

Notes or observations: Sample was colorless, clear and bright, and ran normally.

participating lab (abbreviation), standard liquid	Cannon	A , 15 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 15°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.028	1/K	0.000034	1/K		50
Density of the sample	0.81243	g/cm³	0.00012	g/cm³		50
Surface tension of the sample	28.50	mN/m	0.19	mN/m		50
Time measuring device			0.02178	s	6.0047E-05	1000000
Flow time measurements	362.971	s	0.01539	s	4.2442E-05	19
Inclination of viscometers to vertical axis	0	°		°		
Sample temperature	15.000	°C	0.00059	K	1.6520E-05	50
Viscometer Number 1, Viscometer constant	0.014957	mm²/s²	0.00001	mm²/s²	7.1003E-04	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	0.015816	mm²/s²	0.00001	mm²/s²	7.0997E-04	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	5.08E-04
Effective degrees of freedom, ν_{eff}	105
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	1.98
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	1.01E-03

participating lab (abbreviation), standard liquid	Cannon	A , 15 °C

Additional Note: The National Institute of Standards and Technology (NIST) has designated Cannon Instrument Company to provide United States of America national measurement standards and to issue calibration and measurement certificates for certified liquid viscosity reference standards. Cannon Instrument Company will participate on behalf of the U.S.A. in Key Comparisons organized by the Comite Internationale de Poids et Mesures (CIPM). Cannon Instrument Company maintains its own viscosity scale, and all viscometers used in the laboratory have been calibrated in-house. Kinematic viscosity measurements at the temperatures of 15, 20, and 40 °C for this Key Comparison were made using Cannon-Ubbelohde (long capillary) Master viscometers or Cannon-Ubbelohde Laboratory Standard viscometers, as described in ASTM methods D2162, D445, and D446. The viscometer type is designated on the data entry form for each sample. Uncertainty contributions were derived using methods described in the “Guide to the Expression of Uncertainty in Measurement”.

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 20 °C**

Name of participating laboratory	Cannon Instrument Company
Country	USA

MEASUREMENT **STANDARD LIQUID A, 20 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	26/ October 2012	
Remarks on the liquid (package, seals)	Good Condition	
Date of test	19/ November 2012	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	Hart Sci 1575 w/ SPRT	
Time measuring device (type)	Cannon Digital Timer	
Type of viscometer	Cannon-Ubbelohde Master	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	M100/17		M100/18	
Capillary length (nominal)	395	mm	395	mm
Flow volume (nominal)	3.1	cm³	3.1	cm³
Viscometer constant	0.014777	mm²/s²	0.014585	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	22.00	°C
Air pressure	986.00	hPa
Relative humidity	25.00	%

participating lab (abbreviation), standard liquid	Cannon	A, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 20°C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	330.020	19.999	334.130	19.999
First filling, efflux time 2, temperature 2	329.820	19.999	334.240	19.999
First filling, efflux time 3, temperature 3	329.900	19.999	334.140	19.999
First filling, efflux time 4, temperature 4	329.900	19.999	334.140	19.999
First filling, efflux time 5, temperature 5	329.860	20.000	334.200	20.000
Mean value	329.900	19.999	334.170	19.999
Second filling, efflux time 1, temperature 1	329.930	20.001	334.110	20.001
Second filling, efflux time 2, temperature 2	330.030	20.001	333.910	20.001
Second filling, efflux time 3, temperature 3	329.910	20.001	333.960	20.001
Second filling, efflux time 4, temperature 4	330.030	20.001	333.930	20.001
Second filling, efflux time 5, temperature 5	330.060	20.001	334.250	20.001
Mean value	329.992	20.001	334.032	20.001
Overall mean value	329.946	20.000	334.101	20.000

Mean value of viscosity of the two viscometers*	4.87424	mm²/s
Mean value of the temperature	20.000	°C

*Please do not correct the result to target temperature

Notes or observations: Sample was colorless, clear and bright and ran normally.

participating lab (abbreviation), standard liquid	Cannon	A, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 20 °C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.027	1/K	0.000032	1/K		50
Density of the sample	0.80900	g/cm³	0.00012	g/cm³		50
Surface tension of the sample	28.07	mN/m	0.18	mN/m		50
Time measuring device			0.01992	s	6.0002E-05	1000000
Flow time measurements	332.024	s	0.01871	s	5.6358E-05	19
Inclination of viscometers to vertical axis	0	°		°		
Sample temperature	20.000	°C	0.00059	K	1.5930E-05	50
Viscometer Number 1, Viscometer constant	0.014777	mm²/s²	0.00001	mm²/s²	6.4018E-04	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	0.014585	mm²/s²	0.00001	mm²/s²	6.3982E-04	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	4.60E-04
Effective degrees of freedom, ν_{eff}	107
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	1.98
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	9.12E-04

participating lab (abbreviation), standard liquid	Cannon	A, 20 °C

Additional Note: The National Institute of Standards and Technology (NIST) has designated Cannon Instrument Company to provide United States of America national measurement standards and to issue calibration and measurement certificates for certified liquid viscosity reference standards. Cannon Instrument Company will participate on behalf of the U.S.A. in Key Comparisons organized by the Comite Internationale de Poids et Mesures (CIPM). Cannon Instrument Company maintains its own viscosity scale, and all viscometers used in the laboratory have been calibrated in-house. Kinematic viscosity measurements at the temperatures of 15, 20, and 40 °C for this Key Comparison were made using Cannon-Ubbelohde (long capillary) Master viscometers or Cannon-Ubbelohde Laboratory Standard viscometers, as described in ASTM methods D2162, D445, and D446. The viscometer type is designated on the data entry form for each sample. Uncertainty contributions were derived using methods described in the “Guide to the Expression of Uncertainty in Measurement”.

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 20 °C**

Name of participating laboratory	Cannon Instrument Company
Country	USA

MEASUREMENT **STANDARD LIQUID B, 20 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	26/ October 2012	
Remarks on the liquid (package, seals)	Good Condition	
Date of test	20/ November 2012	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	Hart Sci 1575 w/ SPRT	
Time measuring device (type)	Cannon Digital Timer	
Type of viscometer	Cannon-Ubbelohde Master	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	M500/26		M500/27	
Capillary length (nominal)	395	mm	395	mm
Flow volume (nominal)	3.1	cm³	3.1	cm³
Viscometer constant	7.75430	mm²/s²	7.80420	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	22.00	°C
Air pressure	977.00	hPa
Relative humidity	25.00	%

participating lab (abbreviation), standard liquid	Cannon	B, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 20 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	254.760	19.999	253.180	19.999
First filling, efflux time 2, temperature 2	254.660	20.000	253.060	20.000
First filling, efflux time 3, temperature 3	254.780	20.000	253.100	20.000
First filling, efflux time 4, temperature 4	254.830	19.999	253.270	19.999
First filling, efflux time 5, temperature 5	254.810	20.000	253.040	20.000
Mean value	254.768	20.000	253.130	20.000
Second filling, efflux time 1, temperature 1	254.770	20.003	253.120	20.003
Second filling, efflux time 2, temperature 2	254.650	20.003	253.240	20.003
Second filling, efflux time 3, temperature 3	254.920	20.003	253.150	20.003
Second filling, efflux time 4, temperature 4	254.720	20.003	253.050	20.003
Second filling, efflux time 5, temperature 5	254.610	20.003	253.150	20.003
Mean value	254.734	20.003	253.142	20.003
Overall mean value	254.751	20.001	253.136	20.001

Mean value of viscosity of the two viscometers*	1975.47	mm²/s
Mean value of the temperature	20.001	°C

*Please do not correct the result to target temperature

Notes or observations: Sample was straw colored, clear and bright, and ran normally.

participating lab (abbreviation), standard liquid	Cannon	B, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 20°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.082	1/K	0.000074	1/K		50
Density of the sample	0.88127	g/cm³	0.00013	g/cm³		50
Surface tension of the sample	32.83	mN/m	0.18	mN/m		50
Time measuring device			0.01524	s	6.0001E-05	1000000
Flow time measurements	253.944	s	0.01958	s	7.7091E-05	19
Inclination of viscometers to vertical axis	0	°		°		
Sample temperature	20.001	°C	0.00059	K	4.8380E-05	50
Viscometer Number 1, Viscometer constant	7.75430	mm²/s²	0.01373	mm²/s²	1.7700E-03	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	7.80420	mm²/s²	0.01381	mm²/s²	1.7700E-03	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	1.26E-03
Effective degrees of freedom, ν_{eff}	102
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	1.98
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	2.49E-03

participating lab (abbreviation), standard liquid	Cannon	B, 20 °C

Additional Note: The National Institute of Standards and Technology (NIST) has designated Cannon Instrument Company to provide United States of America national measurement standards and to issue calibration and measurement certificates for certified liquid viscosity reference standards. Cannon Instrument Company will participate on behalf of the U.S.A. in Key Comparisons organized by the Comite Internationale de Poids et Mesures (CIPM). Cannon Instrument Company maintains its own viscosity scale, and all viscometers used in the laboratory have been calibrated in-house. Kinematic viscosity measurements at the temperatures of 15, 20, and 40 °C for this Key Comparison were made using Cannon-Ubbelohde (long capillary) Master viscometers or Cannon-Ubbelohde Laboratory Standard viscometers, as described in ASTM methods D2162, D445, and D446. The viscometer type is designated on the data entry form for each sample. Uncertainty contributions were derived using methods described in the “Guide to the Expression of Uncertainty in Measurement”.

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 40 °C**

Name of participating laboratory	Cannon Instrument Company
Country	USA

MEASUREMENT **STANDARD LIQUID B, 40 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	26/ October 2012	
Remarks on the liquid (package, seals)	Good Condition	
Date of test	30/ November 2012	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	Fluke 1594A w/ SPRT	
Time measuring device (type)	Cannon Digital Timer	
Type of viscometer	Cannon-Ubbelohde Master	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	M400/42		M400/43	
Capillary length (nominal)	395	mm	395	mm
Flow volume (nominal)	3.1	cm³	3.1	cm³
Viscometer constant	1.15890	mm²/s²	1.10560	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	22.00	°C
Air pressure	982.00	hPa
Relative humidity	24.00	%

participating lab (abbreviation), standard liquid	Cannon	B, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 40 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	409.160	40.002	428.750	40.002
First filling, efflux time 2, temperature 2	409.000	40.003	428.740	40.003
First filling, efflux time 3, temperature 3	409.230	40.003	428.550	40.003
First filling, efflux time 4, temperature 4	409.000	40.003	428.680	40.003
First filling, efflux time 5, temperature 5	409.230	40.004	428.780	40.004
Mean value	409.124	40.003	428.700	40.003
Second filling, efflux time 1, temperature 1	409.380	40.008	428.660	40.008
Second filling, efflux time 2, temperature 2	409.080	40.002	428.580	40.002
Second filling, efflux time 3, temperature 3	409.230	40.002	428.870	40.002
Second filling, efflux time 4, temperature 4	409.140	40.003	428.520	40.003
Second filling, efflux time 5, temperature 5	409.320	40.003	428.610	40.003
Mean value	409.230	40.004	428.648	40.004
Overall mean value	409.177	40.003	428.674	40.003

Mean value of viscosity of the two viscometers*	474.069	mm²/s
Mean value of the temperature	40.003	°C

*Please do not correct the result to target temperature

Notes or observations: Sample was straw colored, clear and bright, and ran normally.

participating lab (abbreviation), standard liquid	Cannon	B, 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.063	1/K	0.000037	1/K		50
Density of the sample	0.86920	g/cm³	0.00018	g/cm³		50
Surface tension of the sample	31.04	mN/m	0.22	mN/m		50
Time measuring device			0.02514	s	6.0033E-05	1000000
Flow time measurements	418.926	s	0.02608	s	6.2281E-05	19
Inclination of viscometers to vertical axis	0	°		°		
Sample temperature	40.003	°C	0.00059	K	3.7170E-05	50
Viscometer Number 1, Viscometer constant	1.15890	mm²/s²	0.00162	mm²/s²	1.4004E-03	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	1.10560	mm²/s²	0.00155	mm²/s²	1.3996E-03	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	9.94E-04
Effective degrees of freedom, ν_{eff}	102
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	1.98
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	1.97E-03

participating lab (abbreviation), standard liquid	Cannon	B, 40 °C

Additional Note: The National Institute of Standards and Technology (NIST) has designated Cannon Instrument Company to provide United States of America national measurement standards and to issue calibration and measurement certificates for certified liquid viscosity reference standards. Cannon Instrument Company will participate on behalf of the U.S.A. in Key Comparisons organized by the Comite Internationale de Poids et Mesures (CIPM). Cannon Instrument Company maintains its own viscosity scale, and all viscometers used in the laboratory have been calibrated in-house. Kinematic viscosity measurements at the temperatures of 15, 20, and 40 °C for this Key Comparison were made using Cannon-Ubbelohde (long capillary) Master viscometers or Cannon-Ubbelohde Laboratory Standard viscometers, as described in ASTM methods D2162, D445, and D446. The viscometer type is designated on the data entry form for each sample. Uncertainty contributions were derived using methods described in the “Guide to the Expression of Uncertainty in Measurement”.

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID C, 20°C**

Name of participating laboratory	Cannon Instrument Company
Country	USA

MEASUREMENT **STANDARD LIQUID C, 20°C**

Name of standard liquid	C	
Date of arrival of the liquid at the laboratory	2012/12/8	
Remarks on the liquid (package, seals)	Good Condition	
Date of test	2013/1/9	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	Hart Sci 1575 w/ SPRT	
Time measuring device (type)	Cannon Digital Timer	
Type of viscometer	Cannon-Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	850/A2		850/A4	
Capillary length (nominal)	90	mm	90	mm
Flow volume (nominal)	1.5	cm³	1.5	cm³
Viscometer constant	495.330	mm²/s²	560.410	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit	
Air temperature	23.00	°C	
Air pressure	981.00	hPa	
Relative humidity	24.00	%	
participating lab (abbreviation), standard liquid	Cannon		C, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID C, 20°C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	312.850	20.011	275.160	20.011
First filling, efflux time 2, temperature 2	312.070	20.011	275.550	20.011
First filling, efflux time 3, temperature 3	312.810	20.007	275.150	20.007
First filling, efflux time 4, temperature 4	311.840	20.007	275.880	20.007
First filling, efflux time 5, temperature 5	312.950	20.007	275.940	20.007
Mean value	312.504	20.009	275.536	20.009
Second filling, efflux time 1, temperature 1	312.320	20.008	275.350	20.008
Second filling, efflux time 2, temperature 2	312.230	20.008	276.290	20.008
Second filling, efflux time 3, temperature 3	313.010	20.008	276.040	20.008
Second filling, efflux time 4, temperature 4	312.290	20.008	275.890	20.008
Second filling, efflux time 5, temperature 5	312.720	20.004	275.880	20.004
Mean value	312.514	20.007	275.890	20.007
Overall mean value	312.509	20.008	275.713	20.008

Mean value of viscosity of the two viscometers*	154653.70	mm²/s
Mean value of the temperature	20.008	°C

*Please do not correct the result to target temperature

Notes or observations: Sample was colorless, clear and bright, and ran normally. This data was developed from a second bottle of Sample C that was requested from the pilot laboratory. Difficulties were encountered when running the original bottle (which arrived 10/26/12) and more material was needed to develop acceptable data and complete evaluations.

participating lab (abbreviation), standard liquid	Cannon	C, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID C, 20°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.101	1/K	0.00020	1/K		50
Density of the sample	0.89632	g/cm³	0.00018	g/cm³		50
Surface tension of the sample	32.45	mN/m	0.48	mN/m		50
Time measuring device			0.01765	s	6.0232E-05	1000000
Flow time measurements	294.111	s	0.08771	s	2.9939E-04	19
Inclination of viscometers to vertical axis	0	°		°		
Sample temperature	20.008	°C	0.00059	K	5.9590E-05	50
Viscometer Number 1, Viscometer constant	495.330	mm²/s²	1.08477	mm²/s²	2.1920E-03	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	560.410	mm²/s²	1.22730	mm²/s²	2.1880E-03	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	1.58E-03
Effective degrees of freedom, ν_{eff}	107
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	1.98
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	3.13E-03

participating lab (abbreviation), standard liquid	Cannon	C, 20 °C

Additional Note: The National Institute of Standards and Technology (NIST) has designated Cannon Instrument Company to provide United States of America national measurement standards and to issue calibration and measurement certificates for certified liquid viscosity reference standards. Cannon Instrument Company will participate on behalf of the U.S.A. in Key Comparisons organized by the Comite Internationale de Poids et Mesures (CIPM). Cannon Instrument Company maintains its own viscosity scale, and all viscometers used in the laboratory have been calibrated in-house. Kinematic viscosity measurements at the temperatures of 15, 20, and 40 °C for this Key Comparison were made using Cannon-Ubbelohde (long capillary) Master viscometers or Cannon-Ubbelohde Laboratory Standard viscometers, as described in ASTM methods D2162, D445, and D446. The viscometer type is designated on the data entry form for each sample. Uncertainty contributions were derived using methods described in the “Guide to the Expression of Uncertainty in Measurement”.

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID C , 40 °C**

Name of participating laboratory	Cannon Instrument Company
Country	USA

MEASUREMENT **STANDARD LIQUID C, 40 °C**

Name of standard liquid	C	
Date of arrival of the liquid at the laboratory	2012/10/26	
Remarks on the liquid (package, seals)	Good Condition	
Date of test	2012/12/5	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	Fluke 1594A w/SPRT	
Time measuring device (type)	Cannon Digital Timer	
Type of viscometer	Cannon-Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	700/B61		700/B62	
Capillary length (nominal)	90	mm	90	mm
Flow volume (nominal)	3.1	cm³	3.1	cm³
Viscometer constant	96.1640	mm²/s²	98.8510	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit	
Air temperature	23.00	°C	
Air pressure	977.00	hPa	
Relative humidity	31.00	%	
participating lab (abbreviation), standard liquid	Cannon		C, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID C, 40°C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	261.590	40.003	254.630	40.003
First filling, efflux time 2, temperature 2	261.220	40.003	254.310	40.003
First filling, efflux time 3, temperature 3	261.190	40.003	254.370	40.003
First filling, efflux time 4, temperature 4	261.220	40.003	254.490	40.003
First filling, efflux time 5, temperature 5	261.630	40.004	254.540	40.004
Mean value	261.370	40.003	254.468	40.003
Second filling, efflux time 1, temperature 1	261.240	40.002	254.240	40.002
Second filling, efflux time 2, temperature 2	261.130	40.002	254.300	40.002
Second filling, efflux time 3, temperature 3	261.260	40.002	254.390	40.002
Second filling, efflux time 4, temperature 4	261.100	40.003	254.320	40.003
Second filling, efflux time 5, temperature 5	261.530	40.003	254.210	40.003
Mean value	261.252	40.002	254.292	40.002
Overall mean value	261.311	40.003	254.380	40.003

Mean value of viscosity of the two viscometers*	25137.21	mm²/s
Mean value of the temperature	40.003	°C

*Please do not correct the result to target temperature

Notes or observations: Sample was colorless, clear and bright, and ran normally. Very small bubbles after introducing sample into viscometer, which diminished durring soak time. Due to highly viscous sample and long viscometer cleaning time, Fill 1 was run on 12/5/12 and Fill 2 on 12/6/12. Ambient conditions for Fill 2 was Air Temp: 24 °C, Air Pres: 979 hPa, and Rel Humidity: 25 %.

participating lab (abbreviation), standard liquid	Cannon	C, 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID C, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.083	1/K	0.00013	1/K		50
Density of the sample	0.88514	g/cm³	0.00019	g/cm³		50
Surface tension of the sample	31.40	mN/m	0.36	mN/m		50
Time measuring device			0.01547	s	6.0011E-05	1000000
Flow time measurements	257.846	s	0.03280	s	1.2723E-04	19
Inclination of viscometers to vertical axis	0	°		°		
Sample temperature	40.003	°C	0.00059	K	4.8970E-05	50
Viscometer Number 1, Viscometer constant	96.1640	mm²/s²	0.21060	mm²/s²	2.1893E-03	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	98.8510	mm²/s²	0.21648	mm²/s²	2.1907E-03	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	1.56E-03
Effective degrees of freedom, ν_{eff}	102
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	1.98
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	3.09E-03

participating lab (abbreviation), standard liquid	Cannon	C, 40 °C

Additional Note: The National Institute of Standards and Technology (NIST) has designated Cannon Instrument Company to provide United States of America national measurement standards and to issue calibration and measurement certificates for certified liquid viscosity reference standards. Cannon Instrument Company will participate on behalf of the U.S.A. in Key Comparisons organized by the Comite Internationale de Poids et Mesures (CIPM). Cannon Instrument Company maintains its own viscosity scale, and all viscometers used in the laboratory have been calibrated in-house. Kinematic viscosity measurements at the temperatures of 15, 20, and 40 °C for this Key Comparison were made using Cannon-Ubbelohde (long capillary) Master viscometers or Cannon-Ubbelohde Laboratory Standard viscometers, as described in ASTM methods D2162, D445, and D446. The viscometer type is designated on the data entry form for each sample. Uncertainty contributions were derived using methods described in the “Guide to the Expression of Uncertainty in Measurement”.

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 15 °C**

Name of participating laboratory	
Country	

MEASUREMENT **STANDARD LIQUID A, 15 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	Nov 12th, 2012	
Remarks on the liquid (package, seals)	ok	
Date of test	January 8th and 9th 2013	
Nominal measuring temperature	15	°C
Temperature measuring instrument (type)	Pt-res. Therm., ASL F 700	
Time measuring device (type)	Electronic timer, quartz	
Type of viscometer	Ubbelohde standard viscometers	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	I/303		I/304	
Capillary length (nominal)	90.0000	mm	90.0000	mm
Flow volume (nominal)	5.7000	cm³	5.7000	cm³
Viscometer constant	0.009882	mm²/s²	0.009464	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	20.00	°C
Air pressure	815.91	hPa
Relative humidity	36.40	%

participating lab (abbreviation), standard liquid	CENAM	A, 15 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 15 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	564.510	15.000	589.430	15.000
First filling, efflux time 2, temperature 2	564.310	14.999	589.280	14.999
First filling, efflux time 3, temperature 3	564.420	15.000	589.370	15.000
First filling, efflux time 4, temperature 4	564.420	14.999	589.470	14.999
First filling, efflux time 5, temperature 5	564.410	15.000	589.330	15.000
Mean value	564.414	14.999	589.376	14.999
Second filling, efflux time 1, temperature 1	564.490	15.000	589.450	15.000
Second filling, efflux time 2, temperature 2	564.620	14.999	589.210	14.999
Second filling, efflux time 3, temperature 3	564.440	15.000	589.240	15.000
Second filling, efflux time 4, temperature 4	564.320	14.999	589.320	14.999
Second filling, efflux time 5, temperature 5	564.470	15.000	589.310	15.000
Mean value	564.468	14.999	589.306	14.999
Overall mean value	564.441	15.000	589.346	15.000

Mean value of viscosity of the two viscometers*	5.578	mm²/s
Mean value of the temperature	15.000	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	CENAM	A , 15 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 15°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.028	1/K	0.000034	1/K	$8{,}25 \cdot 10^{-8}$	50
Density of the sample	0.81243	g/cm³	0.00012	g/cm³	can be neglecte	50
Surface tension of the sample	28.50	mN/m	0.19	mN/m	can be neglecte	50
Time measuring device			0.100	s	$1.00 \cdot 10^{-4}$	50
Flow time measurements	576.894	s	0.0865	s	$1.016 \cdot 10^{-4}$	9
Inclination of viscometers to vertical axis	0	°	0.28	°	$8.9 \cdot 10^{-6}$	50
Sample temperature	15.000	°C	0.00323	K	$6.390 \cdot 10^{-5}$	100
Viscometer Number 1, Viscometer constant	0.009882	mm²/s²	0.10	mm²/s²	0.001	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	0.009464	mm²/s²	0.10	mm²/s²	0.001	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	$1.00 \cdot 10^{-3}$
Effective degrees of freedom, ν_{eff}	51
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	2.01·10-3

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 20 °C**

Name of participating laboratory	
Country	

MEASUREMENT **STANDARD LIQUID A, 20 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	Nov 12th, 2012	
Remarks on the liquid (package, seals)	ok	
Date of test	November 21th and 24th 20	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	Pt-res. Therm., ASL F 700	
Time measuring device (type)	Electronic timer, quartz	
Type of viscometer	Ubbelohde standard viscometers	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	l/303		l/304	
Capillary length (nominal)	90.0000	mm	90.0000	mm
Flow volume (nominal)	5.7000	cm³	5.7000	cm³
Viscometer constant	0.009882	mm²/s²	0.009464	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	20.00	°C
Air pressure	818.09	hPa
Relative humidity	45.20	%

participating lab (abbreviation), standard liquid	CENAM	A, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 15 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	492.860	20.000	514.830	20.000
First filling, efflux time 2, temperature 2	492.850	19.999	514.770	19.999
First filling, efflux time 3, temperature 3	492.860	20.000	514.610	20.000
First filling, efflux time 4, temperature 4	492.990	19.999	514.910	19.999
First filling, efflux time 5, temperature 5	493.140	20.000	514.980	20.000
Mean value	492.940	19.999	514.820	19.999
Second filling, efflux time 1, temperature 1	492.890	20.000	514.650	20.000
Second filling, efflux time 2, temperature 2	493.080	19.999	514.480	19.999
Second filling, efflux time 3, temperature 3	492.890	20.000	514.850	20.000
Second filling, efflux time 4, temperature 4	493.080	19.999	514.690	19.999
Second filling, efflux time 5, temperature 5	492.970	20.000	514.640	20.000
Mean value	492.892	19.999	514.662	19.999
Overall mean value	492.916	20.000	514.741	20.000

Mean value of viscosity of the two viscometers*	4.872	mm²/s
Mean value of the temperature	20.000	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	CENAM	A , 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 20°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.027	1/K	0.000032	1/K	can be neglecte	50
Density of the sample	0.80900	g/cm³	0.00012	g/cm³	can be neglecte	50
Surface tension of the sample	28.07	mN/m	0.18	mN/m	can be neglecte	50
Time measuring device			0.100	s	$1.00 \cdot 10^{-4}$	50
Flow time measurements	503.829	s	0.1138	s	$1.016 \cdot 10^{-4}$	9
Inclination of viscometers to vertical axis	0	°	0.28	°	$8.9 \cdot 10^{-6}$	50
Sample temperature	20.000	°C	0.00323	K	$6.162 \cdot 10^{-5}$	100
Viscometer Number 1, Viscometer constant	0.009882	mm²/s²	0.10	mm²/s²	0.001	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	0.009464	mm²/s²	0.10	mm²/s²	0.001	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	$1.02 \cdot 10^{-3}$
Effective degrees of freedom, ν_{eff}	52
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	2.03·10-3

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 20 °C**

Name of participating laboratory	
Country	

MEASUREMENT **STANDARD LIQUID B, 20 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	Nov 12th, 2012	
Remarks on the liquid (package, seals)	ok	
Date of test	Nov 21th and 14th Jan 2013	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	Pt-res. Therm., ASL F 700	
Time measuring device (type)	Electronic timer, quartz	
Type of viscometer	Ubbelohde standard viscometers	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	IIIc/313		IIIc/314	
Capillary length (nominal)	90.0000	mm	90.0000	mm
Flow volume (nominal)	5.7000	cm³	5.7000	cm³
Viscometer constant	3.040700	mm²/s²	3.052200	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	20.00	°C
Air pressure	810.21	hPa
Relative humidity	39.70	%

participating lab (abbreviation), standard liquid	CENAM	B, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 20 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	648.360	20.000	645.990	20.000
First filling, efflux time 2, temperature 2	648.540	19.999	646.160	19.999
First filling, efflux time 3, temperature 3	648.850	20.000	645.910	20.000
First filling, efflux time 4, temperature 4	648.360	19.999	645.900	19.999
First filling, efflux time 5, temperature 5	648.430	20.000	646.000	20.000
Mean value	648.508	19.999	645.992	19.999
Second filling, efflux time 1, temperature 1	648.260	20.000	645.700	20.000
Second filling, efflux time 2, temperature 2	648.180	19.999	645.600	19.999
Second filling, efflux time 3, temperature 3	648.420	20.000	645.760	20.000
Second filling, efflux time 4, temperature 4	648.360	19.999	645.560	19.999
Second filling, efflux time 5, temperature 5	648.510	20.000	645.650	20.000
Mean value	648.346	19.999	645.654	19.999
Overall mean value	648.427	20.000	645.823	20.000

648.427 645.823

648.427 645.823
647.125

Mean value of viscosity of the two viscometers*	1971.426	mm²/s
Mean value of the temperature	20.000	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	CENAM	B , 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 20°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.082	1/K	0.000074	1/K	can be neglecte	50
Density of the sample	0.88127	g/cm³	0.00013	g/cm³	can be neglecte	50
Surface tension of the sample	32.83	mN/m	0.18	mN/m	can be neglecte	50
Time measuring device			0.100	s	$1.00 \cdot 10^{-4}$	50
Flow time measurements	647.125	s	0.130	s	$1.16 \cdot 10^{-4}$	9
Inclination of viscometers to vertical axis	0	°	0.28	°	$8.9 \cdot 10^{-6}$	50
Sample temperature	20.000	°C	0.00323	K	$1.87 \cdot 10^{-4}$	100
Viscometer Number 1, Viscometer constant	3.0407	mm²/s²	0.12	mm²/s²	0.0012	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	3.0522	mm²/s²	0.12	mm²/s²	0.0012	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	$1.21 \cdot 10^{-3}$
Effective degrees of freedom, ν_{eff}	52
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	2.4·10-3

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 40 °C**

Name of participating laboratory	
Country	

MEASUREMENT **STANDARD LIQUID B, 40 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	Nov 12th, 2012	
Remarks on the liquid (package, seals)	ok	
Date of test	11 and 14th Jan 2013	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	Pt-res. Therm., ASL F 700	
Time measuring device (type)	Electronic timer, quartz	
Type of viscometer	Ubbelohde standard viscometers	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	III/311		III/312	
Capillary length (nominal)	90.0000	mm	90.0000	mm
Flow volume (nominal)	5.7000	cm³	5.7000	cm³
Viscometer constant	0.9898	mm²/s²	0.9584	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	21.60	°C
Air pressure	812.36	hPa
Relative humidity	36.40	%

participating lab (abbreviation), standard liquid	CENAM	B, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 40 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	477.310	40.000	493.150	40.000
First filling, efflux time 2, temperature 2	477.470	39.999	493.200	39.999
First filling, efflux time 3, temperature 3	477.540	40.000	493.180	40.000
First filling, efflux time 4, temperature 4	477.510	39.999	493.100	39.999
First filling, efflux time 5, temperature 5	477.550	40.000	493.040	40.000
Mean value	477.476	39.999	493.134	39.999
Second filling, efflux time 1, temperature 1	477.280	40.000	493.230	40.000
Second filling, efflux time 2, temperature 2	477.310	39.999	493.180	39.999
Second filling, efflux time 3, temperature 3	477.620	40.000	493.140	40.000
Second filling, efflux time 4, temperature 4	477.620	39.999	493.140	39.999
Second filling, efflux time 5, temperature 5	477.580	40.000	492.920	40.000
Mean value	477.482	39.999	493.122	39.999
Overall mean value	477.479	40.000	493.128	40.000

Mean value of viscosity of the two viscometers*	472.612	mm²/s
Mean value of the temperature	40.000	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	CENAM	B , 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 40C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.063	1/K	0.000037	1/K	can be neglecte	50
Density of the sample	0.86920	g/cm³	0.00018	g/cm³	can be neglecte	50
Surface tension of the sample	31.04	mN/m	0.22	mN/m	can be neglecte	50
Time measuring device			0.100	s	$1.00 \cdot 10^{-4}$	50
Flow time measurements	485.304	s	0.12	s	$1.18 \cdot 10^{-4}$	9
Inclination of viscometers to vertical axis	0	°	0.28	°	$8.9 \cdot 10^{-6}$	50
Sample temperature	40.000	°C	0.00323	K	$1.43 \cdot 10^{-4}$	100
Viscometer Number 1, Viscometer constant	0.9898	mm²/s²	0.11	mm²/s²	0.0011	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	0.9584	mm²/s²	0.11	mm²/s²	0.0011	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	$1.11 \cdot 10^{-3}$
Effective degrees of freedom, ν_{eff}	52
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	2.22·10-3

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID C, 20 °C**

Name of participating laboratory	
Country	

MEASUREMENT **STANDARD LIQUID C, 20 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	Nov 12th, 2012	
Remarks on the liquid (package, seals)	ok	
Date of test	Nov 22th and 28th Jan 201	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	Pt-res. Therm., ASL F 700	
Time measuring device (type)	Electronic timer, quartz	
Type of viscometer	Ubbelohde standard viscometers	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	V/336		V/337	
Capillary length (nominal)	90.0000	mm	90.0000	mm
Flow volume (nominal)	5.7000	cm³	5.7000	cm³
Viscometer constant	101.4715	mm²/s²	110.7415	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	21.60	°C
Air pressure	812.36	hPa
Relative humidity	36.40	%

participating lab (abbreviation), standard liquid	CENAM	C, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID C, 20 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	1524.820	20.000	1395.280	20.000
First filling, efflux time 2, temperature 2	1525.320	19.999	1394.380	19.999
First filling, efflux time 3, temperature 3	1526.830	20.000	1394.640	20.000
First filling, efflux time 4, temperature 4	1525.320	19.999	1396.520	19.999
First filling, efflux time 5, temperature 5	1524.310	20.000	1394.460	20.000
Mean value	1525.320	19.999	1395.056	19.999
Second filling, efflux time 1, temperature 1	1524.820	20.000	1394.920	20.000
Second filling, efflux time 2, temperature 2	1527.510	19.999	1395.160	19.999
Second filling, efflux time 3, temperature 3	1524.860	20.000	1396.830	20.000
Second filling, efflux time 4, temperature 4	1523.980	19.999	1397.140	19.999
Second filling, efflux time 5, temperature 5	1524.670	20.000	1396.830	20.000
Mean value	1525.168	19.999	1396.176	19.999
Overall mean value	1525.244	20.000	1395.616	20.000

Mean value of viscosity of the two viscometers*	154 660.703	mm²/s
Mean value of the temperature	20.000	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	CENAM	C , 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID C, 20°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.101	1/K	0.00020	1/K	can be neglecte	50
Density of the sample	0.89632	g/cm³	0.00018	g/cm³	can be neglecte	50
Surface tension of the sample	32.45	mN/m	0.48	mN/m	can be neglecte	50
Time measuring device			0.100	s	$4.86 \cdot 10^{-5}$	50
Flow time measurements	1460.430	s	1.06	s	$5.11 \cdot 10^{-4}$	9
Inclination of viscometers to vertical axis	0	°	0.28	°	$8.9 \cdot 10^{-6}$	50
Sample temperature	20.000	°C	0.00323	K	$2.3 \cdot 10^{-4}$	100
Viscometer Number 1, Viscometer constant	101.4715	mm²/s²	0.210	mm²/s²	$2.1 \cdot 10^{-3}$	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	110.7415	mm²/s²	0.210	mm²/s²	$2.1 \cdot 10^{-3}$	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	$2.14 \cdot 10^{-3}$
Effective degrees of freedom, ν_{eff}	52
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	4.29·10-3

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID C, 40 °C**

Name of participating laboratory	
Country	

MEASUREMENT **STANDARD LIQUID C, 20 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	Nov 12th, 2012	
Remarks on the liquid (package, seals)	ok	
Date of test	Nov 22th and 28th Jan 201	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	Pt-res. Therm., ASL F 700	
Time measuring device (type)	Electronic timer, quartz	
Type of viscometer	Ubbelohde standard viscometers	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	V/336		V/337	
Capillary length (nominal)	90.0000	mm	90.0000	mm
Flow volume (nominal)	5.7000	cm³	5.7000	cm³
Viscometer constant	101.4715	mm²/s²	110.7415	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	21.80	°C
Air pressure	815.95	hPa
Relative humidity	39.70	%

participating lab (abbreviation), standard liquid	CENAM	C, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID C, 40 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	247.650	40.000	226.840	40.000
First filling, efflux time 2, temperature 2	247.600	39.999	226.970	39.999
First filling, efflux time 3, temperature 3	247.320	40.000	226.560	40.000
First filling, efflux time 4, temperature 4	247.350	39.999	226.690	39.999
First filling, efflux time 5, temperature 5	247.410	40.000	226.410	40.000
Mean value	247.466	39.999	226.694	39.999
Second filling, efflux time 1, temperature 1	247.670	40.000	226.930	40.000
Second filling, efflux time 2, temperature 2	247.680	39.999	226.530	39.999
Second filling, efflux time 3, temperature 3	247.550	40.000	226.750	40.000
Second filling, efflux time 4, temperature 4	247.460	39.999	226.970	39.999
Second filling, efflux time 5, temperature 5	247.560	40.000	226.840	40.000
Mean value	247.584	39.999	226.804	39.999
Overall mean value	247.525	40.000	226.749	40.000

Mean value of viscosity of the two viscometers*	25 110.524	mm²/s
Mean value of the temperature	40.000	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	CENAM	C , 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID C, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.083	1/K	0.00013	1/K	can be neglecte	50
Density of the sample	0.88514	g/cm³	0.00019	g/cm³	can be neglecte	50
Surface tension of the sample	31.40	mN/m	0.36	mN/m	can be neglecte	50
Time measuring device			0.100	s	$2.99 \cdot 10^{-4}$	50
Flow time measurements	237.137	s	0.16	s	$4.81 \cdot 10^{-4}$	9
Inclination of viscometers to vertical axis	0	°	0.28	°	$8.9 \cdot 10^{-6}$	50
Sample temperature	40.000	°C	0.00323	K	$1.9 \cdot 10^{-4}$	100
Viscometer Number 1, Viscometer constant	101.4715	mm²/s²	0.210	mm²/s²	$2.1 \cdot 10^{-3}$	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	110.7415	mm²/s²	0.210	mm²/s²	$2.1 \cdot 10^{-3}$	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	$2.13 \cdot 10^{-3}$
Effective degrees of freedom, ν_{eff}	52
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	$4.28 \cdot 10^{-3}$

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 15 °C**

Name of participating laboratory	Central Office of Measures
Country	Poland

MEASUREMENT **STANDARD LIQUID A, 15 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	November 20th 2012	
Remarks on the liquid (package, seals)	O.K.	
Date of test	21, 22 November 2012	
Nominal measuring temperature	15	°C
Temperature measuring instrument (type)	Pt-res. Therm., Isotech type	
Time measuring device (type)	Electronic stopwatch	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	3201		3204	
Capillary length (nominal)	500.0000	mm	500.0000	mm
Flow volume (nominal)	5.7000	cm³	5.2000	cm³
Viscometer constant	0.027889	mm²/s²	0.028515	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	17.93	°C
Air pressure	997.23	hPa
Relative humidity	27.65	%

participating lab (abbreviation), standard liquid	GUM	A, 15 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 15 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	200.340	15.000	195.830	14.999
First filling, efflux time 2, temperature 2	200.330	15.001	195.890	15.000
First filling, efflux time 3, temperature 3	200.300	15.001	195.860	15.000
First filling, efflux time 4, temperature 4	200.310	15.001	195.930	15.001
First filling, efflux time 5, temperature 5	200.340	15.001	195.920	15.001
Mean value	200.324	15.001	195.886	15.000
Second filling, efflux time 1, temperature 1	200.270	15.000	195.940	15.001
Second filling, efflux time 2, temperature 2	200.240	15.001	195.970	15.000
Second filling, efflux time 3, temperature 3	200.270	15.000	195.930	15.000
Second filling, efflux time 4, temperature 4	200.230	15.000	195.920	15.000
Second filling, efflux time 5, temperature 5	200.200	15.000	195.950	15.000
Mean value	200.242	15.000	195.942	15.000
Overall mean value	200.283	15.000	195.914	15.000

Mean value of viscosity of the two viscometers*	5.5861	mm²/s
Mean value of the temperature	15.000	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	GUM	A , 15 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 15°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.028	1/K	0.000034	1/K	9.70E-05	50
Density of the sample	0.81243	g/cm³	0.00012	g/cm³	can be neglected	50
Surface tension of the sample	28.50	mN/m	0.19	mN/m	can be neglected	50
Time measuring device			0.02	s	can be neglected	1E+06
Flow time measurements	198.0985	s	0.01343	s	2.5E-04	9
Inclination of viscometers to vertical axis		°		°		
Sample temperature	15.000	°C	0.004	K	1.80E-04	1E+06
Viscometer Number 1, Viscometer constant	0.027889	mm²/s²	1.534E-05	mm²/s²	5.500E-04	50
Individual surface tension correction factor c_S (1)	1.00000		1.360E-06		1.360E-06	
Kinetic energy correction t_{KE} (1)	0.99996	s	3.872E-07	s	3.872E-07	9
Viscometer Number 2, Viscometer constant	0.028515	mm²/s²	1.570E-05	mm²/s²	5.500E-04	50
Individual surface tension correction factor c_S (2)	1.00000		1.350E-06		1.350E-06	
Kinetic energy correction t_{KE} (2)	0.99996	s	3.747E-07	s	3.747E-07	9
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	6.10E-04
Effective degrees of freedom, ν_{eff}	
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	1.22E-03

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 20 °C**

Name of participating laboratory	Central Office of Measures
Country	Poland

MEASUREMENT **STANDARD LIQUID A, 20 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	November 20th 2012	
Remarks on the liquid (package, seals)	O.K.	
Date of test	23,26 November 2012	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	Pt-res. Therm., Isotech type	
Time measuring device (type)	Electronic stopwatch	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	3175		3176	
Capillary length (nominal)	502.0000	mm	502.0000	mm
Flow volume (nominal)	6.0000	cm³	6.0000	cm³
Viscometer constant	0.010988	mm²/s²	0.010981	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	20.70	°C
Air pressure	999.08	hPa
Relative humidity	23.00	%

participating lab (abbreviation), standard liquid	GUM	A, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 20°C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	443.850	20.000	444.140	20.000
First filling, efflux time 2, temperature 2	443.770	20.000	444.130	20.000
First filling, efflux time 3, temperature 3	443.830	19.999	444.120	19.999
First filling, efflux time 4, temperature 4	443.700	19.999	444.140	20.000
First filling, efflux time 5, temperature 5	443.710	19.999	444.150	20.000
Mean value	443.772	20.000	444.136	20.000
Second filling, efflux time 1, temperature 1	443.810	20.001	443.950	20.001
Second filling, efflux time 2, temperature 2	443.810	20.001	443.980	20.000
Second filling, efflux time 3, temperature 3	443.660	20.000	444.090	20.000
Second filling, efflux time 4, temperature 4	443.640	20.001	443.930	20.001
Second filling, efflux time 5, temperature 5	443.740	20.000	444.230	20.000
Mean value	443.732	20.000	444.036	20.000
Overall mean value	443.752	20.000	444.086	20.000

Mean value of viscosity of the two viscometers*	4.8763	mm²/s
Mean value of the temperature	20.000	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	GUM	A, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 20 °C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.027	1/K	0.000032	1/K		50
Density of the sample	0.80900	g/cm³	0.00012	g/cm³	can be neglected	50
Surface tension of the sample	28.07	mN/m	0.18	mN/m	can be neglected	50
Time measuring device			0.02	s	can be neglected	1000000
Flow time measurements	443.919000	s	5.56E-02	s	1.25E-04	9
Inclination of viscometers to vertical axis		°		°		
Sample temperature	20.000000	°C	0.03600	K	1.7E-04	1000000
Viscometer Number 1, Viscometer constant	0.010988	mm²/s²	4.94E-06	mm²/s²	4.50E-04	50
Individual surface tension correction factor c_S (1)	1.000000		1.23E-06		1.23E-06	
Kinetic energy correction t_{KE} (1)	0.999981	s	1.64E-07	s	1.64E-07	9
Viscometer Number 2, Viscometer constant	0.010981	mm²/s²	4.90E-06	mm²/s²	4.50E-04	50
Individual surface tension correction factor c_S (2)	1.000000		1.23E-06		1.23E-06	
Kinetic energy correction t_{KE} (2)	0.999981	s	1.63E-07	s	1.63E-07	9
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.00048
Effective degrees of freedom, ν_{eff}	
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0010

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 20 °C**

Name of participating laboratory	Central Office of Measures
Country	Poland

MEASUREMENT **STANDARD LIQUID B, 20 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	November 20th 2012	
Remarks on the liquid (package, seals)	O.K.	
Date of test	27, 28 November 2012	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	Pt-res. Therm., Isotech type:	
Time measuring device (type)	Electronic stopwatch	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	3226		3227	
Capillary length (nominal)	500.0000	mm	500.0000	mm
Flow volume (nominal)	6.5000	cm³	6.5000	cm³
Viscometer constant	10.0000	mm²/s²	10.1310	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	19.85	°C
Air pressure	989.33	hPa
Relative humidity	27.30	%

participating lab (abbreviation), standard liquid	GUM	B, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 20 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	197.4000	20.001	194.9100	20.000
First filling, efflux time 2, temperature 2	197.3600	20.000	194.8100	19.999
First filling, efflux time 3, temperature 3	197.3000	20.000	194.8800	20.000
First filling, efflux time 4, temperature 4	197.2900	20.001	194.8900	20.000
First filling, efflux time 5, temperature 5	197.4000	20.000	194.9100	20.000
Mean value	197.3500	20.000	194.8800	20.000
Second filling, efflux time 1, temperature 1	197.4100	20.000	194.8100	20.000
Second filling, efflux time 2, temperature 2	197.4000	19.999	194.8100	20.000
Second filling, efflux time 3, temperature 3	197.3600	20.000	194.8800	20.000
Second filling, efflux time 4, temperature 4	197.3100	20.000	194.8600	20.000
Second filling, efflux time 5, temperature 5	197.3300	20.000	194.9100	20.000
Mean value	197.3620	20.000	194.8540	20.000
Overall mean value	197.3560	20.000	194.8670	20.000

Mean value of viscosity of the two viscometers*	1973.9	mm²/s
Mean value of the temperature	20.0001	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	GUM	B, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 20°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.082	1/K	0.000074	1/K	5.19E-04	50
Density of the sample	0.88127	g/cm³	0.00013	g/cm³	can be neglected	50
Surface tension of the sample	32.83	mN/m	0.18	mN/m	can be neglected	50
Time measuring device			0.02	s	can be neglected	1000000
Flow time measurements	196.11200	s	0.04800	s	0.00024	9
Inclination of viscometers to vertical axis		°		°		
Sample temperature	20.00000	°C	0.03600	K	1.7E-04	1000000
Viscometer Number 1, Viscometer constant	10.00000	mm²/s²	1.2E-02	mm²/s²	1.2E-03	50
Individual surface tension correction factor c_S (1)	1.00000		1.2E-06		1.2E-06	
Kinetic energy correction t_{KE} (1)	1.00000	s	2.8E-11	s	2.8E-11	9
Viscometer Number 2, Viscometer constant	10.13100	mm²/s²	1.2E-02	mm²/s²	1.2E-03	50
Individual surface tension correction factor c_S (2)	1.00000		1.19E-06		1.19E-06	
Kinetic energy correction t_{KE} (2)	1.00000	s	2.8E-11	s	2.8E-11	9
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.0013
Effective degrees of freedom, ν_{eff}	
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0026

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 40 °C**

Name of participating laboratory	Central Office of Measures
Country	Poland

MEASUREMENT **STANDARD LIQUID B, 40 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	November 20th 2012	
Remarks on the liquid (package, seals)	O.K.	
Date of test	29, 30 November, 2012	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	Pt-res. Therm., Isotech type	
Time measuring device (type)	Electronic stopwatch	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	3143		3144	
Capillary length (nominal)	500.0000	mm	500.0000	mm
Flow volume (nominal)	5.1000	cm³	5.2000	cm³
Viscometer constant	1.0254	mm²/s²	1.0125	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	21.50	°C
Air pressure	999.85	hPa
Relative humidity	22.58	%

participating lab (abbreviation), standard liquid	GUM	B, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 40 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	460.7900	40.000	466.4500	40.001
First filling, efflux time 2, temperature 2	460.7900	40.000	466.4300	40.001
First filling, efflux time 3, temperature 3	460.8400	40.001	466.4500	40.000
First filling, efflux time 4, temperature 4	460.7200	40.001	466.4700	40.000
First filling, efflux time 5, temperature 5	460.7700	40.001	466.5000	40.000
Mean value	460.7820	40.001	466.4600	40.000
Second filling, efflux time 1, temperature 1	460.8000	40.001	466.3600	40.000
Second filling, efflux time 2, temperature 2	460.8900	40.000	466.2800	40.000
Second filling, efflux time 3, temperature 3	460.8000	40.000	466.3300	40.000
Second filling, efflux time 4, temperature 4	460.7900	40.000	466.4500	40.000
Second filling, efflux time 5, temperature 5	460.7500	40.000	466.3800	40.000
Mean value	460.8060	40.000	466.3600	40.000
Overall mean value	460.7940	40.000	466.4100	40.000

Mean value of viscosity of the two viscometers*	472.37	mm²/s
Mean value of the temperature	40.000	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	GUM	B, 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.063	1/K	0.000037	1/K	0.0002	50
Density of the sample	0.86920	g/cm³	0.00018	g/cm³	can be neglected	50
Surface tension of the sample	31.04	mN/m	0.22	mN/m	can be neglected	50
Time measuring device			0.02	s	can be neglected	1000000
Flow time measurements	463.602	s	0.00510	s	1.09E-04	9
Inclination of viscometers to vertical axis		°		°		
Sample temperature	40.00000	°C	0.03900	K	1.8E-04	1000000
Viscometer Number 1, Viscometer constant	1.02540	mm²/s²	9.741E-04	mm²/s²	9.500E-04	50
Individual surface tension correction factor c_S (1)	1.00000		1.460E-06		1.460E-06	
Kinetic energy correction t_{KE} (1)	1.00000	s	7.731E-11	s	7.731E-11	9
Viscometer Number 2, Viscometer constant	1.01250	mm²/s²	9.619E-04	mm²/s²	9.500E-04	50
Individual surface tension correction factor c_S (2)	1.00000		1.450E-06		1.450E-06	
Kinetic energy correction t_{KE} (2)	1.00000	s	7.682E-11	s	7.682E-11	9
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.0010
Effective degrees of freedom, ν_{eff}	
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0020

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID C , 40 °C**

Name of participating laboratory	Central Office of Measures
Country	Poland

MEASUREMENT **STANDARD LIQUID C, 40 °C**

Name of standard liquid	C	
Date of arrival of the liquid at the laboratory	November 20th 2012	
Remarks on the liquid (package, seals)	O.K.	
Date of test	3,4 December 2012	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	Pt-res. Therm., Isotech type	
Time measuring device (type)	Electronic stopwatch	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	3214		3217	
Capillary length (nominal)	500.0000	mm	500.0000	mm
Flow volume (nominal)	5.3000	cm³	5.2000	cm³
Viscometer constant	117.56	mm²/s²	116.22	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	20.80	°C
Air pressure	999.50	hPa
Relative humidity	22.08	%
participating lab (abbreviation), standard liquid	GUM	C, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID C, 40°C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	213.0100	40.001	215.5600	40.000
First filling, efflux time 2, temperature 2	212.8000	40.001	215.3300	40.000
First filling, efflux time 3, temperature 3	212.9800	40.001	215.5800	40.000
First filling, efflux time 4, temperature 4	213.0100	40.001	215.3000	40.001
First filling, efflux time 5, temperature 5	212.7800	40.001	215.3200	40.000
Mean value	212.9160	40.001	215.4180	40.000
Second filling, efflux time 1, temperature 1	212.8900	40.001	215.4000	40.000
Second filling, efflux time 2, temperature 2	212.9100	40.001	215.3100	40.001
Second filling, efflux time 3, temperature 3	212.8100	40.000	215.5200	40.000
Second filling, efflux time 4, temperature 4	212.9100	39.999	215.5100	40.001
Second filling, efflux time 5, temperature 5	212.9100	40.000	215.5500	40.000
Mean value	212.8860	40.000	215.4580	40.000
Overall mean value	212.9010	40.001	215.4380	40.000

Mean value of viscosity of the two viscometers*	25033	mm²/s
Mean value of the temperature	40.000	°C

*Please do not correct the result to target temperature

Notes or observations:		
participating lab (abbreviation), standard liquid	GUM	C, 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID C, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.083	1/K	0.00013	1/K	2.87E-04	50
Density of the sample	0.88514	g/cm³	0.00019	g/cm³	can be neglected	50
Surface tension of the sample	31.40	mN/m	0.36	mN/m	can be neglected	50
Time measuring device			0.02	s	can be neglected	1000000
Flow time measurements	214.1695	s	0.04189	s	1.9446E-04	9
Inclination of viscometers to vertical axis		°		°		
Sample temperature	40.00000	°C	0.00410	K	1.8E-04	1000000
Viscometer Number 1, Viscometer constant	117.56	mm²/s²	0.17636	mm²/s²	1.50E-03	50
Individual surface tension correction factor c_S (1)	1		2.36E-06		2.36E-06	
Kinetic energy correction t_{KE} (1)	1	s	3.55E-13	s	3.55E-13	9
Viscometer Number 2, Viscometer constant	116.22	mm²/s²	1.74E-01	mm²/s²	1.50E-03	50
Individual surface tension correction factor c_S (2)	1		2.36E-06		2.36E-06	
Kinetic energy correction t_{KE} (2)	1	s	3.45E-13	s	3.45E-13	9
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	1.58E-03
Effective degrees of freedom, ν_{eff}	
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	3.15E-03

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 15 °C**

Name of participating laboratory	Inmetro - National Institute of Metrology, Quality and Technology
Country	Brazil

MEASUREMENT **STANDARD LIQUID A, 15 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	November 23th 2012	
Remarks on the liquid (package, seals)	o.k.	
Date of test	November 29th 2012	
Nominal measuring temperature	15	°C
Temperature measuring instrument (type)	Liquid Glass Thermometer	
Time measuring device (type)	Digital Chronometer	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	I - 43850		I - 89864	
Capillary length (nominal)	91.97	mm	91.68	mm
Flow volume (nominal)	5.722	cm³	5.668	cm³
Viscometer constant	0.0098833	mm²/s²	0.0096080	mm²/s²
Correction factor due to acceleration of free fall	0.0000		0.0000	

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	20.0	°C
Air pressure	1010	hPa
Relative humidity	55	%

participating lab (abbreviation), standard liquid	Inmetro	A, 15 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 15 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	564.85	15.001	581.22	15.001
First filling, efflux time 2, temperature 2	564.82	15.001	581.25	15.001
First filling, efflux time 3, temperature 3	564.90	15.001	581.18	15.001
First filling, efflux time 4, temperature 4	564.90	15.001	581.18	15.001
First filling, efflux time 5, temperature 5	564.75	15.001	581.13	15.001
Mean value	564.844	15.001	581.192	15.001
Second filling, efflux time 1, temperature 1	564.85	15.002	581.09	15.002
Second filling, efflux time 2, temperature 2	564.82	15.001	581.16	15.002
Second filling, efflux time 3, temperature 3	564.78	15.001	581.16	15.002
Second filling, efflux time 4, temperature 4	564.85	15.001	581.13	15.002
Second filling, efflux time 5, temperature 5	564.87	15.001	581.13	15.002
Mean value	564.834	15.001	581.134	15.002
Overall mean value	564.839	15.001	581.163	15.002

Mean value of viscosity of the two viscometers*	5.5829	mm²/s
Mean value of the temperature	15.001	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	Inmetro	A , 15 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 15°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.028	1/K	0.000034	1/K	3.05E-06	50
Density of the sample	0.81243	g/cm³	0.00012	g/cm³	0.00E+00	50
Surface tension of the sample	28.50	mN/m	0.19	mN/m	0.00E+00	50
Time measuring device			0,02	s	1.56E-03	1.0E+11
Flow time measurements	564.83900	s	0.04818	s	2.73E-03	9.0E+00
Inclination of viscometers to vertical axis	0.00000	°	0.00100	°	0.00E+00	1.0E+11
Sample temperature	15.00150	°C	0.01281	K	1.15E-03	2.0E+07
Viscometer Number 1, Viscometer constant	0.00988	mm²/s²	0.00000	mm²/s²	3.94E-07	1.0E+11
Individual surface tension correction factor c_S (1)	1.00000		0.00033		2.95E-05	2.0E+11
Kinetic energy correction t_{KE} (1)	0.02804	s	0.00047	s	4.22E-05	5.3E+07
Viscometer Number 2, Viscometer constant	0.00961	mm²/s²	0.00000	mm²/s²	3.13E-07	1.0E+11
Individual surface tension correction factor c_S (2)	1.00000		0.00033		2.96E-05	2.0E+11
Kinetic energy correction t_{KE} (2)	0.03110	s	0.00052	s	4.68E-05	6.4E+07
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	$4{,}51 \cdot 10^{-4}$
Effective degrees of freedom, ν_{eff}	385823
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.00
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	$9{,}02 \cdot 10^{-4}$

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 20 °C**

Name of participating laboratory	Inmetro - National Institute of Metrology, Quality and Technology
Country	Brazil

MEASUREMENT **STANDARD LIQUID A, 20 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	November 23th 2012	
Remarks on the liquid (package, seals)	o.k.	
Date of test	December 4th 2012	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	Liquid Glass Thermometer	
Time measuring device (type)	Digital Chronometer	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	I - 43850		I - 89864	
Capillary length (nominal)	91.97	mm	91.68	mm
Flow volume (nominal)	5.722	cm³	5.668	cm³
Viscometer constant	0.0098833	mm²/s²	0.0096080	mm²/s²
Correction factor due to acceleration of free fall	0.0000		0.0000	

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	20.5	°C
Air pressure	1005	hPa
Relative humidity	65	%

participating lab (abbreviation), standard liquid	Inmetro	A, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 20°C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	493.09	20.002	507.22	20.002
First filling, efflux time 2, temperature 2	493.00	20.001	507.16	20.002
First filling, efflux time 3, temperature 3	493.00	20.001	507.19	20.002
First filling, efflux time 4, temperature 4	493.03	20.001	507.28	20.002
First filling, efflux time 5, temperature 5	493.00	20.001	507.20	20.002
Mean value	493.024	20.001	507.210	20.002
Second filling, efflux time 1, temperature 1	492.97	19.999	507.16	20.002
Second filling, efflux time 2, temperature 2	493.06	19.999	507.22	20.002
Second filling, efflux time 3, temperature 3	493.03	19.999	507.15	20.002
Second filling, efflux time 4, temperature 4	492.98	19.999	507.09	20.002
Second filling, efflux time 5, temperature 5	492.97	19.999	507.15	20.002
Mean value	493.002	19.999	507.154	20.002
Overall mean value	493.013	20.000	507.182	20.002

Mean value of viscosity of the two viscometers*	4.8724	mm²/s
Mean value of the temperature	20.001	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	Inmetro	A, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 20 °C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.027	1/K	0.000032	1/K	3.28E-06	50
Density of the sample	0.80900	g/cm³	0.00012	g/cm³	0.00E+00	50
Surface tension of the sample	28.07	mN/m	0.18	mN/m	0.00E+00	50
Time measuring device			0,02	s	1.78E-03	1.0E+11
Flow time measurements	507.182000	s	0.05203	s	3.38E-03	9.0E+00
Inclination of viscometers to vertical axis	0.000000	°	0.00100	°	0.00E+00	1.0E+11
Sample temperature	20.000100	°C	0.01223	K	1.26E-03	6.1E+05
Viscometer Number 1, Viscometer constant	0.009883	mm²/s²	0.00000	mm²/s²	4.52E-07	1.0E+11
Individual surface tension correction factor c_S (1)	1.000000		0.00034		3.51E-05	2.0E+11
Kinetic energy correction t_{KE} (1)	0.036804	s	0.00062	s	6.35E-05	6.8E+07
Viscometer Number 2, Viscometer constant	0.009608	mm²/s²	0.00000	mm²/s²	3.59E-07	1.0E+11
Individual surface tension correction factor c_S (2)	1.000000		0.00034		3.53E-05	2.0E+11
Kinetic energy correction t_{KE} (2)	0.040835	s	0.00069	s	7.05E-05	2.5E+07
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	$4{,}4_5 \cdot 10^{-4}$
Effective degrees of freedom, ν_{eff}	231060
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	$8{,}90 \cdot 10^{-4}$

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 20 °C**

Name of participating laboratory	Inmetro - National Institute of Metrology, Quality and Technology
Country	Brazil

MEASUREMENT **STANDARD LIQUID B, 20 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	November 23th 2012	
Remarks on the liquid (package, seals)	o.k.	
Date of test	December 7th 2012	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	Liquid Glass Thermometer	
Time measuring device (type)	Digital Chronometer	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	IIIc - 43837		IIIa - 87992	
Capillary length (nominal)	92.74	mm	90.00	mm
Flow volume (nominal)	5.807	cm³	5.684	cm³
Viscometer constant	3.0146	mm²/s²	4.7413	mm²/s²
Correction factor due to acceleration of free fall	0.0000		0.0000	

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	20.1	°C
Air pressure	1009	hPa
Relative humidity	60	%

participating lab (abbreviation), standard liquid	Inmetro	B, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 20 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	653.68	20.002	415.82	20.002
First filling, efflux time 2, temperature 2	653.75	20.002	415.87	20.002
First filling, efflux time 3, temperature 3	653.66	20.002	415.72	20.002
First filling, efflux time 4, temperature 4	653.62	20.002	415.97	20.002
First filling, efflux time 5, temperature 5	653.62	20.002	415.72	20.002
Mean value	653.666	20.002	415.820	20.002
Second filling, efflux time 1, temperature 1	653.59	20.002	415.82	20.002
Second filling, efflux time 2, temperature 2	653.60	20.002	415.72	20.002
Second filling, efflux time 3, temperature 3	653.66	20.002	415.85	20.002
Second filling, efflux time 4, temperature 4	653.68	20.002	415.78	20.002
Second filling, efflux time 5, temperature 5	653.59	20.003	415.85	20.002
Mean value	653.624	20.002	415.804	20.002
Overall mean value	653.645	20.002	415.812	20.002

Mean value of viscosity of the two viscometers*	1971.0	mm²/s
Mean value of the temperature	20.002	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	Inmetro	B, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 20°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.082	1/K	0.000074	1/K	1.88E-08	50
Density of the sample	0.88127	g/cm³	0.00013	g/cm³	0.00E+00	50
Surface tension of the sample	32.83	mN/m	0.18	mN/m	0.00E+00	50
Time measuring device			0,03	s	6.34E-06	1.0E+11
Flow time measurements	415.81200	s	0.08011	s	1.29E-05	9.0E+00
Inclination of viscometers to vertical axis	0.00000	°	0.00100	°	0.00E+00	1.0E+11
Sample temperature	20.00210	°C	0.01221	K	3.10E-06	1.2E+08
Viscometer Number 1, Viscometer constant	3.01460	mm²/s²	0.00070	mm²/s²	1.77E-07	1.0E+11
Individual surface tension correction factor c_S (1)	1.00009		0.00025		6.36E-08	2.7E+09
Kinetic energy correction t_{KE} (1)	0.00000	s	0.00000	s	8.54E-12	7.6E+07
Viscometer Number 2, Viscometer constant	4.74130	mm²/s²	0.00100	mm²/s²	2.54E-07	1.0E+11
Individual surface tension correction factor c_S (2)	0.99990		0.00026		6.51E-08	2.7E+09
Kinetic energy correction t_{KE} (2)	0.00000	s	0.00000	s	9.71E-12	2.0E+06
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	$7{,}5_0 \cdot 10^{-4}$
Effective degrees of freedom, ν_{eff}	201355
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	$1{,}50 \cdot 10^{-3}$

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 40 °C**

Name of participating laboratory	Inmetro - National Institute of Metrology, Quality and Technology
Country	Brazil

MEASUREMENT **STANDARD LIQUID B, 40 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	November 23th 2012	
Remarks on the liquid (package, seals)	o.k.	
Date of test	December 12th 2012	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	Liquid Glass Thermometer	
Time measuring device (type)	Digital Chronometer	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	III - 43836		III - 88066	
Capillary length (nominal)	89.57	mm	90.76	mm
Flow volume (nominal)	5.684	cm³	5.595	cm³
Viscometer constant	0.99008	mm²/s²	0.99564	mm²/s²
Correction factor due to acceleration of free fall	0.0000		0.0000	

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	20.5	°C
Air pressure	1010	hPa
Relative humidity	67	%

participating lab (abbreviation), standard liquid	Inmetro	B, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 40 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	477.18	39.997	474.32	39.995
First filling, efflux time 2, temperature 2	477.03	39.997	474.47	39.995
First filling, efflux time 3, temperature 3	477.18	39.997	474.28	39.996
First filling, efflux time 4, temperature 4	477.03	39.997	474.28	39.996
First filling, efflux time 5, temperature 5	477.02	39.997	474.32	39.997
Mean value	477.088	39.997	474.334	39.996
Second filling, efflux time 1, temperature 1	477.03	39.997	474.37	39.997
Second filling, efflux time 2, temperature 2	477.18	39.997	474.25	39.997
Second filling, efflux time 3, temperature 3	477.09	39.997	474.25	39.997
Second filling, efflux time 4, temperature 4	477.09	39.997	474.35	39.997
Second filling, efflux time 5, temperature 5	477.18	39.997	474.35	39.997
Mean value	477.114	39.997	474.314	39.997
Overall mean value	477.101	39.997	474.324	39.996

Mean value of viscosity of the two viscometers*	472.31	mm²/s
Mean value of the temperature	39.997	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	Inmetro	B, 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.063	1/K	0.000037	1/K	3.92E-08	50
Density of the sample	0.86920	g/cm³	0.00018	g/cm³	0.00E+00	50
Surface tension of the sample	31.04	mN/m	0.22	mN/m	0.00E+00	50
Time measuring device			0,03	s	2.65E-05	1.0E+11
Flow time measurements	477.10100	s	0.07218	s	4.83E-05	9.0E+00
Inclination of viscometers to vertical axis	0.00000	°	0.00100	°	0.00E+00	1.0E+11
Sample temperature	39.99640	°C	0.01488	K	1.57E-05	5.4E+06
Viscometer Number 1, Viscometer constant	0.99008	mm²/s²	0.00024	mm²/s²	2.54E-07	1.0E+11
Individual surface tension correction factor c_S (1)	1.00000		0.00030		3.22E-07	2.0E+11
Kinetic energy correction t_{KE} (1)	0.00002	s	0.00000	s	4.08E-10	5.3E+06
Viscometer Number 2, Viscometer constant	0.99564	mm²/s²	0.00035	mm²/s²	3.67E-07	1.0E+11
Individual surface tension correction factor c_S (2)	1.00000		0.00030		3.18E-07	2.0E+11
Kinetic energy correction t_{KE} (2)	0.00002	s	0.00000	s	3.98E-10	7.3E+06
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	$7{,}31 \cdot 10^{-4}$
Effective degrees of freedom, ν_{eff}	281504
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	$1{,}46 \cdot 10^{-3}$

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID C, 20°C**

Name of participating laboratory	Inmetro - National Institute of Metrology, Quality and Technology
Country	Brazil

MEASUREMENT **STANDARD LIQUID C, 20°C**

Name of standard liquid	C	
Date of arrival of the liquid at the laboratory	November 23th 2012	
Remarks on the liquid (package, seals)	o.k.	
Date of test	December 19th 2012	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	Liquid Glass Thermometer	
Time measuring device (type)	Digital Chronometer	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	IVa - 40497		V - 41090	
Capillary length (nominal)	90.76	mm	91.35	mm
Flow volume (nominal)	5.808	cm³	5.773	cm³
Viscometer constant	49.578	mm²/s²	101.78	mm²/s²
Correction factor due to acceleration of free fall	0.0000		0.0000	

AMBIENT CONDITIONS

Quantity	Mean value	Unit	
Air temperature	20.4	°C	
Air pressure	1007	hPa	
Relative humidity	58	%	
participating lab (abbreviation), standard liquid	Inmetro		C, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID C, 20°C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	3110.00	20.002	1514.97	20.002
First filling, efflux time 2, temperature 2	3108.68	20.002	1514.03	20.002
First filling, efflux time 3, temperature 3	3110.66	20.002	1514.56	20.002
First filling, efflux time 4, temperature 4	3110.37	20.002	1514.17	20.002
First filling, efflux time 5, temperature 5	3109.92	20.002	1514.66	20.002
Mean value	3109.926	20.002	1514.478	20.002
Second filling, efflux time 1, temperature 1	3110.13	20.002	1514.35	20.002
Second filling, efflux time 2, temperature 2	3109.87	20.002	1514.66	20.002
Second filling, efflux time 3, temperature 3	3110.37	20.002	1514.55	20.002
Second filling, efflux time 4, temperature 4	3110.66	20.002	1514.58	20.002
Second filling, efflux time 5, temperature 5	3110.00	20.002	1514.77	20.002
Mean value	3110.206	20.002	1514.582	20.002
Overall mean value	3110.066	20.002	1514.530	20.002

Mean value of viscosity of the two viscometers*	154170	mm²/s
Mean value of the temperature	20.002	°C

*Please do not correct the result to target temperature

Notes or observations:		
participating lab (abbreviation), standard liquid	Inmetro	C, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID C, 20°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.101	1/K	0.00020	1/K	6.49E-10	50
Density of the sample	0.89632	g/cm³	0.00018	g/cm³	0.00E+00	50
Surface tension of the sample	32.45	mN/m	0.48	mN/m	0.00E+00	50
Time measuring device			0,03	s	8.11E-08	1.0E+11
Flow time measurements	3110.07	s	0.56608	s	1.16E-06	9.0E+00
Inclination of viscometers to vertical axis	0.00000	°	0.00100	°	0.00E+00	1.0E+11
Sample temperature	20.00200	°C	0.01221	K	3.96E-08	6.3E+51
Viscometer Number 1, Viscometer constant	49.57800	mm²/s²	0.01300	mm²/s²	4.20E-08	1.0E+11
Individual surface tension correction factor c_S (1)	1.00000		0.00018		5.75E-10	2.0E+11
Kinetic energy correction t_{KE} (1)	0.00000	s	0.00000	s	4.99E-17	2.5E+06
Viscometer Number 2, Viscometer constant	101.78000	mm²/s²	0.03000	mm²/s²	9.73E-08	1.0E+11
Individual surface tension correction factor c_S (2)	1.00000		0.00017		5.58E-10	2.0E+11
Kinetic energy correction t_{KE} (2)	0.00000	s	0.00000	s	6.46E-17	2.4E+06
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	$9{,}0_6 \cdot 10^{-4}$
Effective degrees of freedom, ν_{eff}	269043
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	$1{,}81 \cdot 10^{-3}$

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID C , 40 °C**

Name of participating laboratory	Inmetro - National Institute of Metrology, Quality and Technology
Country	Brazil

MEASUREMENT **STANDARD LIQUID C, 40 °C**

Name of standard liquid	C	
Date of arrival of the liquid at the laboratory	November 23th 2012	
Remarks on the liquid (package, seals)	o.k.	
Date of test	January 10th 2013	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	Liquid Glass Thermometer	
Time measuring device (type)	Digital Chronometer	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	IVa - 40497		V - 41090	
Capillary length (nominal)	90.76	mm	91.35	mm
Flow volume (nominal)	5.808	cm³	5.773	cm³
Viscometer constant	49.578	mm²/s²	101.78	mm²/s²
Correction factor due to acceleration of free fall	0.0000		0.0000	

AMBIENT CONDITIONS

Quantity	Mean value	Unit	
Air temperature	20.2	°C	
Air pressure	1001	hPa	
Relative humidity	61	%	
participating lab (abbreviation), standard liquid	Inmetro		C, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID C, 40°C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	505.30	39.997	246.18	39.997
First filling, efflux time 2, temperature 2	505.47	39.997	246.18	39.997
First filling, efflux time 3, temperature 3	505.44	39.997	246.16	39.997
First filling, efflux time 4, temperature 4	505.35	39.997	246.10	39.997
First filling, efflux time 5, temperature 5	505.33	39.997	246.15	39.997
Mean value	505.378	39.997	246.154	39.997
Second filling, efflux time 1, temperature 1	505.30	39.997	246.02	39.996
Second filling, efflux time 2, temperature 2	505.47	39.997	246.21	39.996
Second filling, efflux time 3, temperature 3	505.41	39.997	246.26	39.997
Second filling, efflux time 4, temperature 4	505.33	39.997	246.16	39.997
Second filling, efflux time 5, temperature 5	505.40	39.997	246.16	39.997
Mean value	505.382	39.997	246.162	39.997
Overall mean value	505.380	39.997	246.158	39.997

Mean value of viscosity of the two viscometers*	25055	mm²/s
Mean value of the temperature	39.997	°C

*Please do not correct the result to target temperature

Notes or observations:		
participating lab (abbreviation), standard liquid	Inmetro	C, 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID C, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.083	1/K	0.00013	1/K	2.59E-09	50
Density of the sample	0.88514	g/cm³	0.00019	g/cm³	0.00E+00	50
Surface tension of the sample	31.40	mN/m	0.36	mN/m	0.00E+00	50
Time measuring device			0,03	s	4.99E-07	1.0E+11
Flow time measurements	246.16200	s	0.06650	s	8.39E-07	9.0E+00
Inclination of viscometers to vertical axis	0.00000	°	0.00100	°	0.00E+00	1.0E+11
Sample temperature	39.99690	°C	0.01487	K	2.97E-07	8.7E+07
Viscometer Number 1, Viscometer constant	49.57800	mm²/s²	0.01300	mm²/s²	2.58E-07	1.0E+11
Individual surface tension correction factor c_S (1)	1.00000		0.00019		3.84E-09	2.0E+11
Kinetic energy correction t_{KE} (1)	0.00000	s	0.00000	s	1.16E-14	9.2E+06
Viscometer Number 2, Viscometer constant	101.78000	mm²/s²	0.03000	mm²/s²	5.99E-07	1.0E+11
Individual surface tension correction factor c_S (2)	1.00000		0.00019		3.72E-09	2.0E+11
Kinetic energy correction t_{KE} (2)	0.00000	s	0.00000	s	1.51E-14	6.2E+05
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	$9{,}1_1 \cdot 10^{-4}$
Effective degrees of freedom, ν_{eff}	129187
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.00
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	$1{,}82 \cdot 10^{-3}$

CCM key comparison on viscosity: CCM.V-K3

Report Form 1: Measurement results **STANDARD LIQUID B , 20°C**

Name of participating laboratory	Istituto di Ricerca Metrologica (INRIM)
Country	ITALY

MEASUREMENT **STANDARD LIQUID B, 20°C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	2012/10/29	
Remarks on the liquid (package, seals)	O.K	
Date of test	2012/11/14	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	Pt-res. Therm., Haart 1560	
Time measuring device (type)	Electronic timer, quarz	
Type of viscometer	Master Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	3c-N1		3c-N2	
Capillary length (nominal)	400	mm	400	mm
Flow volume (nominal)	5.7	cm³	5.7	cm³
Viscometer constant	3.1187	mm²/s²	2.9995	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	19.8	°C
Air pressure	989.5	hPa
Relative humidity	56	%

participating lab (abbreviation), standard liquid	INRIM	B, 20°C

MEASUREMENT RESULTS **STANDARD LIQUID B, 20°C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	633.51	20.002	657.79	20.002
First filling, efflux time 2, temperature 2	633.76	20.001	657.39	20.002
First filling, efflux time 3, temperature 3	633.44	20.004	656.95	20.001
First filling, efflux time 4, temperature 4	632.59	20.004	656.67	20.004
First filling, efflux time 5, temperature 5	633.65	20.005	656.82	20.004
Mean value	633.390	20.003	657.124	20.003
Second filling, efflux time 1, temperature 1	633.52	20.001	657.43	20.001
Second filling, efflux time 2, temperature 2	635.02	19.997	658.22	19.997
Second filling, efflux time 3, temperature 3	634.84	19.997	656.62	19.997
Second filling, efflux time 4, temperature 4	634.44	20.001	658.08	20.001
Second filling, efflux time 5, temperature 5	634.34	20.002	657.31	20.002
Mean value	634.432	20.000	657.532	20.000
Overall mean value	633.911	20.001	657.328	20.001

Mean value of viscosity of the two viscometers*	1974.3	mm²/s
Mean value of the temperature	20.001	°C

*Please do not correct the result to target temperature

Notes or observations: Corrections due to the kinetic energy and to the surface tension are not necessary. The viscosity value at 20 °C was calculated from the average of two viscosities determined with the pair of viscometers.

participating lab (abbreviation), standard liquid	INRIM	B , 20°C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 20°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.082	1/K	0.000074	1/K	can be neglected	
Density of the sample	0.88127	g/cm³	0.00013	g/cm³	can be neglected	
Surface tension of the sample	32.83	mN/m	0.18	mN/m	can be neglected	
Time measuring device			0.01	s	1.55E-05	50
Flow time measurements	645.391	s	0.1	s	1.55E-04	20
Inclination of viscometers to vertical axis		°		°		
Sample temperature	20.001	°C	0.005	K	4.10E-04	50
Viscometer Number 1, Viscometer constant	3.1187	mm²/s²	0.0023	mm²/s²	3.75E-04	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	2.9995	mm²/s²	0.0022	mm²/s²	3.75E-04	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1- correlation component		mm²/s			4.74E-04	50
additional uncertainty component 2 - Buoyant effect		mm²/s	0.04	mm²/s	2.03E-05	50
Mean viscosity and rel. experimental standard deviation	1974.32	mm²/s	0.17	mm²/s	8.52E-05	50

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	8.4E-04
Effective degrees of freedom, n_{eff}	208
Coverage faktor $k_{95} = t_{95}(n_{eff})$	1.97
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	1.7E-03

CCM key comparison on viscosity: CCM.V-K3

Report Form 1: Measurement results **STANDARD LIQUID B , 40°C**

Name of participating laboratory	Istituto di Ricerca Metrologica (INRIM)
Country	ITALY

MEASUREMENT **STANDARD LIQUID B, 40°C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	2012/10/29	
Remarks on the liquid (package, seals)	O.K	
Date of test	2012/12/4	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	Pt-res. Therm., Haart 1560	
Time measuring device (type)	Electronic timer, quarz	
Type of viscometer	Master Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	3-M1 (T1)		3-M2 (T3)	
Capillary length (nominal)	400	mm	400	mm
Flow volume (nominal)	5.7	cm³	5.7	cm³
Viscometer constant	1.0125	mm²/s²	1.1147	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	19.8	°C
Air pressure	989.5	hPa
Relative humidity	56	%

participating lab (abbreviation), standard liquid	INRIM	B, 40°C

MEASUREMENT RESULTS **STANDARD LIQUID B, 40°C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	468.02	39.997	424.81	39.997
First filling, efflux time 2, temperature 2	467.88	39.999	424.17	39.999
First filling, efflux time 3, temperature 3	467.72	39.999	424.38	39.998
First filling, efflux time 4, temperature 4	467.70	39.998	424.35	39.998
First filling, efflux time 5, temperature 5	467.86	39.998	424.93	39.998
Mean value	467.836	39.9983	424.528	39.9982
Second filling, efflux time 1, temperature 1	467.75	39.998	424.37	39.998
Second filling, efflux time 2, temperature 2	467.49	40.001	424.44	40.001
Second filling, efflux time 3, temperature 3	467.64	40.001	424.70	40.000
Second filling, efflux time 4, temperature 4	467.90	40.000	424.46	40.000
Second filling, efflux time 5, temperature 5	467.42	40.000	424.51	39.999
Mean value	467.640	40.0000	424.496	39.9997
Overall mean value	467.738	39.9992	424.512	39.9989

Mean value of viscosity of the two viscometers*	473.38	mm²/s
Mean value of the temperature	39.999	°C

*Please do not correct the result to target temperature

Notes or observations: Corrections due to the kinetic energy and to the surface tension are not necessary. The viscosity value at 40 °C was calculated from the average of two viscosities determined with the pair of viscometers.

participating lab (abbreviation), standard liquid	INRIM	B , 40°C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.063	1/K	0.000037	1/K	can be neglected	
Density of the sample	0.86920	g/cm³	0.00018	g/cm³	can be neglected	
Surface tension of the sample	31.04	mN/m	0.22	mN/m	can be neglected	
Time measuring device			0.01	s	2.25E-05	50
Flow time measurements	445.087	s	0.1	s	2.25E-04	20
Inclination of viscometers to vertical axis		°		°		
Sample temperature	39.999	°C	0.005	K	3.15E-04	50
Viscometer Number 1, Viscometer constant	1.0125	mm²/s²	7.6E-04	mm²/s²	3.75E-04	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	1.1147	mm²/s²	8.4E-04	mm²/s²	3.75E-04	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1- correlation component		mm²/s			2.34E-04	50
additional uncertainty component 2 - Buoyant effect		mm²/s	0.03	mm²/s	6.34E-05	50
Mean viscosity and rel. experimental standard deviation	473.38	mm²/s	0.01	mm²/s	3.10E-05	50

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	7.01E-04
Effective degrees of freedom, n_{eff}	205
Coverage faktor $k_{95} = t_{95}(n_{eff})$	1.97
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	1.38E-03

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 15 °C**

Name of participating laboratory	Laboratoire National de Metrologie et d'Essais - CCM V K3
Country	France

MEASUREMENT **STANDARD LIQUID A, 15 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	5/11/12	
Remarks on the liquid (package, seals)	/	
Date of test	december 2012	
Nominal measuring temperature	15	°C
Temperature measuring instrument (type)	Pt25 tinsley	
Time measuring device (type)	digital chronometer	
Type of viscometer	capillary ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	0.01-1		0.01-2	
Capillary length (nominal)	400.0000	mm	400.0000	mm
Flow volume (nominal)	5.2000	cm³	5.2000	cm³
Viscometer constant	0.012198	mm²/s²	0.012239	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	20.50	°C
Air pressure	1020.00	hPa
Relative humidity	46.50	%

participating lab (abbreviation), standard liquid	LNE	A, 15 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 15 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	457.750	15.009	456.030	15.011
First filling, efflux time 2, temperature 2	457.990	15.005	456.020	15.004
First filling, efflux time 3, temperature 3	457.940	15.009	455.690	15.006
First filling, efflux time 4, temperature 4	458.080	15.008	455.760	15.006
First filling, efflux time 5, temperature 5	457.880	15.006	455.800	15.005
Mean value	457.928	15.007	455.860	15.006
Second filling, efflux time 1, temperature 1	457.430	15.002	456.220	15.007
Second filling, efflux time 2, temperature 2	457.380	15.008	456.440	15.000
Second filling, efflux time 3, temperature 3	457.610	15.005	456.260	15.005
Second filling, efflux time 4, temperature 4	457.410	15.002	456.230	15.002
Second filling, efflux time 5, temperature 5	457.480	15.001	456.420	15.007
Mean value	457.462	15.004	456.314	15.004
Overall mean value	457.695	15.006	456.087	15.005

Mean value of viscosity of the two viscometers*	**5.583**	mm²/s
Mean value of the temperature	15.005	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	LNE	A , 15 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 15°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.028	1/K	0.000034	1/K	3.51E-05	50
Density of the sample	0.81243	g/cm³	0.00012	g/cm³		50
Surface tension of the sample	28.50	mN/m	0.19	mN/m		50
Time measuring device			0.05000	s	5.02E-02	100
Flow time measurements	456.89100	s	0.26820	s	5.87E-04	
Inclination of viscometers to vertical axis	0.00000	°	0.10000	°		
Sample temperature	15.00540	°C	0.00700	K	4.66E-04	50
Viscometer Number 1, Viscometer constant	0.01220	mm²/s²	0.000025	mm²/s²	2.05E-03	50
Individual surface tension correction factor c_S (1)	-0.00014		-0.000136		-2.97E-07	50
Kinetic energy correction t_{KE} (1)	0.00551	s	0.0005158	s	1.20E-05	50
Viscometer Number 2, Viscometer constant	0.01224	mm²/s²	0.000034	mm²/s²	2.78E-03	50
Individual surface tension correction factor c_S (2)	-0.00003		-0.00002700		-7.22E-10	50
Kinetic energy correction t_{KE} (2)	0.00553	s	0.00052	s	1.48E-07	50
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	$1{,}8 \cdot 10^{-3}$
Effective degrees of freedom, ν_{eff}	90.0000
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.0000
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	$3{,}7 \cdot 10^{-3}$

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 20 °C**

Name of participating laboratory	Laboratoire National de Metrologie et d'Essais - CCM V K3
Country	France

MEASUREMENT **STANDARD LIQUID A, 20 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	5/11/12	
Remarks on the liquid (package, seals)	/	
Date of test	december 2012	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	Pt25 tinsley	
Time measuring device (type)	digital chronometer	
Type of viscometer	capillary ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	0.01-1		0.01-2	
Capillary length (nominal)	400.0000	mm	400.0000	mm
Flow volume (nominal)	5.2000	cm³	5.2000	cm³
Viscometer constant	0.012198	mm²/s²	0.012239	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	18.00	°C
Air pressure	1020.00	hPa
Relative humidity	46.45	%

participating lab (abbreviation), standard liquid	LNE	A, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 20°C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	399.670	19.997	398.140	19.997
First filling, efflux time 2, temperature 2	400.300	19.997	398.350	19.997
First filling, efflux time 3, temperature 3	399.690	19.995	398.170	19.995
First filling, efflux time 4, temperature 4	399.850	19.995	399.300	19.995
First filling, efflux time 5, temperature 5	399.870	19.994	398.350	19.994
Mean value	399.876	19.996	398.462	19.996
Second filling, efflux time 1, temperature 1	399.150	20.008	398.190	20.006
Second filling, efflux time 2, temperature 2	399.430	20.009	398.200	20.009
Second filling, efflux time 3, temperature 3	399.220	20.008	398.210	20.009
Second filling, efflux time 4, temperature 4	399.310	20.007	398.210	20.004
Second filling, efflux time 5, temperature 5	399.290	20.006	398.370	20.007
Mean value	399.280	20.008	398.236	20.007
Overall mean value	399.578	20.002	398.349	20.001

Mean value of viscosity of the two viscometers*	**4.875**	mm²/s
Mean value of the temperature	20.001	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	LNE	A, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 20 °C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sampl	0.027	1/K	0.000032	1/K	3.88E-05	50
Density of the sample	0.80900	g/cm³	0.00012	g/cm³		50
Surface tension of the sample	28.07	mN/m	0.18	mN/m		50
Time measuring device			0.05000	s	5.02E-02	100
Flow time measurements	398.96350	s	0.35391	s	8.87E-04	
Inclination of viscometers to vertical axis	0.00000	°	0.10000	°		
Sample temperature	20.00145	°C	0.00700	K	3.50E-04	50
Viscometer Number 1, Viscometer constant	0.01220	mm²/s²	0.000025	mm²/s²	2.05E-03	50
Individual surface tension correction factor c_S (1)	-0.00002		0.000041		-5.14E-08	50
Kinetic energy correction t_{KE} (1)	0.00551	s	0.00003	s	1.38E-05	50
Viscometer Number 2, Viscometer constant	0.01224	mm²/s²	0.000034	mm²/s²	2.78E-03	50
Individual surface tension correction factor c_S (2)	-0.00002		0.00004083		-6.29E-10	50
Kinetic energy correction t_{KE} (2)	0.00553	s	0.00068	s	1.69E-07	50
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	$1{,}8 \cdot 10^{-3}$
Effective degrees of freedom, ν_{eff}	90.0000
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.0000
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	$3{,}7 \cdot 10^{-3}$

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 20 °C**

Name of participating laboratory	Laboratoire National de Metrologie et d'Essais - CCM V K3
Country	France

MEASUREMENT **STANDARD LIQUID B, 20 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	5/11/12	
Remarks on the liquid (package, seals)	/	
Date of test	december 2012	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	Pt25 tinsley	
Time measuring device (type)	digital chronometer	
Type of viscometer	capillary ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	5-1		5-2	
Capillary length (nominal)	390.0000	mm	390.0000	mm
Flow volume (nominal)	4.4000	cm³	4.4000	cm³
Viscometer constant	4.925	mm²/s²	5.15000000	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	19.00	°C
Air pressure	1018.00	hPa
Relative humidity	49.00	%

participating lab (abbreviation), standard liquid	LNE	B, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 20 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	400.2000	20.010	383.1200	20.007
First filling, efflux time 2, temperature 2	400.4000	20.007	383.0300	20.010
First filling, efflux time 3, temperature 3	400.4900	20.008	383.1800	20.009
First filling, efflux time 4, temperature 4	400.2400	20.008	383.1500	20.008
First filling, efflux time 5, temperature 5	400.7500	20.007	383.3200	20.008
Mean value	400.416	20.008	383.160	20.008
Second filling, efflux time 1, temperature 1	401.1800	20.004	384.0800	20.005
Second filling, efflux time 2, temperature 2	401.4200	20.005	384.2400	20.000
Second filling, efflux time 3, temperature 3	401.3400	20.006	384.1700	20.006
Second filling, efflux time 4, temperature 4	401.3000	20.002	383.7200	20.020
Second filling, efflux time 5, temperature 5	401.1700	20.004	383.7100	20.006
Mean value	401.282	20.004	383.984	20.007
Overall mean value	400.849	20.006	383.572	20.008

Mean value of viscosity of the two viscometers*	**1,975**	mm²/s
Mean value of the temperature	20.007	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	LNE	B, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 20°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.082	1/K	0.000074	1/K	2.91E-07	50
Density of the sample	0.88127	g/cm³	0.00013	g/cm³		50
Surface tension of the sample	32.83	mN/m	0.18	mN/m		50
Time measuring device			0.05000	s	5.02E-02	100
Flow time measurements	392.21050	s	0.47789	s	1.22E-03	
Inclination of viscometers to vertical axis	0.00000	°	0.10000	°		
Sample temperature	20.00700	°C	0.00700	K	3.50E-04	50
Viscometer Number 1, Viscometer constant	4.925	mm²/s²	0.027	mm²/s²	5.48E-03	50
Individual surface tension correction factor c_S (1)	-0.00014		0.000041		-3.39E-07	50
Kinetic energy correction t_{KE} (1)	0.00000041	s	0.00000004	s	1.02E-09	50
Viscometer Number 2, Viscometer constant	5.15	mm²/s²	0.043	mm²/s²	8.35E-03	50
Individual surface tension correction factor c_S (2)	-0.00003		0.00004060		-3.47E-07	50
Kinetic energy correction t_{KE} (2)	0.00000042	s	0.00000	s	5.36E-09	50
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	$5{,}0 \cdot 10^{-3}$
Effective degrees of freedom, ν_{eff}	90.0000
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.0000
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	$1{,}0 \cdot 10^{-2}$

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 40 °C**

Name of participating laboratory	Laboratoire National de Metrologie et d'Essais - CCM V K3
Country	France

MEASUREMENT **STANDARD LIQUID B, 40 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	5/11/12	
Remarks on the liquid (package, seals)	/	
Date of test	december 2012	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	Pt25 tinsley	
Time measuring device (type)	digital chronometer	
Type of viscometer	capillary ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	0.8-1		0.8-2	
Capillary length (nominal)	400	mm	400	mm
Flow volume (nominal)	5.1	cm³	5.2	cm³
Viscometer constant	0.8085	mm²/s²	0.8073	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	20.00	°C
Air pressure	1010.00	hPa
Relative humidity	49.00	%

participating lab (abbreviation), standard liquid	LNE	B, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 40 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	585.5400	39.998	586.4600	39.995
First filling, efflux time 2, temperature 2	585.9000	39.995	585.9300	39.996
First filling, efflux time 3, temperature 3	586.2000	39.996	585.7500	39.998
First filling, efflux time 4, temperature 4	585.7500	39.996	585.3600	39.996
First filling, efflux time 5, temperature 5	585.8000	39.997	585.8300	39.994
Mean value	585.838	39.996	585.866	39.996
Second filling, efflux time 1, temperature 1	586.3400	40.002	585.9200	39.994
Second filling, efflux time 2, temperature 2	586.2500	40.000	585.8400	40.002
Second filling, efflux time 3, temperature 3	586.0700	40.000	585.7700	39.997
Second filling, efflux time 4, temperature 4	586.3000	39.994	585.7800	39.997
Second filling, efflux time 5, temperature 5	586.1600	39.960	585.5700	39.998
Mean value	586.224	39.991	585.776	39.998
Overall mean value	586.031	39.994	585.821	39.997

Mean value of viscosity of the two viscometers*	**473.37**	mm²/s
Mean value of the temperature	39.995	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	LNE	B, 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.063	1/K	0.000037	1/K	9.32E-07	50
Density of the sample	0.86920	g/cm³	0.00018	g/cm³		50
Surface tension of the sample	31.04	mN/m	0.22	mN/m		50
Time measuring device			0.05000	s	5.02E-02	100
Flow time measurements	585.92600	s	0.27565	s	4.70E-04	
Inclination of viscometers to vertical axis	0.00000	°	0.10000	°		
Sample temperature	39.99525	°C	0.00700	K	1.75E-04	50
Viscometer Number 1, Viscometer constant	0.809	mm²/s²	0.0036	mm²/s²	4.45E-03	50
Individual surface tension correction factor c_S (1)	-0.00003		0.000035		-5.69E-08	50
Kinetic energy correction t_{KE} (1)	0.00000413	s	0.00000039	s	7.05E-09	50
Viscometer Number 2, Viscometer constant	0.81	mm²/s²	0.0063	mm²/s²	7.80E-03	50
Individual surface tension correction factor c_S (2)	-0.00003		0.00003476		-4.59E-08	50
Kinetic energy correction t_{KE} (2)	0.00000414	s	0.00000	s	5.70E-09	50
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	$4{,}5 \cdot 10^{-3}$
Effective degrees of freedom, ν_{eff}	90.0000
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.0000
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	$9{,}0 \cdot 10^{-3}$

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID C, 20°C**

Name of participating laboratory	Laboratoire National de Metrologie et d'Essais - CCM V K3
Country	France

MEASUREMENT **STANDARD LIQUID C, 20°C**

Name of standard liquid	C	
Date of arrival of the liquid at the laboratory	5/11/12	
Remarks on the liquid (package, seals)	/	
Date of test	december 2012	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	Pt25 tinsley	
Time measuring device (type)	digital chronometer	
Type of viscometer	capillary ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	100-1		100-2	
Capillary length (nominal)	390.0000	mm	390.0000	mm
Flow volume (nominal)	5.2000	cm³	5.2000	cm³
Viscometer constant	99.32	mm²/s²	101.70	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	18.00	°C
Air pressure	1002.00	hPa
Relative humidity	49.00	%
participating lab (abbreviation), standard liquid	LNE	C, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID C, 20°C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	1556.2000	20.009	1519.9800	20.008
First filling, efflux time 2, temperature 2	1552.4300	20.008	1518.8700	20.007
First filling, efflux time 3, temperature 3	1553.9000	20.008	1519.3600	20.010
First filling, efflux time 4, temperature 4	1552.2400	20.018	1519.2000	20.016
First filling, efflux time 5, temperature 5	1553.9100	20.012	1517.7800	20.011
Mean value	1553.736	20.011	1519.038	20.010
Second filling, efflux time 1, temperature 1	1551.5200	20.016	1518.8700	20.007
Second filling, efflux time 2, temperature 2	1553.1500	20.018	1517.8400	20.011
Second filling, efflux time 3, temperature 3	1550.7600	20.015	1517.9100	20.013
Second filling, efflux time 4, temperature 4	1552.1000	20.014	1518.4500	20.017
Second filling, efflux time 5, temperature 5	1549.8900	20.012	1518.2200	20.013
Mean value	1551.484	20.015	1518.258	20.012
Overall mean value	1552.610	20.013	1518.648	20.011

Mean value of viscosity of the two viscometers*	**154,326**	mm²/s
Mean value of the temperature	20.012	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	LNE	C, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID C, 20°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.101	1/K	0.00020	1/K	4.58E-09	50
Density of the sample	0.89632	g/cm³	0.00018	g/cm³		50
Surface tension of the sample	32.45	mN/m	0.48	mN/m		50
Time measuring device			0.05000	s	5.02E-02	100
Flow time measurements	1535.62900	s	1.26444	s	8.23E-04	
Inclination of viscometers to vertical axis	0.00000	°	0.00000	°		
Sample temperature	20.01215	°C	0.00700	K	3.50E-04	50
Viscometer Number 1, Viscometer constant	0.80850000	mm²/s²	0.0036	mm²/s²	4.45E-03	50
Individual surface tension correction factor c_S (1)	-0.00002052		0.000035		3.52E-05	50
Kinetic energy correction t_{KE} (1)	0.00000000	s	0.00000000	s	2.39E-11	50
Viscometer Number 2, Viscometer constant	0.81	mm²/s²	0.0063	mm²/s²	7.80E-03	50
Individual surface tension correction factor c_S (2)	-0.00002052		0.00003517		3.52E-05	50
Kinetic energy correction t_{KE} (2)	0.00000000	s	0.00000	s	2.41E-11	50
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	$4{,}6 \cdot 10^{-3}$
Effective degrees of freedom, ν_{eff}	90.0000
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.0000
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	$9{,}1 \cdot 10^{-3}$

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID C , 40 °C**

Name of participating laboratory	Laboratoire National de Metrologie et d'Essais - CCM V K3
Country	France

MEASUREMENT **STANDARD LIQUID C, 40 °C**

Name of standard liquid	C	
Date of arrival of the liquid at the laboratory	5/11/12	
Remarks on the liquid (package, seals)	/	
Date of test	december 2012	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	Pt25 tinsley	
Time measuring device (type)	digital chronometer	
Type of viscometer	capillary ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	100-1		100-2	
Capillary length (nominal)	390.0000	mm	390.0000	mm
Flow volume (nominal)	5.2000	cm³	5.2000	cm³
Viscometer constant	99.32	mm²/s²	101.70	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	19.00	°C
Air pressure	1009.00	hPa
Relative humidity	48.00	%
participating lab (abbreviation), standard liquid	LNE	C, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID C, 40°C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	252.2700	40.001	246.0700	40.007
First filling, efflux time 2, temperature 2	252.1000	40.004	246.6900	40.002
First filling, efflux time 3, temperature 3	252.5400	40.007	246.4100	40.001
First filling, efflux time 4, temperature 4	252.0900	40.009	246.3300	40.005
First filling, efflux time 5, temperature 5	252.1900	40.008	246.6800	40.003
Mean value	252.238	40.006	246.436	40.004
Second filling, efflux time 1, temperature 1	251.9700	40.000	247.0200	40.000
Second filling, efflux time 2, temperature 2	252.3100	39.995	246.7400	39.996
Second filling, efflux time 3, temperature 3	251.9400	39.995	246.6400	39.995
Second filling, efflux time 4, temperature 4	252.2900	39.994	246.8700	39.995
Second filling, efflux time 5, temperature 5	251.9900	39.997	246.9200	39.995
Mean value	252.100	39.996	246.838	39.996
Overall mean value	252.169	40.001	246.637	40.000

Mean value of viscosity of the two viscometers*	**25,064**	mm²/s
Mean value of the temperature	40.000	°C

*Please do not correct the result to target temperature

Notes or observations:		
participating lab (abbreviation), standard liquid	LNE	C, 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID C, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.083	1/K	0.00013	1/K	2.32E-08	50
Density of the sample	0.88514	g/cm³	0.00019	g/cm³		50
Surface tension of the sample	31.40	mN/m	0.36	mN/m		50
Time measuring device			0.05000	s	5.02E-02	100
Flow time measurements	249.40300	s	0.23961	s	9.61E-04	
Inclination of viscometers to vertical axis	0.00000	°	0.00000	°		
Sample temperature	40.00045	°C	0.00700	K	1.75E-04	50
Viscometer Number 1, Viscometer constant	0.80850000	mm²/s²	0.0036	mm²/s²	4.45E-03	50
Individual surface tension correction factor c_S (1)	-0.00002052		0.000035		3.52E-05	50
Kinetic energy correction t_{KE} (1)	0.00000000	s	0.00000000	s	2.39E-11	50
Viscometer Number 2, Viscometer constant	0.81	mm²/s²	0.0063	mm²/s²	7.80E-03	50
Individual surface tension correction factor c_S (2)	-0.00002052		0.00003517		3.52E-05	50
Kinetic energy correction t_{KE} (2)	0.00000000	s	0.00000	s	2.41E-11	50
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	$4{,}5 \cdot 10^{-3}$
Effective degrees of freedom, ν_{eff}	90.0000
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.0000
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	$9{,}1 \cdot 10^{-3}$

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 20 °C**

Name of participating laboratory	National Institute of Metrology
Country	China

MEASUREMENT **STANDARD LIQUID A, 20 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	Nov. 7th 2012	
Remarks on the liquid (package, seals)	o.k.	
Date of test	Nov. 13th and 20th 2012	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	Pt-res. Therm.	
Time measuring device (type)	Electronic timer, quarz	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	1007		1015	
Capillary length (nominal)	300	mm	300	mm
Flow volume (nominal)	6.2	cm³	6.2	cm³
Viscometer constant	0.0057180	mm²/s²	0.0054310	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	21	°C
Air pressure	1021	hPa
Relative humidity	16	%

participating lab (abbreviation), standard liquid	NIM	A, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 20°C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	852.322	20.000	897.500	20.000
First filling, efflux time 2, temperature 2	852.057	20.000	897.623	20.000
First filling, efflux time 3, temperature 3	852.188	20.000	897.660	20.000
First filling, efflux time 4, temperature 4	852.249	20.000	897.720	20.000
First filling, efflux time 5, temperature 5	852.247	20.000	897.511	20.000
Mean value	852.213	20.000	897.603	20.000
Second filling, efflux time 1, temperature 1	852.075	20.000	897.295	20.000
Second filling, efflux time 2, temperature 2	851.891	20.000	897.398	20.000
Second filling, efflux time 3, temperature 3	851.875	20.000	897.618	20.000
Second filling, efflux time 4, temperature 4	851.995	20.000	897.651	20.000
Second filling, efflux time 5, temperature 5	852.060	20.000	897.346	20.000
Mean value	851.979	20.000	897.462	20.000
Overall mean value	852.096	20.000	897.532	20.000

Mean value of viscosity of the two viscometers*	4.8734	mm²/s
Mean value of the temperature	20.000	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	NIM	A, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 20 °C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.027	1/K	0.000032	1/K	Can be neglected	50
Density of the sample	0.80900	g/cm³	0.00012	g/cm³	Can be neglected	50
Surface tension of the sample	28.07	mN/m	0.18	mN/m	Can be neglected	50
Time measuring device			0.00005	s	0.000029	infinity
Flow time measurements	897.462	s	0.162	s	0.00018	16
Inclination of viscometers to vertical axis	0.17	°	0.10	°	0.000012	infinity
Sample temperature	20.000	°C	0.0029	K	0.000016	infinity
Viscometer Number 1, Viscometer constant	0.0057180	mm²/s²	0.0000030	mm²/s²	0.00035	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	0.0054310	mm²/s²	0.0000028	mm²/s²	0.00035	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.00053
Effective degrees of freedom, ν_{eff}	116.60
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	1.984
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0011

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 20 °C**

Name of participating laboratory	National Institute of Metrology
Country	China

MEASUREMENT **STANDARD LIQUID B, 20 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	Nov. 7th 2012	
Remarks on the liquid (package, seals)	o.k.	
Date of test	Nov. 20th and 30th 2012	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	Pt-res. Therm.	
Time measuring device (type)	Electronic timer, quarz	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	5-1		5-3	
Capillary length (nominal)	300	mm	300	mm
Flow volume (nominal)	6.2	cm³	6.2	cm³
Viscometer constant	2.5056	mm²/s²	2.4607	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	21	°C
Air pressure	1016	hPa
Relative humidity	8	%

participating lab (abbreviation), standard liquid	NIM	B, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 20 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	787.417	20.000	802.701	20.000
First filling, efflux time 2, temperature 2	787.626	20.000	802.331	20.000
First filling, efflux time 3, temperature 3	787.772	20.000	802.688	20.000
First filling, efflux time 4, temperature 4	787.456	20.000	802.364	20.000
First filling, efflux time 5, temperature 5	787.160	20.000	802.204	20.000
Mean value	787.486	20.000	802.458	20.000
Second filling, efflux time 1, temperature 1	787.235	20.000	802.603	20.000
Second filling, efflux time 2, temperature 2	787.342	20.000	802.172	20.000
Second filling, efflux time 3, temperature 3	787.601	20.000	802.574	20.000
Second filling, efflux time 4, temperature 4	787.264	20.000	802.107	20.000
Second filling, efflux time 5, temperature 5	787.075	20.000	802.063	20.000
Mean value	787.303	20.000	802.304	20.000
Overall mean value	787.395	20.000	802.381	20.000

Mean value of viscosity of the two viscometers*	1973.7	mm²/s
Mean value of the temperature	20.000	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	NIM	B, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 20°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.082	1/K	0.000074	1/K	Can be neglected	50
Density of the sample	0.88127	g/cm³	0.00013	g/cm³	Can be neglected	50
Surface tension of the sample	32.83	mN/m	0.18	mN/m	Can be neglected	50
Time measuring device			0.00005	s	0.000029	infinity
Flow time measurements	802.304	s	0.263	s	0.00033	16
Inclination of viscometers to vertical axis	0.17	°	0.10	°	0.000012	infinity
Sample temperature	20.000	°C	0.0029	K	0.00000012	infinity
Viscometer Number 1, Viscometer constant	2.5056	mm²/s²	0.0017	mm²/s²	0.00066	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	2.4607	mm²/s²	0.0016	mm²/s²	0.00066	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.00099
Effective degrees of freedom, ν_{eff}	115.53
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	1.984
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0020

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 40 °C**

Name of participating laboratory	National Institute of Metrology
Country	China

MEASUREMENT **STANDARD LIQUID B, 40 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	Nov. 7th 2012	
Remarks on the liquid (package, seals)	o.k.	
Date of test	Nov. 27th 2012	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	Pt-res. Therm.	
Time measuring device (type)	Electronic timer, quarz	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	3010		3011	
Capillary length (nominal)	300	mm	300	mm
Flow volume (nominal)	6.2	cm³	6.2	cm³
Viscometer constant	0.44644	mm²/s²	0.48775	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	21	°C
Air pressure	1015	hPa
Relative humidity	10	%

participating lab (abbreviation), standard liquid	NIM	B, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 40 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	1060.660	40.000	970.647	40.000
First filling, efflux time 2, temperature 2	1060.737	40.000	970.669	40.000
First filling, efflux time 3, temperature 3	1060.376	40.000	970.647	40.000
First filling, efflux time 4, temperature 4	1060.512	40.000	970.448	40.000
First filling, efflux time 5, temperature 5	1060.577	40.000	970.309	40.000
Mean value	1060.572	40.000	970.544	40.000
Second filling, efflux time 1, temperature 1	1060.451	40.000	970.319	40.000
Second filling, efflux time 2, temperature 2	1060.405	40.000	970.572	40.000
Second filling, efflux time 3, temperature 3	1060.344	40.000	970.387	40.000
Second filling, efflux time 4, temperature 4	1060.248	40.000	970.270	40.000
Second filling, efflux time 5, temperature 5	1060.346	40.000	970.208	40.000
Mean value	1060.359	40.000	970.351	40.000
Overall mean value	1060.466	40.000	970.448	40.000

Mean value of viscosity of the two viscometers*	473.38	mm²/s
Mean value of the temperature	40.000	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	NIM	B, 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.063	1/K	0.000037	1/K	Can be neglected	50
Density of the sample	0.86920	g/cm³	0.00018	g/cm³	Can be neglected	50
Surface tension of the sample	31.04	mN/m	0.22	mN/m	Can be neglected	50
Time measuring device			0.00005	s	0.000029	infinity
Flow time measurements	970.544	s	0.159	s	0.00016	16
Inclination of viscometers to vertical axis	0.17	°	0.10	°	0.000012	infinity
Sample temperature	40.000	°C	0.0029	K	0.00000038	infinity
Viscometer Number 1, Viscometer constant	0.44644	mm²/s²	0.00035	mm²/s²	0.00057	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	0.48775	mm²/s²	0.00038	mm²/s²	0.00057	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.00082
Effective degrees of freedom, ν_{eff}	107.31
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	1.984
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0016

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID C , 40 °C**

Name of participating laboratory	National Institute of Metrology
Country	China

MEASUREMENT **STANDARD LIQUID C, 40 °C**

Name of standard liquid	C	
Date of arrival of the liquid at the laboratory	Nov. 7th 2012	
Remarks on the liquid (package, seals)	o.k.	
Date of test	Nov. 23th and 28th 2012	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	Pt-res. Therm.	
Time measuring device (type)	Electronic timer, quarz	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	7-1		7-2	
Capillary length (nominal)	90	mm	90	mm
Flow volume (nominal)	6.2	cm³	6.2	cm³
Viscometer constant	37.482	mm²/s²	37.898	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	21	°C
Air pressure	1018	hPa
Relative humidity	16	%
participating lab (abbreviation), standard liquid	NIM	C, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID C, 40°C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	667.157	40.000	659.321	40.000
First filling, efflux time 2, temperature 2	667.520	40.000	659.606	40.000
First filling, efflux time 3, temperature 3	667.533	40.000	659.916	40.000
First filling, efflux time 4, temperature 4	667.105	40.000	659.354	40.000
First filling, efflux time 5, temperature 5	667.289	40.000	659.420	40.000
Mean value	667.321	40.000	659.523	40.000
Second filling, efflux time 1, temperature 1	666.993	40.000	659.267	40.000
Second filling, efflux time 2, temperature 2	667.239	40.000	659.492	40.000
Second filling, efflux time 3, temperature 3	667.424	40.000	659.791	40.000
Second filling, efflux time 4, temperature 4	666.882	40.000	659.174	40.000
Second filling, efflux time 5, temperature 5	667.063	40.000	659.196	40.000
Mean value	667.120	40.000	659.384	40.000
Overall mean value	667.221	40.000	659.454	40.000

Mean value of viscosity of the two viscometers*	25000	mm²/s
Mean value of the temperature	40.000	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	NIM	C, 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID C, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.083	1/K	0.00013	1/K	Can be neglected	50
Density of the sample	0.88514	g/cm³	0.00019	g/cm³	Can be neglected	50
Surface tension of the sample	31.40	mN/m	0.36	mN/m	Can be neglected	50
Time measuring device			0.00005	s	0.000029	infinity
Flow time measurements	659.384	s	0.260	s	0.00039	16
Inclination of viscometers to vertical axis	0.17	°	0.10	°	0.000012	infinity
Sample temperature	40.000	°C	0.0029	K	0.0000000096	infinity
Viscometer Number 1, Viscometer constant	37.482	mm²/s²	0.041	mm²/s²	0.0011	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	37.898	mm²/s²	0.042	mm²/s²	0.0011	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.0016
Effective degrees of freedom, ν_{eff}	110.33
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	1.984
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0032

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 15 °C**

Name of participating laboratory	National Metrology Institute of Japan (NMIJ)
Country	Japan

MEASUREMENT **STANDARD LIQUID A, 15 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory		
Remarks on the liquid (package, seals)	O.K.	
Date of test	Nov. 27th and Dec. 8th 201	
Nominal measuring temperature	15	°C
Temperature measuring instrument (type)	Pt-res. Therm., ASL F 700	
Time measuring device (type)	Auto efflux time measurement system with photoelectronic device	
Type of viscometer	U tube	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	No. 2-1 HL		No. 2-31 HL	
Capillary length (nominal)	400	mm	400	mm
Flow volume (nominal)	3.09	cm³	2.99	cm³
Viscometer constant	0.0035039	mm²/s²	0.0034427	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	21.2	°C
Air pressure	999.3	hPa
Relative humidity	54.2	%

participating lab (abbreviation), standard liquid	NMIJ	A, 15 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 15 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	1593.56	15.000	1621.98	15.000
First filling, efflux time 2, temperature 2	1593.55	15.000	1621.99	15.000
First filling, efflux time 3, temperature 3	1593.57	14.999	1622.00	14.999
First filling, efflux time 4, temperature 4	1593.57	14.999	1622.00	14.999
First filling, efflux time 5, temperature 5	1593.56	14.999	1621.99	14.999
Mean value	1593.56	14.999	1621.99	14.999
Second filling, efflux time 1, temperature 1	1593.58	15.000	1621.79	15.000
Second filling, efflux time 2, temperature 2	1593.55	15.000	1621.76	15.000
Second filling, efflux time 3, temperature 3	1593.55	14.999	1621.78	15.000
Second filling, efflux time 4, temperature 4	1593.63	14.999	1621.79	14.999
Second filling, efflux time 5, temperature 5	1593.58	14.999	1621.80	14.999
Mean value	1593.58	15.000	1621.79	15.000
Overall mean value	1593.57	14.999	1621.89	14.999

Mean value of viscosity of the two viscometers*	5.5837	mm²/s
Mean value of the temperature	14.999	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	NMIJ	A , 15 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 15°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.028	1/K	0.000034	1/K	0.0001%	50
Density of the sample	0.81243	g/cm³	0.00012	g/cm³	included in uncertainties of corrections	50
Surface tension of the sample	28.50	mN/m	0.19	mN/m	can be neglecte	50
Time measuring device			less than 0.01	s	can be neglected	
Flow time measurements (Viscometer1)	1593.57	s	0.021	s	0.0009%	9
Flow time measurements (Viscometer2)	1621.89	s	0.109	s	0.0048%	9
Inclination of viscometers to vertical axis	0.000	°	0.017	°	can be neglected	
Sample temperature	14.999	°C	0.003	K	0.0084%	1E+06
Viscometer Number 1, Viscometer constant	0.0035039	mm²/s²	0.00000068	mm²/s²	0.014%	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	0.0034427	mm²/s²	0.00000067	mm²/s²	0.014%	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
correction for thermal expansion of liquid sample	-0.000043				0.0013%	50
correction of buoyancy in viscometer column	0.000042				0.00022%	50
correction for thermal expansion of viscometer glass	can be neglected				can be neglecte	50

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.022%
Effective degrees of freedom, ν_{eff}	150.60
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	1.9759
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.043%

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 20 °C**

Name of participating laboratory	National Metrology Institute of Japan (NMIJ)
Country	Japan

Yellow cells: please input data

Blue cells: please don't change

MEASUREMENT **STANDARD LIQUID A, 20 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory		
Remarks on the liquid (package, seals)	O.K.	
Date of test	Nov. 27th and Dec. 8th 201	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	Pt-res. Therm., ASL F 700	
Time measuring device (type)	Auto efflux time measurement system with photoelectronic device	
Type of viscometer	U tube	

	Viscometer 1		Viscometer 2	
Identification number	No. 2-1 HL		No. 2-31 HL	
Capillary length (nominal)	400	mm	400	mm
Flow volume (nominal)	3.09	cm³	2.99	cm³
Viscometer constant	0.0035039	mm²/s²	0.0034427	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	21.1	°C
Air pressure	1006.1	hPa
Relative humidity	51.1	%

participating lab (abbreviation), standard liquid	NMIJ	A, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 20°C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	1390.86	20.001	1415.58	20.001
First filling, efflux time 2, temperature 2	1390.87	20.001	1415.61	20.001
First filling, efflux time 3, temperature 3	1390.88	20.001	1415.63	20.001
First filling, efflux time 4, temperature 4	1390.92	20.001	1415.64	20.001
First filling, efflux time 5, temperature 5	1390.88	20.002	1415.61	20.002
Mean value	1390.88	20.001	1415.61	20.001
Second filling, efflux time 1, temperature 1	1391.00	20.000	1415.55	20.000
Second filling, efflux time 2, temperature 2	1390.95	20.000	1415.55	20.000
Second filling, efflux time 3, temperature 3	1390.92	20.001	1415.53	20.001
Second filling, efflux time 4, temperature 4	1390.95	20.000	1415.55	20.000
Second filling, efflux time 5, temperature 5	1390.92	20.001	1415.53	20.001
Mean value	1390.95	20.001	1415.54	20.001
Overall mean value	1390.92	20.001	1415.58	20.001

Mean value of viscosity of the two viscometers*	4.8735	mm²/s
Mean value of the temperature	20.001	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	NMIJ	A, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 20 °C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.027	1/K	0.000032	1/K	0.0001%	50
Density of the sample	0.80900	g/cm³	0.00012	g/cm³	included in uncertainties of corrections	50
Surface tension of the sample	28.07	mN/m	0.18	mN/m	can be neglec	50
Time measuring device			less than 0.01	s	can be neglected	
Flow time measurements (Viscometer1)	1390.92	s	0.042	s	0.0021%	9
Flow time measurements (Viscometer2)	1415.58	s	0.042	s	0.0021%	9
Inclination of viscometers to vertical axis	0.000	°	0.017	°	can be neglected	
Sample temperature	20.001	°C	0.003	K	0.0081%	1000000
Viscometer Number 1, Viscometer constant	0.0035039	mm²/s²	0.00000068	mm²/s²	0.014%	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	0.0034427	mm²/s²	0.00000067	mm²/s²	0.014%	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
correction for thermal expansion of liquid sample	-0.000043				0.0013%	50
correction of buoyancy in viscometer column	0.000043				0.00022%	50
correction for thermal expansion of viscometer glass	can be neglected				can be neglec	50

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.021%
Effective degrees of freedom, ν_{eff}	143.56
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	1.977
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.042%

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 20 °C**

Name of participating laboratory	National Metrology Institute of Japan (NMIJ)
Country	Japan

Yellow cells: please input data

Blue cells: please don't change

MEASUREMENT **STANDARD LIQUID B, 20 °C**

Name of standard liquid	B			
Date of arrival of the liquid at the laboratory				
Remarks on the liquid (package, seals)	O.K.			
Date of test	Nov. 27th and Dec. 8th 2012			
Nominal measuring temperature	20	°C		
Temperature measuring instrument (type)	Pt-res. Therm., ASL F 700			
Time measuring device (type)	Auto efflux time measurement system with photoelectronic device			
Type of viscometer	U tube			
	Viscometer 1		Viscometer 2	
Identification number	No. 6-1		No. 6-31	
Capillary length (nominal)	400	mm	400	mm
Flow volume (nominal)	4.96	cm³	4.89	cm³
Viscometer constant	2.4579	mm²/s²	2.6846	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	21.7	°C
Air pressure	996.0	hPa
Relative humidity	25.7	%

participating lab (abbreviation), standard liquid	NMIJ	B, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 20 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	801.810	20.000	734.176	20.000
First filling, efflux time 2, temperature 2	801.829	20.000	734.196	20.000
First filling, efflux time 3, temperature 3	801.860	20.000	734.237	20.000
First filling, efflux time 4, temperature 4	801.886	20.000	734.262	20.000
First filling, efflux time 5, temperature 5	801.905	20.000	734.280	20.000
Mean value	801.858	20.000	734.230	20.000
Second filling, efflux time 1, temperature 1	801.831	20.000	734.264	20.000
Second filling, efflux time 2, temperature 2	801.838	20.000	734.309	20.000
Second filling, efflux time 3, temperature 3	801.863	20.000	734.325	20.000
Second filling, efflux time 4, temperature 4	801.869	20.000	734.353	20.000
Second filling, efflux time 5, temperature 5	801.867	20.000	734.360	20.000
Mean value	801.854	20.000	734.322	20.000
Overall mean value	801.856	20.000	734.276	20.000

Mean value of viscosity of the two viscometers*	1971.1	mm²/s
Mean value of the temperature	20.000	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	NMIJ	B, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 20°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.082	1/K	0.000074	1/K	0.0001%	50
Density of the sample	0.88127	g/cm³	0.00013	g/cm³	included in uncertainties of corrections	50
Surface tension of the sample	32.83	mN/m	0.18	mN/m	can be neglec	50
Time measuring device			less than 0.00	s	can be neglected	
Flow time measurements (Viscometer1)	801.856	s	0.026	s	0.0023%	9
Flow time measurements (Viscometer2)	734.276	s	0.060	s	0.0057%	9
Inclination of viscometers to vertical axis	0.000	°	0.017	°	can be neglected	
Sample temperature	20.000	°C	0.003	K	0.025%	1000000
Viscometer Number 1, Viscometer constant	2.4579	mm²/s²	0.00098	mm²/s²	0.028%	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	2.6846	mm²/s²	0.00105	mm²/s²	0.028%	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
correction for thermal expansion of the sample					0.0020%	50
buoyancy correction					0.00020%	50
correction for thermal expansion of the glass of visco	can be neglected				can be neglec	50

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.047%
Effective degrees of freedom, ν_{eff}	199.03
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	1.9720
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.093%

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 40 °C**

Name of participating laboratory	National Metrology Institute of Japan (NMIJ)
Country	Japan

MEASUREMENT **STANDARD LIQUID B, 40 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory		
Remarks on the liquid (package, seals)	O.K.	
Date of test	Nov. 27th and Dec. 7th 2012	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	Pt-res. Therm., ASL F 700	
Time measuring device (type)	Auto efflux time measurement system with photoelectronic device	
Type of viscometer	U tube	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	No. 5-1		No. 5-31	
Capillary length (nominal)	400	mm	400	mm
Flow volume (nominal)	2.97	cm³	3.04	cm³
Viscometer constant	0.48896	mm²/s²	0.49690	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	21.5	°C
Air pressure	1011.4	hPa
Relative humidity	30.3	%

participating lab (abbreviation), standard liquid	NMIJ	B, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 40 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	966.343	40.001	950.719	40.001
First filling, efflux time 2, temperature 2	966.323	40.001	950.695	40.001
First filling, efflux time 3, temperature 3	966.312	40.002	950.695	40.002
First filling, efflux time 4, temperature 4	966.316	40.002	950.704	40.002
First filling, efflux time 5, temperature 5	966.305	40.002	950.714	40.002
Mean value	966.320	40.002	950.706	40.002
Second filling, efflux time 1, temperature 1	966.624	40.001	951.140	40.002
Second filling, efflux time 2, temperature 2	966.621	40.001	951.143	40.002
Second filling, efflux time 3, temperature 3	966.619	40.001	951.134	40.002
Second filling, efflux time 4, temperature 4	966.611	40.002	951.121	40.002
Second filling, efflux time 5, temperature 5	966.613	40.002	951.129	40.002
Mean value	966.618	40.002	951.134	40.002
Overall mean value	966.469	40.002	950.920	40.002

Mean value of viscosity of the two viscometers*	472.54	mm²/s
Mean value of the temperature	40.002	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	NMIJ	B, 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.063	1/K	0.000037	1/K	0.0001%	50
Density of the sample	0.86920	g/cm³	0.00018	g/cm³	included in uncertainties of correction factors	50
Surface tension of the sample	31.04	mN/m	0.22	mN/m	can be neglected	50
Time measuring device			less than 0.0001	s	can be neglected	
Flow time measurements (Viscometer1)	966.469	s	0.157	s	0.012%	9
Flow time measurements (Viscometer2)	950.920	s	0.226	s	0.017%	9
Inclination of viscometers to vertical axis	0	°	0.017	°	can be neglected	
Sample temperature	40.002	°C	0.003	K	0.0189%	1000000
Viscometer Number 1, Viscometer constant	0.48896	mm²/s²	0.00017	mm²/s²	0.025%	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	0.49690	mm²/s²	0.00017	mm²/s²	0.025%	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
correction for thermal expansion of liquid sample	0.00048				0.0018%	50
correction of buoyancy in viscometer column	0.000068				0.0002%	50
correction for thermal expansion of viscometer glass	0.000064				0.0010%	50

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.045%
Effective degrees of freedom, ν_{eff}	155.14
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	1.9754
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.089%

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID C, 20°C**

Name of participating laboratory	National Metrology Institute of Japan (NMIJ)
Country	Japan

MEASUREMENT **STANDARD LIQUID C, 20°C**

Name of standard liquid	C	
Date of arrival of the liquid at the laboratory		
Remarks on the liquid (package, seals)	O.K.	
Date of test	Nov. 24th and Dec. 10th 2012	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	Pt-res. Therm., ASL F 700	
Time measuring device (type)	Auto efflux time measurement system with photoelectronic device	
Type of viscometer	U tube	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	No. 9-1		No. 9-31	
Capillary length (nominal)	400	mm	400	mm
Flow volume (nominal)	9.99	cm³	9.84	cm³
Viscometer constant	139.799	mm²/s²	151.222	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit	
Air temperature	21.8	°C	
Air pressure	1003.8	hPa	
Relative humidity	56.0	%	
participating lab (abbreviation), standard liquid	NMIJ		C, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID C, 20°C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	1107.816	20.000	1023.361	20.000
First filling, efflux time 2, temperature 2	1107.666	20.000	1023.182	20.000
First filling, efflux time 3, temperature 3	1107.701	20.000	1022.651	20.000
First filling, efflux time 4, temperature 4	1107.653	20.000	1022.949	20.000
First filling, efflux time 5, temperature 5	1107.523	20.000	1022.999	20.000
Mean value	1107.672	20.000	1023.029	20.000
Second filling, efflux time 1, temperature 1	1108.142	20.000	1022.492	20.000
Second filling, efflux time 2, temperature 2	1108.043	20.000	1022.766	20.000
Second filling, efflux time 3, temperature 3	1108.186	20.000	1023.769	20.000
Second filling, efflux time 4, temperature 4	1108.416	20.000	1022.318	20.000
Second filling, efflux time 5, temperature 5	1108.370	20.000	1023.222	20.000
Mean value	1108.231	20.000	1022.913	20.000
Overall mean value	1107.952	20.000	1022.971	20.000

Mean value of viscosity of the two viscometers*	154793	mm²/s
Mean value of the temperature	20.000	°C

*Please do not correct the result to target temperature

Notes or observations:		
participating lab (abbreviation), standard liquid	NMIJ	C, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID C, 20°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.101	1/K	0.00020	1/K	0.0001%	50
Density of the sample	0.89632	g/cm³	0.00018	g/cm³	included in uncertainties of corrections	50
Surface tension of the sample	32.45	mN/m	0.48	mN/m	can be neglected	50
Time measuring device				s	can be neglected	
Flow time measurements (Viscometer1)	1107.952	s	0.321	s	0.020%	9
Flow time measurements (Viscometer2)	1022.971	s	0.435	s	0.030%	9
Inclination of viscometers to vertical axis	0.000	°	0.017	°	can be neglected	
Sample temperature	20.000	°C	0.003	K	0.030%	1000000
Viscometer Number 1, Viscometer constant	139.799	mm²/s²	0.101	mm²/s²	0.051%	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	151.222	mm²/s²	0.116	mm²/s²	0.054%	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
correction for thermal expansion of liquid sample					0.0028%	50
correction of buoyancy in viscometer column					0.0002%	50
correction for thermal expansion of viscometer glass	can be neglected				can be neglected	50

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.088%
Effective degrees of freedom, ν_{eff}	144.30
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	1.9766
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.17%

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID C , 40 °C**

Name of participating laboratory	National Metrology Institute of Japan (NMIJ)
Country	Japan

MEASUREMENT **STANDARD LIQUID C, 40 °C**

Name of standard liquid	C	
Date of arrival of the liquid at the laboratory		
Remarks on the liquid (package, seals)	O.K.	
Date of test	Nov. 24th and Dec. 10th 2012	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	Pt-res. Therm., ASL F 700	
Time measuring device (type)	Auto efflux time measurement system with photoelectronic device	
Type of viscometer	U tube	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	No. 8-1 HL		No. 8-31 HL	
Capillary length (nominal)	400	mm	400	mm
Flow volume (nominal)	9.82	cm³	9.59	cm³
Viscometer constant	32.695	mm²/s²	33.573	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	23.4	°C
Air pressure	1009.8	hPa
Relative humidity	49.3	%

participating lab (abbreviation), standard liquid	NMIJ	C, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID C, 40°C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	766.942	40.000	746.405	40.000
First filling, efflux time 2, temperature 2	766.839	40.001	746.369	40.001
First filling, efflux time 3, temperature 3	766.888	40.000	746.352	40.000
First filling, efflux time 4, temperature 4	767.078	40.000	746.479	40.000
First filling, efflux time 5, temperature 5	767.054	40.001	746.428	40.001
Mean value	766.960	40.000	746.407	40.000
Second filling, efflux time 1, temperature 1	766.974	40.001	746.550	40.001
Second filling, efflux time 2, temperature 2	767.021	40.000	746.610	40.000
Second filling, efflux time 3, temperature 3	766.966	40.000	746.564	40.000
Second filling, efflux time 4, temperature 4	766.888	40.001	746.505	40.001
Second filling, efflux time 5, temperature 5	766.958	40.000	746.557	40.000
Mean value	766.962	40.000	746.557	40.000
Overall mean value	766.961	40.000	746.482	40.000

Mean value of viscosity of the two viscometers*	25069	mm²/s
Mean value of the temperature	40.000	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	NMIJ	C, 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID C, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.083	1/K	0.00013	1/K	0.0001%	50
Density of the sample	0.88514	g/cm³	0.00019	g/cm³	included in uncertainties of corrections	50
Surface tension of the sample	31.40	mN/m	0.36	mN/m	can be neglected	50
Time measuring device			less than 0.001	s	can be neglected	
Flow time measurements (Viscometer1)	766.961	s	0.07597	s	0.007%	9
Flow time measurements (Viscometer2)	746.482	s	0.08964	s	0.008%	9
Inclination of viscometers to vertical axis	0.000	°	0.017	°	can be neglected	
Sample temperature	40.000	°C	0.003	K	0.025%	1000000
Viscometer Number 1, Viscometer constant	32.695	mm²/s²	0.019	mm²/s²	0.040%	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	33.573	mm²/s²	0.020	mm²/s²	0.043%	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
correction for thermal expansion of liquid sample	0.00070				0.0027%	50
correction of buoyancy in viscometer column	0.000050				0.00019%	50
correction for thermal expansion of viscometer glass	0.000032				0.00050%	50

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.065%
Effective degrees of freedom, ν_{eff}	144.97
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	1.9766
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.13%

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 15 °C**

Name of participating laboratory	Physikalisch-Technische Bundesanstalt
Country	Germany

MEASUREMENT **STANDARD LIQUID A, 15 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	2012/11/20	
Remarks on the liquid (package, seals)	ok	
Date of test	22.11.2012 + 06.12.2012	
Nominal measuring temperature	15	°C
Temperature measuring instrument (type)	MKT50, 2 PRT	
Time measuring device (type)	Electronic timer, quarz	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	I/421		I/422	
Capillary length (nominal)		mm		mm
Flow volume (nominal)	5.7	cm³	5.7	cm³
Viscometer constant	0.0107135	mm²/s²	0.010578	mm²/s²
Correction factor due to acceleration of free fall	1.0000		1.0000	

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	21.30	°C
Air pressure	1001.70	hPa
Relative humidity	34.50	%

participating lab (abbreviation), standard liquid	PTB	A, 15 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 15 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	521.460	15.000	528.230	15.000
First filling, efflux time 2, temperature 2	521.270	15.000	527.930	15.000
First filling, efflux time 3, temperature 3	521.320	15.000	528.150	15.000
First filling, efflux time 4, temperature 4	521.310	15.000	528.150	15.000
First filling, efflux time 5, temperature 5	521.400	15.000	528.120	15.000
Mean value	521.352	15.000	528.116	15.000
Second filling, efflux time 1, temperature 1	521.310	15.000	528.060	15.000
Second filling, efflux time 2, temperature 2	521.290	15.000	528.170	15.000
Second filling, efflux time 3, temperature 3	521.260	15.000	528.090	15.000
Second filling, efflux time 4, temperature 4	521.290	15.000	528.160	15.000
Second filling, efflux time 5, temperature 5	521.200	15.000	528.020	15.000
Mean value	521.270	15.000	528.100	15.000
Overall mean value	521.311	15.000	528.108	15.000

Mean value of viscosity of the two viscometers*	5.5854	mm²/s
Mean value of the temperature	15.000	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid		A , 15 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	to be specified	1/K		1/K		50
Density of the sample	to be specified	g/cm³		g/cm³		50
Surface tension of the sample	to be specified	mN/m		mN/m		50
Time measuring device			0.00835	s	1.6E-05	1E+06
Flow time measurements	524.7	s	0.00850	s	6.3E-05	16
Inclination of viscometers to vertical axis	0	°	0.57700	°	8.8E-05	1E+06
Sample temperature	15.000	°C	0.00277	K	7.8E-05	33
Viscometer Number 1, Viscometer constant	0.0107135	mm²/s²	0.0000035	mm²/s²	1.6E-04	100
Individual surface tension correction factor c_S (1)	1		0.00004		1.7E-05	1E+06
Kinetic energy correction t_{KE} (1)	0.066	s	0.00290	s	2.8E-06	1E+06
Viscometer Number 2, Viscometer constant	0.0105781	mm²/s²	0.0000035	mm²/s²	1.6E-04	100
Individual surface tension correction factor c_S (2)	1		0.00004		1.7E-05	1E+06
Kinetic energy correction t_{KE} (2)	0.059	s	0.00290	s	2.8E-06	1E+06
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.00027
Effective degrees of freedom, ν_{eff}	340
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.00
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.00054

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 20 °C**

Name of participating laboratory	Physikalisch-Technische Bundesanstalt
Country	Germany

MEASUREMENT **STANDARD LIQUID A, 20 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	2012/11/20	
Remarks on the liquid (package, seals)	ok	
Date of test	22.11.2012 + 06.12.2012	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	MKT50, 2 PRT	
Time measuring device (type)	Electronic timer, quarz	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	I/421		I/422	
Capillary length (nominal)		mm		mm
Flow volume (nominal)	5.7	cm³	5.7	cm³
Viscometer constant	0.0107135	mm²/s²	0.010578	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	21.30	°C
Air pressure	1001.70	hPa
Relative humidity	34.50	%

participating lab (abbreviation), standard liquid	PTB	A, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 20°C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	455.060	20.000	460.900	20.000
First filling, efflux time 2, temperature 2	455.030	20.000	460.920	20.000
First filling, efflux time 3, temperature 3	455.020	20.000	460.960	20.000
First filling, efflux time 4, temperature 4	455.000	20.000	460.890	20.000
First filling, efflux time 5, temperature 5	455.010	20.000	460.930	20.000
Mean value	455.024	20.000	460.920	20.000
Second filling, efflux time 1, temperature 1	455.010	20.000	461.010	20.000
Second filling, efflux time 2, temperature 2	455.030	20.000	460.990	20.000
Second filling, efflux time 3, temperature 3	455.130	20.000	461.030	20.000
Second filling, efflux time 4, temperature 4	455.080	20.000	461.040	20.000
Second filling, efflux time 5, temperature 5	455.100	20.000	461.010	20.000
Mean value	455.070	20.000	461.016	20.000
Overall mean value	455.047	20.000	460.968	20.000

Mean value of viscosity of the two viscometers*	4.8753	mm²/s
Mean value of the temperature	20.000	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid		A, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 20 °C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	to be specified	1/K		1/K		50
Density of the sample	to be specified	g/cm³		g/cm³		50
Surface tension of the sample	to be specified	mN/m		mN/m		50
Time measuring device			0.00835	s	1.8E-05	1000000
Flow time measurements	458.0	s	0.00850	s	2.9E-05	16
Inclination of viscometers to vertical axis	0	°	0.57700	°	8.8E-05	1000000
Sample temperature	20.000	°C	0.00290	K	7.3E-05	33
Viscometer Number 1, Viscometer constant	0.0107135	mm²/s²	0.0000035	mm²/s²	1.6E-04	100
Individual surface tension correction factor c_S (1)	1		0.00004		1.9E-05	1000000
Kinetic energy correction t_{KE} (1)	0.086	s	0.00290	s	3.2E-05	1000000
Viscometer Number 2, Viscometer constant	0.0105781	mm²/s²	0.0000035	mm²/s²	1.6E-04	100
Individual surface tension correction factor c_S (2)	1		0.00004		1.9E-05	1000000
Kinetic energy correction t_{KE} (2)	0.077	s	0.00290	s	3.2E-05	1000000
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.00027
Effective degrees of freedom, ν_{eff}	340
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.00
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.00053

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 20 °C**

Name of participating laboratory	Physikalisch-Technische Bundesanstalt
Country	Germany

MEASUREMENT **STANDARD LIQUID B, 20 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	2012/11/20	
Remarks on the liquid (package, seals)	ok	
Date of test	23.11.2012 + 04.12.2012	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	MKT50, 2 PRT	
Time measuring device (type)	Electronic timer, quarz	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	IIIc/84468		IIIc/84473	
Capillary length (nominal)	90	mm	90	mm
Flow volume (nominal)	5.7	cm³	5.7	cm³
Viscometer constant	3.32247	mm²/s²	3.07334	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	20.90	°C
Air pressure	986.20	hPa
Relative humidity	33.50	%

participating lab (abbreviation), standard liquid	PTB	B, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 20 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	593.50	20.000	641.57	20.000
First filling, efflux time 2, temperature 2	593.40	20.000	641.51	20.000
First filling, efflux time 3, temperature 3	593.47	20.000	641.55	20.000
First filling, efflux time 4, temperature 4	593.50	20.000	641.54	20.000
First filling, efflux time 5, temperature 5	593.41	20.000	641.63	20.000
Mean value	593.46	20.000	641.56	20.000
Second filling, efflux time 1, temperature 1	593.36	19.998	641.68	19.998
Second filling, efflux time 2, temperature 2	593.18	20.001	641.51	20.001
Second filling, efflux time 3, temperature 3	593.20	20.001	641.54	20.001
Second filling, efflux time 4, temperature 4	593.29	20.000	641.64	20.000
Second filling, efflux time 5, temperature 5	593.31	20.000	641.58	20.000
Mean value	593.27	20.000	641.59	20.000
Overall mean value	593.362	20.000	641.575	20.000

Mean value of viscosity of the two viscometers*	1971.60	mm²/s
Mean value of the temperature	20.000	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid		B, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 20°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	to be specified	1/K		1/K		50
Density of the sample	to be specified	g/cm³		g/cm³		50
Surface tension of the sample	to be specified	mN/m		mN/m		50
Time measuring device			0.01000	s	0.00002	1000000
Flow time measurements	617.5	s	0.10000	s	0.00004	16
Inclination of viscometers to vertical axis	0	°	0.00009	°	0.00009	1000000
Sample temperature	20.000	°C	0.00280	K	0.00023	33
Viscometer Number 1, Viscometer constant	3.32247	mm²/s²	0.00249	mm²/s²	0.00038	100
Individual surface tension correction factor c_S (1)	1		0.00001		0.00000	1000000
Kinetic energy correction t_{KE} (1)	0.000	s	0.00290	s	0.00000	1000000
Viscometer Number 2, Viscometer constant	3.07334	mm²/s²	0.00000	mm²/s²	0.00038	100
Individual surface tension correction factor c_S (2)	1		0.00001		0.00000	1000000
Kinetic energy correction t_{KE} (2)	0.000	s	0.00290	s	0.00000	1000000
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.0006
Effective degrees of freedom, ν_{eff}	250
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.00
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0012

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 40 °C**

Name of participating laboratory	Physikalisch-Technische Bundesanstalt
Country	Germany

MEASUREMENT **STANDARD LIQUID B, 40 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	2012/11/20	
Remarks on the liquid (package, seals)	ok	
Date of test	26.11.2012 + 03.12.2012	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	MKT50, 2 PRT	
Time measuring device (type)	Electronic timer, quarz	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	III/86		III/6504	
Capillary length (nominal)	90	mm	90	mm
Flow volume (nominal)	5.7	cm³	5.7	cm³
Viscometer constant	0.921062	mm²/s²	0.999431	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	21.30	°C
Air pressure	1004.60	hPa
Relative humidity	30.40	%

participating lab (abbreviation), standard liquid	PTB	B, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 40 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	512.87	40.0003	472.76	40.0003
First filling, efflux time 2, temperature 2	512.92	40.0003	472.67	40.0003
First filling, efflux time 3, temperature 3	512.93	40.0009	472.52	40.0009
First filling, efflux time 4, temperature 4	513.05	39.9997	472.61	39.9997
First filling, efflux time 5, temperature 5	512.93	39.9998	472.62	39.9998
Mean value	512.94	40.0002	472.64	40.0002
Second filling, efflux time 1, temperature 1	513.14	39.9965	472.93	39.9965
Second filling, efflux time 2, temperature 2	513.00	40.0030	472.58	40.0030
Second filling, efflux time 3, temperature 3	513.07	39.9979	472.68	39.9979
Second filling, efflux time 4, temperature 4	512.95	40.0007	472.66	40.0007
Second filling, efflux time 5, temperature 5	512.97	40.0007	472.58	40.0007
Mean value	513.03	39.9995	472.686	39.9995
Overall mean value	512.983	40.000	472.661	40.000

Mean value of viscosity of the two viscometers*	472.44	mm²/s
Mean value of the temperature	40.000	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid		B, 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	to be specified	1/K		1/K		50
Density of the sample	to be specified	g/cm³		g/cm³		50
Surface tension of the sample	to be specified	mN/m		mN/m		50
Time measuring device			0.01000	s	0.00002	1000000
Flow time measurements	492.0	s	0.17000	s	0.00009	16
Inclination of viscometers to vertical axis	0	°	0.00009	°	0.00009	1000000
Sample temperature	40.000	°C	0.00280	K	0.00018	35
Viscometer Number 1, Viscometer constant	0.921062	mm²/s²	0.00065	mm²/s²	0.00035	100
Individual surface tension correction factor c_S (1)	1		0.00003		0.00001	1000000
Kinetic energy correction t_{KE} (1)	0.000	s	0.00290	s	0.00000	1000000
Viscometer Number 2, Viscometer constant	0.999431	mm²/s²	0.00070	mm²/s²	0.00035	100
Individual surface tension correction factor c_S (2)	1		0.00003		0.00001	1000000
Kinetic energy correction t_{KE} (2)	0.000	s	0.00000	s	0.00000	1000000
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.0005
Effective degrees of freedom, ν_{eff}	260
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.00
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0011

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID C, 20°C**

Name of participating laboratory	Physikalisch-Technische Bundesanstalt
Country	Germany

MEASUREMENT **STANDARD LIQUID C, 20°C**

Name of standard liquid	C	
Date of arrival of the liquid at the laboratory	2012/11/20	
Remarks on the liquid (package, seals)	ok	
Date of test	27.11.2012 + 17.12.2012	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	MKT50, 2 PRT	
Time measuring device (type)	Electronic timer, quarz	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	V/95140		V/95141	
Capillary length (nominal)	90	mm	90	mm
Flow volume (nominal)	5.7	cm³	5.7	cm³
Viscometer constant	110.042	mm²/s²	104.341	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit	
Air temperature	21.80	°C	
Air pressure	994.94	hPa	
Relative humidity	43.70	%	
participating lab (abbreviation), standard liquid	PTB		C, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID C, 20 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	1402.45	20.000	1479.89	20.000
First filling, efflux time 2, temperature 2	1402.73	20.000	1479.74	20.000
First filling, efflux time 3, temperature 3	1402.86	20.000	1479.67	20.000
First filling, efflux time 4, temperature 4				
First filling, efflux time 5, temperature 5				
Mean value	1402.68	20.000	1479.77	20.000
Second filling, efflux time 1, temperature 1	1403.43	20.001	1480.89	20.001
Second filling, efflux time 2, temperature 2	1403.66	20.000	1480.96	20.000
Second filling, efflux time 3, temperature 3	1403.44	20.000	1480.77	20.000
Second filling, efflux time 4, temperature 4	1403.49	20.000	1480.80	20.000
Second filling, efflux time 5, temperature 5	1403.47	20.000	1480.73	20.000
Mean value	1403.43	20.000	1480.83	20.000
Overall mean value	1403.19	20.000	1480.43	20.000

Mean value of viscosity of the two viscometers*	154427	mm²/s
Mean value of the temperature	20.000	°C

*Please do not correct the result to target temperature

Notes or observations:		
participating lab (abbreviation), standard liquid		C, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID C, 20°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	to be specified	1/K		1/K		50
Density of the sample	to be specified	g/cm³		g/cm³		50
Surface tension of the sample	to be specified	mN/m		mN/m		50
Time measuring device			0.02000	s	1.36E-05	1000000
Flow time measurements	1441.8	s	0.27000	s	4.73E-05	16
Inclination of viscometers to vertical axis	0	°	0.00009	°	9.10E-05	1000000
Sample temperature	20.000	°C	0.00280	K	2.80E-04	33
Viscometer Number 1, Viscometer constant	110.0420000	mm²/s²	0.10000	mm²/s²	4.70E-04	100
Individual surface tension correction factor c_S (1)	1		0.00002		1.04E-05	1000000
Kinetic energy correction t_{KE} (1)	0.000	s	0.00290	s	1.04E-06	1000000
Viscometer Number 2, Viscometer constant	104.3410000	mm²/s²	0.09900	mm²/s²	4.73E-04	100
Individual surface tension correction factor c_S (2)	1		0.00002		1.04E-05	1000000
Kinetic energy correction t_{KE} (2)	0.000	s	0.00290	s	1.04E-06	1000000
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.0007
Effective degrees of freedom, ν_{eff}	240
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.00
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0015

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID C , 40 °C**

Name of participating laboratory	Physikalisch-Technische Bundesanstalt
Country	Germany

MEASUREMENT **STANDARD LIQUID C, 40 °C**

Name of standard liquid	C	
Date of arrival of the liquid at the laboratory	2012/11/20	
Remarks on the liquid (package, seals)	ok	
Date of test	27.11.2012 + 04.12.2012	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	MKT50, 2 PRT	
Time measuring device (type)	Electronic timer, quarz	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	IVc/70873		IVc/70892	
Capillary length (nominal)	90.0000	mm	90.0000	mm
Flow volume (nominal)	5.7000	cm³	5.7000	cm³
Viscometer constant	25.7883	mm²/s²	26.5610	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit	
Air temperature	21.30	°C	
Air pressure	990.36	hPa	
Relative humidity	39.40	%	
participating lab (abbreviation), standard liquid	PTB		C, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID C, 40 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	970.07	40.0001	942.34	40.000
First filling, efflux time 2, temperature 2	970.03	39.9998	942.53	40.000
First filling, efflux time 3, temperature 3	969.98	40.0003	942.28	40.000
First filling, efflux time 4, temperature 4	969.98	40.0008	942.35	40.001
First filling, efflux time 5, temperature 5	970.05	40.0005	942.31	40.001
Mean value	970.02	40.0003	942.36	40.000
Second filling, efflux time 1, temperature 1	970.55	40.0001	942.73	40.000
Second filling, efflux time 2, temperature 2	970.07	39.9990	942.33	39.999
Second filling, efflux time 3, temperature 3	970.25	39.9993	942.63	39.999
Second filling, efflux time 4, temperature 4	970.27	40.0001	942.50	40.000
Second filling, efflux time 5, temperature 5	970.17	40.0008	942.25	40.001
Mean value	970.26	39.9999	942.49	40.000
Overall mean value	970.14	40.000	942.43	40.000

Mean value of viscosity of the two viscometers*	25025	mm²/s
Mean value of the temperature	40.000	°C

*Please do not correct the result to target temperature

Notes or observations:		
participating lab (abbreviation), standard liquid		C, 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID C, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	to be specified	1/K		1/K		50
Density of the sample	to be specified	g/cm³		g/cm³		50
Surface tension of the sample	to be specified	mN/m		mN/m		50
Time measuring device				s		1000000
Flow time measurements	956.3	s	0.23000	s	1.44E-05	16
Inclination of viscometers to vertical axis	0	°	0.00009	°	6.00E-05	1000000
Sample temperature	40.000	°C	0.00280	K	2.28E-04	33
Viscometer Number 1, Viscometer constant	25.7883000	mm²/s²	0.10000	mm²/s²	4.50E-04	100
Individual surface tension correction factor c_S (1)	1		0.00002		1.46E-05	1000000
Kinetic energy correction t_{KE} (1)	0.000	s	0.00290	s	1.49E-06	1000000
Viscometer Number 2, Viscometer constant	26.5610000	mm²/s²	0.09900	mm²/s²	4.50E-04	100
Individual surface tension correction factor c_S (2)	1		0.00002		1.46E-05	1000000
Kinetic energy correction t_{KE} (2)	0.000	s	0.00290	s	1.53E-06	1000000
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.0007
Effective degrees of freedom, ν_{eff}	250
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.00
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0014

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 15 °C**

Name of participating laboratory	Slovenský metrologický ústav
Country	Slovakia

MEASUREMENT **STANDARD LIQUID A, 15 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	2012/10/31	
Remarks on the liquid (package, seals)	OK	
Date of test	12.11.12; 15.11.12	
Nominal measuring temperature	15	°C
Temperature measuring instrument (type)	PRTD Pt25; Tinsley	
Time measuring device (type)	Counter/Timer Card	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	51788		51489	
Capillary length (nominal)	500.0000	mm	500.0000	mm
Flow volume (nominal)	5.7000	cm³	5.7000	cm³
Viscometer constant	0.0112044	mm²/s²	0.011768	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	21.50	°C
Air pressure	996.00	hPa
Relative humidity	65.00	%

participating lab (abbreviation), standard liquid	SMU	A, 15 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 15 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	499.237	15.000	474.932	15.000
First filling, efflux time 2, temperature 2	499.242	15.000	474.935	15.000
First filling, efflux time 3, temperature 3	499.254	15.000	474.946	15.000
First filling, efflux time 4, temperature 4	499.250	15.000	474.947	15.000
First filling, efflux time 5, temperature 5	499.238	15.000	474.941	15.000
Mean value	499.244	15.000	474.940	15.000
Second filling, efflux time 1, temperature 1	499.129	15.000	474.786	15.000
Second filling, efflux time 2, temperature 2	499.127	15.000	474.785	15.000
Second filling, efflux time 3, temperature 3	499.134	15.000	474.780	15.000
Second filling, efflux time 4, temperature 4	499.125	15.000	474.787	15.000
Second filling, efflux time 5, temperature 5	499.125	15.000	474.775	15.000
Mean value	499.128	15.000	474.783	15.000
Overall mean value	499.186	15.000	474.861	15.000

Mean value of viscosity of the two viscometers*	5.5906	mm²/s
Mean value of the temperature	15.000	°C

*Please do not correct the result to target temperature

Notes or observations:
Temperature is given as the nominal value, because it changes during measurement. The changes were within ± 3 mK.

participating lab (abbreviation), standard liquid	SMU	A , 15 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 15°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.028	1/K	0.000034	1/K	3.36E-08	50
Density of the sample	0.81243	g/cm³	0.00012	g/cm³		50
Surface tension of the sample	28.50	mN/m	0.19	mN/m		50
Time measuring device			0.00010	s	1.00E-06	1000000
Flow time measurements	487.024	s	0.010	s	1.47E-05	9
Inclination of viscometers to vertical axis	0.00000	°	0.10000	°	1.08E-06	1000000
Sample temperature	15.00000	°C	0.00700	K	1.96E-04	1000000
Viscometer Number 1, Viscometer constant	0.0112044	mm²/s²	0.0000060	mm²/s²	5.36E-04	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	0.0117680	mm²/s²	0.0000063	mm²/s²	5.35E-04	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.00078
Effective degrees of freedom, ν_{eff}	114
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0016

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 20 °C**

Name of participating laboratory	Slovenský metrologický ústav
Country	Slovakia

MEASUREMENT **STANDARD LIQUID A, 20 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	2012/10/31	
Remarks on the liquid (package, seals)	OK	
Date of test	13.11.12; 16.11.12	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	PRTD Pt25; Tinsley	
Time measuring device (type)	Counter/Timer Card	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	51788		51489	
Capillary length (nominal)	500.0000	mm	500.0000	mm
Flow volume (nominal)	5.7000	cm³	5.7000	cm³
Viscometer constant	0.0112044	mm²/s²	0.011768	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	21.50	°C
Air pressure	996.00	hPa
Relative humidity	65.00	%

participating lab (abbreviation), standard liquid	SMU	A, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 20 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	435.642	20.000	414.439	20.000
First filling, efflux time 2, temperature 2	435.643	20.000	414.442	20.000
First filling, efflux time 3, temperature 3	435.648	20.000	414.447	20.000
First filling, efflux time 4, temperature 4	435.660	20.000	414.452	20.000
First filling, efflux time 5, temperature 5	435.650	20.000	414.455	20.000
Mean value	435.649	20.000	414.447	20.000
Second filling, efflux time 1, temperature 1	435.806	20.000	414.648	20.000
Second filling, efflux time 2, temperature 2	435.802	20.000	414.646	20.000
Second filling, efflux time 3, temperature 3	435.798	20.000	414.644	20.000
Second filling, efflux time 4, temperature 4	435.806	20.000	414.649	20.000
Second filling, efflux time 5, temperature 5	435.811	20.000	414.645	20.000
Mean value	435.805	20.000	414.646	20.000
Overall mean value	435.727	20.000	414.547	20.000

Mean value of viscosity of the two viscometers*	4.8802	mm²/s
Mean value of the temperature	20.000	°C

*Please do not correct the result to target temperature

Notes or observations:
Temperature is given as the nominal value, because it changes during measurement. The changes were within ± 3 mK.

participating lab (abbreviation), standard liquid	SMU	A , 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 20°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.027	1/K	0.000032	1/K	3.24E-08	50
Density of the sample	0.80900	g/cm³	0.00012	g/cm³		50
Surface tension of the sample	28.07	mN/m	0.18	mN/m		50
Time measuring device			0.00010	s	1.00E-06	1000000
Flow time measurements	425.137	s	0.010	s	1.68E-05	9
Inclination of viscometers to vertical axis	0.00000	°	0.01129	°	1.08E-06	1000000
Sample temperature	20.00000	°C	0.00700	K	1.89E-04	1000000
Viscometer Number 1, Viscometer constant	0.0112044	mm²/s²	0.0000060	mm²/s²	5.36E-04	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	0.0117680	mm²/s²	0.0000063	mm²/s²	5.35E-04	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.00078
Effective degrees of freedom, ν_{eff}	113
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0016

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 20 °C**

Name of participating laboratory	Slovenský metrologický ústav
Country	Slovakia

MEASUREMENT **STANDARD LIQUID B, 20 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	2012/10/31	
Remarks on the liquid (package, seals)	OK	
Date of test	13.11.12; 16.11.12	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	PRTD Pt25; Tinsley	
Time measuring device (type)	Counter/Timer Card	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	51919		51920	
Capillary length (nominal)	500.0000	mm	500.0000	mm
Flow volume (nominal)	5.7000	cm³	5.7000	cm³
Viscometer constant	2.7765	mm²/s²	2.9277	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	21.50	°C
Air pressure	996.00	hPa
Relative humidity	65.00	%

participating lab (abbreviation), standard liquid	SMU	B, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 20 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	711.222	20.000	674.441	20.000
First filling, efflux time 2, temperature 2	711.252	20.000	674.467	20.000
First filling, efflux time 3, temperature 3	711.063	20.000	674.438	20.000
First filling, efflux time 4, temperature 4	711.187	20.000	674.481	20.000
First filling, efflux time 5, temperature 5	711.185	20.000	674.431	20.000
Mean value	711.182	20.000	674.452	20.000
Second filling, efflux time 1, temperature 1	711.397	20.000	674.852	20.000
Second filling, efflux time 2, temperature 2	711.326	20.000	674.857	20.000
Second filling, efflux time 3, temperature 3	711.324	20.000	674.848	20.000
Second filling, efflux time 4, temperature 4	711.399	20.000	674.884	20.000
Second filling, efflux time 5, temperature 5	711.361	20.000	674.858	20.000
Mean value	711.361	20.000	674.860	20.000
Overall mean value	711.272	20.000	674.656	20.000

Mean value of viscosity of the two viscometers*	1975.0	mm²/s
Mean value of the temperature	20.000	°C

*Please do not correct the result to target temperature

Notes or observations:
Temperature is given as the nominal value, because it changes during measurement. The changes were within ± 3 mK.

participating lab (abbreviation), standard liquid	SMU	B , 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 20°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.027	1/K	0.000032	1/K	3.24E-08	50
Density of the sample	0.80900	g/cm³	0.00012	g/cm³		50
Surface tension of the sample	28.07	mN/m	0.18	mN/m		50
Time measuring device			0.00010	s	1.00E-06	1000000
Flow time measurements	692.964	s	0.092	s	9.35E-05	9
Inclination of viscometers to vertical axis	0.00000	°	0.09164	°	1.08E-06	1000000
Sample temperature	20.00000	°C	0.00700	K	1.89E-04	1000000
Viscometer Number 1, Viscometer constant	2.7765	mm²/s²	0.0033	mm²/s²	1.19E-03	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	2.9277	mm²/s²	0.0032	mm²/s²	1.09E-03	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTBINTY OF MEBSUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.00163
Effective degrees of freedom, ν_{eff}	103
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0033

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 40 °C**

Name of participating laboratory	Slovenský metrologický ústav
Country	Slovakia

MEASUREMENT **STANDARD LIQUID B, 40 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	2012/10/31	
Remarks on the liquid (package, seals)	OK	
Date of test	13.11.12; 16.11.12	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	PRTD Pt25; Tinsley	
Time measuring device (type)	Counter/Timer Card	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	51928		51925	
Capillary length (nominal)	500.0000	mm	400.0000	mm
Flow volume (nominal)	5.7000	cm³	5.7000	cm³
Viscometer constant	1.1076	mm²/s²	1.1272	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	21.50	°C
Air pressure	996.00	hPa
Relative humidity	65.00	%

participating lab (abbreviation), standard liquid	SMU	B, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 40 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	426.696	40.000	417.992	40.000
First filling, efflux time 2, temperature 2	426.673	40.000	417.975	40.000
First filling, efflux time 3, temperature 3	426.650	40.000	417.984	40.000
First filling, efflux time 4, temperature 4	426.648	40.000	417.992	40.000
First filling, efflux time 5, temperature 5	426.658	40.000	417.989	40.000
Mean value	426.665	40.000	417.986	40.000
Second filling, efflux time 1, temperature 1	426.494	40.000	418.520	40.000
Second filling, efflux time 2, temperature 2	426.465	40.000	418.526	40.000
Second filling, efflux time 3, temperature 3	426.450	40.000	418.528	40.000
Second filling, efflux time 4, temperature 4	426.478	40.000	418.530	40.000
Second filling, efflux time 5, temperature 5	426.483	40.000	418.562	40.000
Mean value	426.474	40.000	418.533	40.000
Overall mean value	426.570	40.000	418.260	40.000

Mean value of viscosity of the two viscometers*	471.97	mm²/s
Mean value of the temperature	40.000	°C

*Please do not correct the result to target temperature

Notes or observations:
Temperature is given as the nominal value, because it changes during measurement. The changes were within ± 3 mK.

participating lab (abbreviation), standard liquid	SMU	B , 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.027	1/K	0.000032	1/K	3.24E-08	50
Density of the sample	0.80900	g/cm³	0.00012	g/cm³		50
Surface tension of the sample	28.07	mN/m	0.18	mN/m		50
Time measuring device			0.00010	s	1.00E-06	1000000
Flow time measurements	422.415	s	0.033	s	5.47E-05	9
Inclination of viscometers to vertical axis	0.00000	°	0.03268	°	1.08E-06	1000000
Sample temperature	40.00000	°C	0.00700	K	1.89E-04	1000000
Viscometer Number 1, Viscometer constant	1.1076	mm²/s²	0.0012	mm²/s²	1.08E-03	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	1.1272	mm²/s²	0.0012	mm²/s²	1.06E-03	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTBINTY OF MEBSUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.0015
Effective degrees of freedom, ν_{eff}	103
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0031

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID C, 20 °C**

Name of participating laboratory	Slovenský metrologický ústav
Country	Slovakia

MEASUREMENT **STANDARD LIQUID C, 20 °C**

Name of standard liquid	C	
Date of arrival of the liquid at the laboratory	2012/10/31	
Remarks on the liquid (package, seals)	OK	
Date of test	20.11.12; 27.11.12	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	PRTD Pt25; Tinsley	
Time measuring device (type)	Counter/Timer Card	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	51932		51933	
Capillary length (nominal)	500.0000	mm	500.0000	mm
Flow volume (nominal)	5.7000	cm³	5.7000	cm³
Viscometer constant	85.129	mm²/s²	83.182	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	21.50	°C
Air pressure	996.00	hPa
Relative humidity	65.00	%

participating lab (abbreviation), standard liquid	SMU	C, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID C, 20 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	1821.720	20.000	1864.489	20.000
First filling, efflux time 2, temperature 2	1821.652	20.000	1864.511	20.000
First filling, efflux time 3, temperature 3	1821.905	20.000	1864.354	20.000
First filling, efflux time 4, temperature 4	1821.937	20.000	1864.940	20.000
First filling, efflux time 5, temperature 5	1822.052	20.000	1864.665	20.000
Mean value	1821.853	20.000	1864.592	20.000
Second filling, efflux time 1, temperature 1	1823.723	20.000	1866.913	20.000
Second filling, efflux time 2, temperature 2	1823.744	20.000	1866.722	20.000
Second filling, efflux time 3, temperature 3	1823.632	20.000	1866.392	20.000
Second filling, efflux time 4, temperature 4	1823.928	20.000	1866.454	20.000
Second filling, efflux time 5, temperature 5	1823.429	20.000	1866.552	20.000
Mean value	1823.691	20.000	1866.607	20.000
Overall mean value	1822.772	20.000	1865.599	20.000

Mean value of viscosity of the two viscometers*	155178	mm²/s
Mean value of the temperature	20.000	°C

*Please do not correct the result to target temperature

Notes or observations:
Temperature is given as the nominal value, because it changes during measurement. The changes were within ± 3 mK.

participating lab (abbreviation), standard liquid	SMU	C, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID C, 20°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.101	1/K	0.00020	1/K	2.02E-07	50
Density of the sample	0.89632	g/cm³	0.00018	g/cm³		50
Surface tension of the sample	32.45	mN/m	0.48	mN/m		50
Time measuring device			0.00010	s	1.00E-06	1000000
Flow time measurements	1844.186	s	0.367	s	1.41E-04	9
Inclination of viscometers to vertical axis	0.00000	°	0.36715	°	1.08E-06	1000000
Sample temperature	20.00000	°C	0.00700	K	7.07E-04	1000000
Viscometer Number 1, Viscometer constant	85.1290	mm²/s²	0.1500	mm²/s²	1.76E-03	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	83.1820	mm²/s²	0.1400	mm²/s²	1.68E-03	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTBINTY OF MEBSUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.00254
Effective degrees of freedom, ν_{eff}	118
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0051

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID C, 40 °C**

Name of participating laboratory	Slovenský metrologický ústav
Country	Slovakia

MEASUREMENT **STANDARD LIQUID C, 40 °C**

Name of standard liquid	C	
Date of arrival of the liquid at the laboratory	2012/10/31	
Remarks on the liquid (package, seals)	OK	
Date of test	3.12.12; 7.12.12	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	PRTD Pt25; Tinsley	
Time measuring device (type)	Counter/Timer Card	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	51932		51933	
Capillary length (nominal)	500.0000	mm	500.0000	mm
Flow volume (nominal)	5.7000	cm³	5.7000	cm³
Viscometer constant	85.129	mm²/s²	83.182	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	21.50	°C
Air pressure	996.00	hPa
Relative humidity	65.00	%

participating lab (abbreviation), standard liquid	SMU	C, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID C, 40 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	294.922	40.000	302.015	40.000
First filling, efflux time 2, temperature 2	295.069	40.000	301.894	40.000
First filling, efflux time 3, temperature 3	294.924	40.000	302.101	40.000
First filling, efflux time 4, temperature 4	294.805	40.000	301.712	40.000
First filling, efflux time 5, temperature 5	294.976	40.000	302.081	40.000
Mean value	294.939	40.000	301.961	40.000
Second filling, efflux time 1, temperature 1	295.001	40.000	302.666	40.000
Second filling, efflux time 2, temperature 2	294.924	40.000	302.756	40.000
Second filling, efflux time 3, temperature 3	295.103	40.000	302.781	40.000
Second filling, efflux time 4, temperature 4	294.710	40.000	302.790	40.000
Second filling, efflux time 5, temperature 5	294.812	40.000	302.684	40.000
Mean value	294.910	40.000	302.735	40.000
Overall mean value	294.925	40.000	302.348	40.000

Mean value of viscosity of the two viscometers*	25128	mm²/s
Mean value of the temperature	40.000	°C

*Please do not correct the result to target temperature

Notes or observations:
Temperature is given as the nominal value, because it changes during measurement. The changes were within ± 3 mK.

participating lab (abbreviation), standard liquid	SMU	C, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID C, 20°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.101	1/K	0.00020	1/K	2.02E-07	50
Density of the sample	0.89632	g/cm³	0.00018	g/cm³		50
Surface tension of the sample	32.45	mN/m	0.48	mN/m		50
Time measuring device			0.00010	s	1.00E-06	1000000
Flow time measurements	298.636	s	0.287	s	6.80E-04	9
Inclination of viscometers to vertical axis	0.00000	°	0.28705	°	1.08E-06	1000000
Sample temperature	40.00000	°C	0.00700	K	7.07E-04	1000000
Viscometer Number 1, Viscometer constant	85.1290	mm²/s²	0.1500	mm²/s²	1.76E-03	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	83.1820	mm²/s²	0.1400	mm²/s²	1.68E-03	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTBINTY OF MEBSUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.00263
Effective degrees of freedom, ν_{eff}	126
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0053

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 15 °C**

Name of participating laboratory	TÜBİTAK - **U**lusal **M**etroloji **E**nstitüsü (UME), Viscosity lab
Country	TURKEY

MEASUREMENT **STANDARD LIQUID A, 15 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	November 12th 2012	
Remarks on the liquid (package, seals)	o.k.	
Date of test	November 15th 2012	
Nominal measuring temperature	15	°C
Temperature measuring instrument (type)	SPRT, Hart Scien.5681	
Time measuring device (type)	Chronometer, HUGER-SL8	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	**1** 73213		**1** 73214	
Capillary length (nominal)	90	mm	90	mm
Flow volume (nominal)	4.0	cm^3	4.0	cm^3
Viscometer constant	0.010140	mm^2/s^2	0.010123	mm^2/s^2
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	20.20	°C
Air pressure	1003	hPa
Relative humidity	49	%

participating lab (abbreviation), standard liquid	TÜBİTAK UME	A, 15 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 15 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	550.30	15.002	551.30	15.002
First filling, efflux time 2, temperature 2	550.48	15.002	551.33	15.002
First filling, efflux time 3, temperature 3	550.55	15.002	551.24	15.002
First filling, efflux time 4, temperature 4	550.31	15.003	551.33	15.003
First filling, efflux time 5, temperature 5	550.47	15.003	551.53	15.003
Mean value	550.422	15.002	551.346	15.002
Second filling, efflux time 1, temperature 1	550.43	15.000	551.35	15.000
Second filling, efflux time 2, temperature 2	550.44	14.999	551.31	15.000
Second filling, efflux time 3, temperature 3	550.41	14.999	551.34	14.999
Second filling, efflux time 4, temperature 4	550.44	15.000	551.30	15.000
Second filling, efflux time 5, temperature 5	550.42	15.000	551.37	15.000
Mean value	550.428	15.000	551.334	15.000
Overall mean value	550.425	15.001	551.340	15.001

Mean value of viscosity of the two viscometers*	5.5808	mm^2/s
Mean value of the temperature	15.001	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	TÜBİTAK UME	A , 15 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 15°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.028	1/K	0.000034	1/K	$1{,}68 \cdot 10^{-7}$	50
Density of the sample	0.81243	g/cm^3	0.00012	g/cm^3	can be neglected	50
Surface tension of the sample	28.50	mN/m	0.19	mN/m	can be neglected	50
Time measuring device			0.0636	s	$8{,}16 \cdot 10^{-5}$	1000000
Flow time measurements	550.883	s	0.0751	s	$9{,}65 \cdot 10^{-5}$	9
Inclination of viscometers to vertical axis	0	°	0.456	°	$2{,}24 \cdot 10^{-5}$	1000000
Sample temperature	15.001	°C	0.00577	K	$1{,}14 \cdot 10^{-4}$	1000000
Viscometer Number 1, Viscometer constant	0.010140	mm^2/s^2	0.001376	mm^2/s^2	$2{,}41 \cdot 10^{-4}$	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)	0.0368	s	0.0213	s	$3{,}86 \cdot 10^{-5}$	50
Viscometer Number 2, Viscometer constant	0.010123	mm^2/s^2	0.001399	mm^2/s^2	$2{,}41 \cdot 10^{-4}$	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)	0.0272	s	0.0157	s	$2{,}85 \cdot 10^{-5}$	50
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	$2{,}9_9 \cdot 10^{-4}$
Effective degrees of freedom, ν_{eff}	103
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	$5{,}9_7 \cdot 10^{-4}$

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 20 °C**

Name of participating laboratory	TÜBİTAK - **U**lusal **M**etroloji **E**nstitüsü (UME), Viscosity lab
Country	TURKEY

Yellow cells: please input data

Blue cells: please don't change

MEASUREMENT **STANDARD LIQUID A, 20 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	November 12th 2012	
Remarks on the liquid (package, seals)	o.k.	
Date of test	November 19th 2012	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	SPRT, Hart Scien.5681	
Time measuring device (type)	Chronometer, HUGER-SL8	
Type of viscometer	Ubbelohde	

	Viscometer 1		Viscometer 2	
Identification number	**1** 73213		**1** 73214	
Capillary length (nominal)	90	mm	90	mm
Flow volume (nominal)	4.0	cm³	4.0	cm³
Viscometer constant	0.010140	mm²/s²	0.010123	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	20.20	°C
Air pressure	999	hPa
Relative humidity	51	%

participating lab (abbreviation), standard liquid	TÜBİTAK UME	A, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 20°C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	480.47	20.000	481.03	20.000
First filling, efflux time 2, temperature 2	480.41	20.000	481.17	20.000
First filling, efflux time 3, temperature 3	480.65	20.000	481.11	20.000
First filling, efflux time 4, temperature 4	480.60	20.002	481.20	20.002
First filling, efflux time 5, temperature 5	480.49	20.002	481.14	20.002
Mean value	480.524	20.001	481.130	20.001
Second filling, efflux time 1, temperature 1	480.43	20.000	481.11	20.000
Second filling, efflux time 2, temperature 2	480.47	20.000	481.17	20.000
Second filling, efflux time 3, temperature 3	480.65	19.999	481.15	19.999
Second filling, efflux time 4, temperature 4	480.61	19.999	481.13	19.999
Second filling, efflux time 5, temperature 5	480.44	20.000	481.10	20.000
Mean value	480.520	20.000	481.132	20.000
Overall mean value	480.522	20.000	481.131	20.000

Mean value of viscosity of the two viscometers*	4.8709	mm²/s
Mean value of the temperature	20.000	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	TÜBİTAK UME	A, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 20 °C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sampl	0.027	1/K	0.000032	1/K	$6{,}48 \cdot 10^{-8}$	50
Density of the sample	0.80900	g/cm³	0.00012	g/cm³	can be neglected	50
Surface tension of the sample	28.07	mN/m	0.18	mN/m	can be neglected	50
Time measuring device			0.0555	s	$8{,}16 \cdot 10^{-5}$	1000000
Flow time measurements	480.827	s	0.0711	s	$1{,}05 \cdot 10^{-4}$	9
Inclination of viscometers to vertical axis	0	°	0.456	°	$2{,}24 \cdot 10^{-5}$	1000000
Sample temperature	20.000	°C	0.00404	K	$7{,}72 \cdot 10^{-5}$	1000000
Viscometer Number 1, Viscometer constant	0.010140	mm²/s²	0.00138	mm²/s²	$2{,}41 \cdot 10^{-4}$	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)	0.0483	s	0.0279	s	$5{,}80 \cdot 10^{-5}$	50
Viscometer Number 2, Viscometer constant	0.010123	mm²/s²	0.00140	mm²/s²	$2{,}41 \cdot 10^{-4}$	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)	0.0357	s	0.0206	s	$4{,}29 \cdot 10^{-5}$	50
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	$2{,}92 \cdot 10^{-4}$
Effective degrees of freedom, ν_{eff}	90
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	$5{,}85 \cdot 10^{-4}$

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 20 °C**

Name of participating laboratory	TÜBİTAK - **U**lusal **M**etroloji **E**nstitüsü (UME), Viscosity lab
Country	TURKEY

MEASUREMENT **STANDARD LIQUID B, 20 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	November 12th 2012	
Remarks on the liquid (package, seals)	o.k.	
Date of test	November 20th 2012	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	SPRT, Hart Scien.5681	
Time measuring device (type)	Chronometer, HUGER-SL88	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	**3B** 69624		**3B** 69625	
Capillary length (nominal)	90	mm	90	mm
Flow volume (nominal)	4.0	cm³	4.0	cm³
Viscometer constant	4.4701	mm²/s²	4.5319	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	20.20	°C
Air pressure	1000	hPa
Relative humidity	48	%

participating lab (abbreviation), standard liquid	TÜBİTAK UME	B, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 20 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	441.52	20.000	435.55	20.000
First filling, efflux time 2, temperature 2	441.54	20.000	435.47	20.000
First filling, efflux time 3, temperature 3	441.60	20.000	435.45	20.000
First filling, efflux time 4, temperature 4	441.39	19.999	435.41	19.999
First filling, efflux time 5, temperature 5	441.56	19.999	435.60	19.999
Mean value	441.522	20.000	435.496	20.000
Second filling, efflux time 1, temperature 1	441.57	19.999	435.47	19.999
Second filling, efflux time 2, temperature 2	441.40	19.999	435.57	19.999
Second filling, efflux time 3, temperature 3	441.56	19.998	435.48	19.998
Second filling, efflux time 4, temperature 4	441.38	19.998	435.40	19.998
Second filling, efflux time 5, temperature 5	441.68	19.998	435.56	19.998
Mean value	441.518	19.998	435.496	19.998
Overall mean value	441.52	19.999	435.496	19.999

Mean value of viscosity of the two viscometers*	1973.64	mm²/s
Mean value of the temperature	19.999	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	TÜBİTAK UME	B, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 20°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.082	1/K	0.000074	1/K	$1{,}48 \cdot 10^{-7}$	50
Density of the sample	0.88127	g/cm³	0.00013	g/cm³	can be neglec	50
Surface tension of the sample	32.83	mN/m	0.18	mN/m	can be neglec	50
Time measuring device			0.0506	s	$8{,}16 \cdot 10^{-5}$	1000000
Flow time measurements	438.508	s	0.0845	s	$1{,}36 \cdot 10^{-4}$	9
Inclination of viscometers to vertical axis	0	°	0.456	°	$2{,}24 \cdot 10^{-5}$	1000000
Sample temperature	19.999	°C	0.00404	K	$2{,}34 \cdot 10^{-4}$	1000000
Viscometer Number 1, Viscometer constant	4.4701	mm²/s²	0.00319	mm²/s²	$5{,}59 \cdot 10^{-4}$	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	4.5319	mm²/s²	0.00322	mm²/s²	$5{,}55 \cdot 10^{-4}$	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	$6{,}27 \cdot 10^{-4}$
Effective degrees of freedom, ν_{eff}	78
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	$1{,}25 \cdot 10^{-3}$

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 40 °C**

Name of participating laboratory	TÜBİTAK - **U**lusal **M**etroloji **E**nstitüsü (UME), Viscosity lab
Country	TURKEY

MEASUREMENT **STANDARD LIQUID B, 40 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	November 12th 2012	
Remarks on the liquid (package, seals)	o.k.	
Date of test	November 27th 2012	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	SPRT, Hart Scien.5681	
Time measuring device (type)	Chronometer, HUGER-SL88	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	**3** 71548		**3** 71549	
Capillary length (nominal)	90	mm	90	mm
Flow volume (nominal)	4.0	cm³	4.0	cm³
Viscometer constant	0.95385	mm²/s²	0.90882	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	20.70	°C
Air pressure	999	hPa
Relative humidity	41	%

participating lab (abbreviation), standard liquid	TÜBİTAK UME	B, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 40 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	495.42	39.999	520.05	39.999
First filling, efflux time 2, temperature 2	495.52	40.000	519.93	40.000
First filling, efflux time 3, temperature 3	495.41	40.000	519.88	40.000
First filling, efflux time 4, temperature 4	495.48	40.001	520.04	40.001
First filling, efflux time 5, temperature 5	495.44	39.998	520.03	39.998
Mean value	495.454	40.000	519.986	40.000
Second filling, efflux time 1, temperature 1	495.47	39.996	519.88	39.996
Second filling, efflux time 2, temperature 2	495.63	39.996	520.13	39.996
Second filling, efflux time 3, temperature 3	495.45	39.997	520.02	39.997
Second filling, efflux time 4, temperature 4	495.37	39.995	519.79	39.995
Second filling, efflux time 5, temperature 5	495.34	39.996	520.17	39.996
Mean value	495.452	39.996	519.998	39.996
Overall mean value	495.453	39.998	519.992	39.998

Mean value of viscosity of the two viscometers*	472.584	mm²/s
Mean value of the temperature	39.998	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	TÜBİTAK UME	B, 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.063	1/K	0.000037	1/K	$1{,}86 \cdot 10^{-7}$	50
Density of the sample	0.86920	g/cm³	0.00018	g/cm³	can be neglec	50
Surface tension of the sample	31.04	mN/m	0.22	mN/m	can be neglec	50
Time measuring device			0.0586	s	$8{,}16 \cdot 10^{-5}$	1000000
Flow time measurements	507.723	s	0.1004	s	$1{,}40 \cdot 10^{-4}$	9
Inclination of viscometers to vertical axis	0	°	0.456	°	$2{,}24 \cdot 10^{-5}$	1000000
Sample temperature	39.998	°C	0.00577	K	$2{,}57 \cdot 10^{-4}$	1000000
Viscometer Number 1, Viscometer constant	0.95385	mm²/s²	0.00265	mm²/s²	$4{,}64 \cdot 10^{-4}$	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	0.90882	mm²/s²	0.00269	mm²/s²	$4{,}64 \cdot 10^{-4}$	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	$5{,}5_5 \cdot 10^{-4}$
Effective degrees of freedom, ν_{eff}	98
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	$1{,}1_1 \cdot 10^{-3}$

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID C , 40 °C**

Name of participating laboratory	TÜBİTAK - **U**lusal **M**etroloji **E**nstitüsü (UME), Viscosity lab
Country	TURKEY

MEASUREMENT **STANDARD LIQUID C, 40 °C**

Name of standard liquid	C	
Date of arrival of the liquid at the laboratory	November 12th 2012	
Remarks on the liquid (package, seals)	o.k.	
Date of test	November 27th 2012	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	SPRT, Hart Scien.5681	
Time measuring device (type)	Chronometer, HUGER-SL8	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	**4B** 64013		**4B** 34339	
Capillary length (nominal)	90	mm	90	mm
Flow volume (nominal)	5.0	cm³	5.0	cm³
Viscometer constant	53.123	mm²/s²	50.522	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit	
Air temperature	20.60	°C	
Air pressure	999	hPa	
Relative humidity	44	%	
participating lab (abbreviation), standard liquid	TÜBİTAK UME		C, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID C, 40°C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	470.54	39.998	494.82	39.998
First filling, efflux time 2, temperature 2	470.77	40.000	494.77	40.000
First filling, efflux time 3, temperature 3	470.65	40.000	495.02	40.000
First filling, efflux time 4, temperature 4	470.64	39.998	494.87	39.998
First filling, efflux time 5, temperature 5	470.74	40.000	495.01	40.000
Mean value	470.668	39.999	494.898	39.999
Second filling, efflux time 1, temperature 1	470.79	40.003	495.05	40.003
Second filling, efflux time 2, temperature 2	470.55	40.003	494.80	40.002
Second filling, efflux time 3, temperature 3	470.64	40.002	494.97	40.002
Second filling, efflux time 4, temperature 4	470.70	40.000	494.72	40.000
Second filling, efflux time 5, temperature 5	470.74	40.000	494.88	40.000
Mean value	470.684	40.001	494.884	40.001
Overall mean value	470.676	40.000	494.891	40.000

Mean value of viscosity of the two viscometers*	25003.4	mm²/s
Mean value of the temperature	40.000	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	TÜBİTAK UME	C, 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID C, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.083	1/K	0.00013	1/K	$6{,}64 \cdot 10^{-7}$	50
Density of the sample	0.88514	g/cm³	0.00019	g/cm³	can be neglecte	50
Surface tension of the sample	31.40	mN/m	0.36	mN/m	can be neglecte	50
Time measuring device			0.0557	s	$8{,}16 \cdot 10^{-5}$	1000000
Flow time measurements	482.784	s	0.1013	s	$1{,}48 \cdot 10^{-4}$	9
Inclination of viscometers to vertical axis	0	°	0.760	°	$6{,}22 \cdot 10^{-5}$	1000000
Sample temperature	40.000	°C	0.00577	K	$3{,}39 \cdot 10^{-4}$	1000000
Viscometer Number 1, Viscometer constant	53.123	mm²/s²	0.00415	mm²/s²	$7{,}27 \cdot 10^{-4}$	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	50.522	mm²/s²	0.00415	mm²/s²	$7{,}15 \cdot 10^{-4}$	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	$8{,}22 \cdot 10^{-4}$
Effective degrees of freedom, ν_{eff}	81
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	$1{,}64 \cdot 10^{-3}$

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 15 °C**

Name of participating laboratory	VSL
Country	Netherlands

MEASUREMENT **STANDARD LIQUID A, 15 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	October 29, 2012	
Remarks on the liquid (package, seals)	none	
Date of test	November 5-15, 2012	
Nominal measuring temperature	15	°C
Temperature measuring instrument (type)	Pt 100	
Time measuring device (type)	Spec. clock	
Type of viscometer	Ostwald	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	2A		2B	
Capillary length (nominal)	180	mm	180	mm
Flow volume (nominal)	7.5	cm³	7.5	cm³
Viscometer constant	0.012791	mm²/s²	0.012498	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	20	°C
Air pressure	1001	hPa
Relative humidity	50	%

participating lab (abbreviation), standard liquid	VSL	A, 15 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 15 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	436.002	15.000	446.106	15.000
First filling, efflux time 2, temperature 2	436.066	15.000	446.235	15.000
First filling, efflux time 3, temperature 3	436.188	15.000	446.313	15.000
First filling, efflux time 4, temperature 4	436.283	15.000	446.358	15.000
First filling, efflux time 5, temperature 5	436.153	15.000	446.153	15.000
Mean value	436.1384	15.000	446.2330	15.000
Second filling, efflux time 1, temperature 1	436.316	15.000	445.902	15.000
Second filling, efflux time 2, temperature 2	436.261	15.000	446.075	15.000
Second filling, efflux time 3, temperature 3	436.287	15.000	446.083	15.000
Second filling, efflux time 4, temperature 4	436.260	15.000	445.980	15.000
Second filling, efflux time 5, temperature 5	436.236	15.000	446.145	15.000
Mean value	436.2721	15.000	446.0370	15.000
Overall mean value	436.2053	15.000	446.1350	15.000

Mean value of viscosity of the two viscometers*	5.578	mm²/s
Mean value of the temperature	15.000	°C

*Please do not correct the result to target temperature

Notes or observations:
- For a description of our Ostwald viscometers is referred to: S.J. Uitterdijk, *Method for reducing surface-tension effects in relative viscosity measurements with Ostwald-type viscometers* , Metrologia, 1997, **34**, 153-159
- No surface tension correction is applied. It has been demonstrated (see paper S. Uitterdijk) that this correction can be neglected for our type of Ostwald viscometers.

participating lab (abbreviation), standard liquid	VSL	A , 15 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 15°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.028	1/K	0.000034	1/K		50
Density of the sample	0.81243	g/cm³	0.00012	g/cm³		50
Surface tension of the sample	28.50	mN/m	0.19	mN/m		50
Time measuring device		s	0.025	s	0.00006	50
Flow time measurements	436.20526	s	0.140	s	0.00032	9
Inclination of viscometers to vertical axis	0.00000	°	0.025	°	0.00010	50
Sample temperature	15.00000	°C	0.0049	K	0.00014	50
Viscometer Number 1, Viscometer constant	0.01279	mm²/s²	0.00001	mm²/s²	0.00047	50
Individual surface tension correction factor c_S (1)		%	0.012	%	0.00012	1000000
Kinetic energy correction t_{KE} (1)		s	0	s	0	1000000
Viscometer Number 2, Viscometer constant	0.01250	mm²/s²	0.00001	mm²/s²	0.00047	50
Individual surface tension correction factor c_S (2)		%	0.012	%	0.00012	1000000
Kinetic energy correction t_{KE} (2)		s	0	s	0	1000000
Ageing of viscometer glass		%	0.012	%	0.00012	1000000
Temperature gradient of thermostat		°C	0.0029	°C	0.00008	1000000

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.00065
Effective degrees of freedom, ν_{eff}	85
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.00
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0013

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 20 °C**

Name of participating laboratory	VSL
Country	Netherlands

MEASUREMENT **STANDARD LIQUID A, 20 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	October 29, 2012	
Remarks on the liquid (package, seals)	none	
Date of test	November 5-15, 2012	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	Pt 100	
Time measuring device (type)	Spec. clock	
Type of viscometer	Ostwald	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	2A		2B	
Capillary length (nominal)	180	mm	180	mm
Flow volume (nominal)	7.5	cm³	7.5	cm³
Viscometer constant	0.012791	mm²/s²	0.012498	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	20	°C
Air pressure	1004	hPa
Relative humidity	50	%

participating lab (abbreviation), standard liquid	VSL	A, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 20°C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	380.542	20.000	389.428	20.000
First filling, efflux time 2, temperature 2	380.723	20.000	389.449	20.000
First filling, efflux time 3, temperature 3	380.584	20.000	389.405	20.000
First filling, efflux time 4, temperature 4	380.760	20.000	389.490	20.000
First filling, efflux time 5, temperature 5	380.832	20.000	389.409	20.000
Mean value	380.6881	20.000	389.4362	20.000
Second filling, efflux time 1, temperature 1	380.896	20.000	389.622	20.000
Second filling, efflux time 2, temperature 2	380.895	20.000	389.630	20.000
Second filling, efflux time 3, temperature 3	380.876	20.000	389.535	20.000
Second filling, efflux time 4, temperature 4	380.914	20.000	389.489	20.000
Second filling, efflux time 5, temperature 5	380.877	20.000	389.588	20.000
Mean value	380.8916	20.000	389.5728	20.000
Overall mean value	380.7898	20.000	389.5045	20.000

Mean value of viscosity of the two viscometers*	4.869	mm²/s
Mean value of the temperature	20.000	°C

*Please do not correct the result to target temperature

Notes or observations:
- For a description of our Ostwald viscometers is referred to: S.J. Uitterdijk, *Method for reducing surface-tension effects in relative viscosity measurements with Ostwald-type viscometers* , Metrologia, 1997, **34**, 153-159
- No surface tension correction is applied. It has been demonstrated (see paper S. Uitterdijk) that this correction can be neglected for our type of Ostwald viscometers.

participating lab (abbreviation), standard liquid	VSL	A, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 20 °C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.027	1/K	0.000032	1/K		50
Density of the sample	0.80900	g/cm³	0.00012	g/cm³		50
Surface tension of the sample	28.07	mN/m	0.18	mN/m		50
Time measuring device		s	0.025	s	0.00007	50
Flow time measurements	380.78983	s	0.135	s	0.00035	9
Inclination of viscometers to vertical axis	0.00000	°	0.025	°	0.00010	50
Sample temperature	20.00000	°C	0.0049	K	0.00013	50
Viscometer Number 1, Viscometer constant	0.01279	mm²/s²	0.00001	mm²/s²	0.00047	50
Individual surface tension correction factor c_S (1)		%	0.012	%	0.00012	1000000
Kinetic energy correction t_{KE} (1)		s	0	s	0	1000000
Viscometer Number 2, Viscometer constant	0.01250	mm²/s²	0.00001	mm²/s²	0.00047	50
Individual surface tension correction factor c_S (2)		%	0.012	%	0.00012	1000000
Kinetic energy correction t_{KE} (2)		s	0	s	0	1000000
Ageing of viscometer glass		%	0.012	%	0.00012	1000000
Temperature gradient of thermostat		°C	0.0029	°C	0.00008	1000000

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.00066
Effective degrees of freedom, ν_{eff}	70
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.00
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0013

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 20 °C**

Name of participating laboratory	VSL
Country	Netherlands

MEASUREMENT **STANDARD LIQUID B, 20 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	October 29, 2012	
Remarks on the liquid (package, seals)	none	
Date of test	November 5-15, 2012	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	Pt 100	
Time measuring device (type)	Spec. clock	
Type of viscometer	Ostwald	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	7A		7B	
Capillary length (nominal)	180	mm	180	mm
Flow volume (nominal)	8	cm³	8	cm³
Viscometer constant	3.3208	mm²/s²	3.3377	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	20	°C
Air pressure	1023	hPa
Relative humidity	47	%

participating lab (abbreviation), standard liquid	VSL	B, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 20 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	594.3795	20.000	590.2157	20.000
First filling, efflux time 2, temperature 2	594.5189	20.000	590.4041	20.000
First filling, efflux time 3, temperature 3	594.5635	20.000	590.2005	20.000
First filling, efflux time 4, temperature 4	594.5431	20.000	590.7489	20.000
First filling, efflux time 5, temperature 5	594.7249	20.000	590.6313	20.000
Mean value	594.5460	20.000	590.4401	20.000
Second filling, efflux time 1, temperature 1	593.6047	20.000	591.0619	20.000
Second filling, efflux time 2, temperature 2	593.7285	20.000	591.0953	20.000
Second filling, efflux time 3, temperature 3	593.7439	20.000	590.9801	20.000
Second filling, efflux time 4, temperature 4	593.7231	20.000	591.0321	20.000
Second filling, efflux time 5, temperature 5	593.7939	20.000	591.1933	20.000
Mean value	593.7188	20.000	591.0726	20.000
Overall mean value	594.1324	20.000	590.7564	20.000

Mean value of viscosity of the two viscometers*	1972	mm²/s
Mean value of the temperature	20.000	°C

*Please do not correct the result to target temperature

Notes or observations:
- For a description of our Ostwald viscometers is referred to: S.J. Uitterdijk, *Method for reducing surface-tension effects in relative viscosity measurements with Ostwald-type viscometers* , Metrologia, 1997, **34**, 153-159
- No surface tension correction is applied. It has been demonstrated (see paper S. Uitterdijk) that this correction can be neglected for our type of Ostwald viscometers.

participating lab (abbreviation), standard liquid	VSL	B, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 20°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.082	1/K	0.000074	1/K		50
Density of the sample	0.88127	g/cm³	0.00013	g/cm³		50
Surface tension of the sample	32.83	mN/m	0.18	mN/m		50
Time measuring device		s	0.025	s	0.00004	50
Flow time measurements	590.75635	s	0.446	s	0.00076	9
Inclination of viscometers to vertical axis	0.00000	°	0.025	°	0.00010	50
Sample temperature	20.00000	°C	0.0049	K	0.00040	50
Viscometer Number 1, Viscometer constant	3.3208	mm²/s²	0.0032	mm²/s²	0.00095	50
Individual surface tension correction factor c_S (1)		%	0.012	%	0.00012	1000000
Kinetic energy correction t_{KE} (1)		s	0	s	0	1000000
Viscometer Number 2, Viscometer constant	3.33770	mm²/s²	0.0032	mm²/s²	0.00095	50
Individual surface tension correction factor c_S (2)		%	0.012	%	0.00012	1000000
Kinetic energy correction t_{KE} (2)		s	0	s	0	1000000
Ageing of viscometer glass		%	0.012	%	0.00012	1000000
Temperature gradient of thermostat		°C	0.0029	°C	0.00024	1000000

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.00133
Effective degrees of freedom, ν_{eff}	59
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.00
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0027

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 40 °C**

Name of participating laboratory	VSL
Country	Netherlands

MEASUREMENT **STANDARD LIQUID B, 40 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	October 29, 2012	
Remarks on the liquid (package, seals)	none	
Date of test	November 5-15, 2012	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	Pt 100	
Time measuring device (type)	Spec. clock	
Type of viscometer	Ostwald	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	6A		6B	
Capillary length (nominal)	180	mm	180	mm
Flow volume (nominal)	7.5	cm³	7.5	cm³
Viscometer constant	0.93396	mm²/s²	0.94250	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	20	°C
Air pressure	1014	hPa
Relative humidity	46	%

participating lab (abbreviation), standard liquid	VSL	B, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 40 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	505.2760	40.000	501.1756	40.000
First filling, efflux time 2, temperature 2	505.3800	40.000	501.2414	40.000
First filling, efflux time 3, temperature 3	505.4154	40.000	501.0582	40.000
First filling, efflux time 4, temperature 4	505.6522	40.000	501.1428	40.000
First filling, efflux time 5, temperature 5	505.4762	40.000	501.2130	40.000
Mean value	505.4400	40.000	501.1662	40.000
Second filling, efflux time 1, temperature 1	505.2716	40.000	500.3324	40.000
Second filling, efflux time 2, temperature 2	505.4306	40.000	500.5584	40.000
Second filling, efflux time 3, temperature 3	505.6688	40.000	500.6134	40.000
Second filling, efflux time 4, temperature 4	505.4874	40.000	500.6198	40.000
Second filling, efflux time 5, temperature 5	505.6488	40.000	500.8154	40.000
Mean value	505.5014	40.000	500.5879	40.000
Overall mean value	505.4707	40.000	500.8771	40.000

Mean value of viscosity of the two viscometers*	472.1	mm²/s
Mean value of the temperature	40.000	°C

*Please do not correct the result to target temperature

Notes or observations:
- For a description of our Ostwald viscometers is referred to: S.J. Uitterdijk, *Method for reducing surface-tension effects in relative viscosity measurements with Ostwald-type viscometers* , Metrologia, 1997, **34**, 153-159
- No surface tension correction is applied. It has been demonstrated (see paper S. Uitterdijk) that this correction can be neglected for our type of Ostwald viscometers.

participating lab (abbreviation), standard liquid	VSL	B, 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.063	1/K	0.000037	1/K		50
Density of the sample	0.86920	g/cm³	0.00018	g/cm³		50
Surface tension of the sample	31.04	mN/m	0.22	mN/m		50
Time measuring device		s	0.025	s	0.00005	50
Flow time measurements	500.87705	s	0.329	s	0.00066	9
Inclination of viscometers to vertical axis	0.00000	°	0.025	°	0.00010	50
Sample temperature	40.00000	°C	0.0049	K	0.00031	50
Viscometer Number 1, Viscometer constant	0.9340	mm²/s²	0.0007	mm²/s²	0.00071	50
Individual surface tension correction factor c_S (1)		%	0.012	%	0.00012	1000000
Kinetic energy correction t_{KE} (1)		s	0	s	0	1000000
Viscometer Number 2, Viscometer constant	0.94250	mm²/s²	0.0007	mm²/s²	0.00071	50
Individual surface tension correction factor c_S (2)		%	0.012	%	0.00012	1000000
Kinetic energy correction t_{KE} (2)		s	0	s	0	1000000
Ageing of viscometer glass		%	0.012	%	0.00012	1000000
Temperature gradient of thermostat		°C	0.0029	°C	0.00018	1000000

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.00105
Effective degrees of freedom, ν_{eff}	47
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.01
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0021

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID C , 40 °C**

Name of participating laboratory	VSL
Country	Netherlands

MEASUREMENT **STANDARD LIQUID C, 40 °C**

Name of standard liquid	C	
Date of arrival of the liquid at the laboratory	October 29, 2012	
Remarks on the liquid (package, seals)	none	
Date of test	November 5-15, 2012	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	Pt 100	
Time measuring device (type)	Spec. clock	
Type of viscometer	Ostwald	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	9A		9B	
Capillary length (nominal)	190	mm	190	mm
Flow volume (nominal)	20	cm³	20	cm³
Viscometer constant	32.051	mm²/s²	32.618	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	20	°C
Air pressure	1010	hPa
Relative humidity	46	%

participating lab (abbreviation), standard liquid	VSL	C, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID C, 40°C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	779.9077	40.000	767.7488	40.000
First filling, efflux time 2, temperature 2	780.0947	40.000	768.1720	40.000
First filling, efflux time 3, temperature 3	780.4017	40.000	768.6040	40.000
First filling, efflux time 4, temperature 4	780.0697	40.000	768.7976	40.000
First filling, efflux time 5, temperature 5	780.2403	40.000	768.4282	40.000
Mean value	780.1429	40.000	768.3501	40.000
Second filling, efflux time 1, temperature 1	779.8473	40.000	766.1070	40.000
Second filling, efflux time 2, temperature 2	779.9491	40.000	766.3358	40.000
Second filling, efflux time 3, temperature 3	780.1609	40.000	766.5426	40.000
Second filling, efflux time 4, temperature 4	780.3971	40.000	766.3694	40.000
Second filling, efflux time 5, temperature 5	780.3721	40.000	766.9892	40.000
Mean value	780.1453	40.000	766.4688	40.000
Overall mean value	780.1441	40.000	767.4094	40.000

Mean value of viscosity of the two viscometers*	25018	mm²/s
Mean value of the temperature	40.000	°C

*Please do not correct the result to target temperature

Notes or observations:
- For a description of our Ostwald viscometers is referred to: S.J. Uitterdijk, *Method for reducing surface-tension effects in relative viscosity measurements with Ostwald-type viscometers*, Metrologia, 1997, **34**, 153-159
- No surface tension correction is applied. It has been demonstrated (see paper S. Uitterdijk) that this correction can be neglected for our type of Ostwald viscometers.

participating lab (abbreviation), standard liquid	VSL	C, 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID C, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.083	1/K	0.00013	1/K		50
Density of the sample	0.88514	g/cm³	0.00019	g/cm³		50
Surface tension of the sample	31.40	mN/m	0.36	mN/m		50
Time measuring device		s	0.025	s	0.00003	50
Flow time measurements	767.40943	s	1.051	s	0.00137	9
Inclination of viscometers to vertical axis	0.00000	°	0.025	°	0.00010	50
Sample temperature	40.00000	°C	0.0049	K	0.00041	50
Viscometer Number 1, Viscometer constant	32.051	mm²/s²	0.047	mm²/s²	0.00147	50
Individual surface tension correction factor c_S (1)		%	0.012	%	0.00012	1000000
Kinetic energy correction t_{KE} (1)		s	0	s	0	1000000
Viscometer Number 2, Viscometer constant	32.618	mm²/s²	0.048	mm²/s²	0.00147	50
Individual surface tension correction factor c_S (2)		%	0.012	%	0.00012	1000000
Kinetic energy correction t_{KE} (2)		s	0	s	0	1000000
Ageing of viscometer glass		%	0.012	%	0.00012	1000000
Temperature gradient of thermostat		°C	0.0029	°C	0.00024	1000000

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.00209
Effective degrees of freedom, ν_{eff}	40
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.02
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0042

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 15 °C**

Name of participating laboratory	Bundesamt für Eich- und Vermessungswesen (BEV)
Country	Austria

MEASUREMENT **STANDARD LIQUID A, 15 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	7th Nov. 2012	
Remarks on the liquid (package, seals)	ok	
Date of test	Nov.-Dec. 2012	
Nominal measuring temperature	15	°C
Temperature measuring instrument (type)	TP Cal 100/25; 25 Ohm Pt-	
Time measuring device (type)	Stop Watch 8 Hanhart mer	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	874		598	
Capillary length (nominal)	90	mm	90	mm
Flow volume (nominal)	5.7	cm³	5.7	cm³
Viscometer constant	0.03004	mm²/s²	0.00996	mm²/s²
Correction factor due to acceleration of free fall	0.999582		0.999582	

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	21.30	°C
Air pressure	995.00	hPa
Relative humidity	35.00	%

participating lab (abbreviation), standard liquid	BEV	A, 15 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 15 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	186.030	15.000	560.630	15.004
First filling, efflux time 2, temperature 2	186.060	15.003	560.910	14.996
First filling, efflux time 3, temperature 3	186.090	15.001	560.940	14.999
First filling, efflux time 4, temperature 4	186.090	14.998	560.320	15.001
First filling, efflux time 5, temperature 5	186.220	14.994	560.410	15.004
Mean value	186.098	14.999	560.642	15.001
Second filling, efflux time 1, temperature 1	186.060	14.997	560.280	15.000
Second filling, efflux time 2, temperature 2	186.090	15.001	560.370	15.009
Second filling, efflux time 3, temperature 3	186.000	15.009	560.530	14.996
Second filling, efflux time 4, temperature 4	185.970	15.001	560.500	14.996
Second filling, efflux time 5, temperature 5	186.160	14.992	560.470	15.004
Mean value	186.056	15.000	560.430	15.001
Overall mean value	186.077	15.000	560.536	15.001

Mean value of viscosity of the two viscometers*	5.5890	mm²/s
Mean value of the temperature	15.002	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid		A , 15 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 15°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.028	1/K	0.000034	1/K		50
Density of the sample	0.81243	g/cm³	0.00012	g/cm³		50
Surface tension of the sample	28.50	mN/m	0.19	mN/m		50
Time measuring device				s		
Flow time measurements		s		s		
Inclination of viscometers to vertical axis	neglected	°		°		
Reference temperature of thermostat	15.00	°C		K		
Instability of temperature control of thermostat	0.01	°C		K		
Temperature gradient of thermostat		°C		K		
		°C		K		
Viscometer Number 1, Viscometer constant		mm²/s²		mm²/s²	0,0042 mm²/s	
Flow time measurements	126.420	s	0.200	s	0,009 mm²/s	50
Sample temperature	15.00000	°C	0.00500	K	0.0030	
Individual surface tension correction factor c_S (1)	4.35E-04		1.73E-05		0,029 mm²/s	∞
Kinetic energy correction t_{KE} (1)	3.00E-01	s	3.75E-04	s	1,7e-3 mm²/s	∞
Ageing of viscometer glass		%		%		
additional uncertainty/ observer influence	0		0.003		2,9e-3 mm²/s	∞

UNCERTAINTY OF MEASUREMENT RESULTS 1

Rel. combined standard uncertainty of viscosity, u_c	
Effective degrees of freedom, ν_{eff}	
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.0000
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	

Viscometer Number 2, Viscometer constant		mm²/s²		mm²/s²		
Flow time measurements	311.590	s	0.300	s	0,15 mm²/s	50
Sample temperature		°C		K		
Individual surface tension correction factor c_S (2)	4.35E-04		1.73E-05		0,022 mm²/s	∞
Kinetic energy correction t_{KE} (2)	3.00E-01	s	3.75E-04	s	1,4e-6 mm²/s	∞
Ageing of viscometer glass		%		%		
additional uncertainty/ observer influence	0		0.003		2,9e-3 mm²/s	∞

UNCERTAINTY OF MEASUREMENT RESULTS 2

Rel. combined standard uncertainty of viscosity, u_c	0.0019
Effective degrees of freedom, ν_{eff}	
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.0000
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0038

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 20 °C**

Name of participating laboratory	Bundesamt für Eich- und Vermessungswesen (BEV)
Country	Austria

MEASUREMENT **STANDARD LIQUID A, 20 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	7th Nov. 2012	
Remarks on the liquid (package, seals)	ok	
Date of test	Nov.-Dec. 2012	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	TP Cal 100/25; 25 Ohm Pt-	
Time measuring device (type)	Stop Watch 8 Hanhart mem	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	874		598	
Capillary length (nominal)	90	mm	90	mm
Flow volume (nominal)	5.7	cm³	5.7	cm³
Viscometer constant	0.03004	mm²/s²	0.009963	mm²/s²
Correction factor due to acceleration of free fall	0.999582		0.999582	

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	21.30	°C
Air pressure	995.00	hPa
Relative humidity	35.00	%

participating lab (abbreviation), standard liquid	BEV	A, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 20°C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	162.410	20.000	489.350	20.006
First filling, efflux time 2, temperature 2	162.370	20.003	488.910	20.010
First filling, efflux time 3, temperature 3	162.360	20.006	489.220	20.013
First filling, efflux time 4, temperature 4	162.530	20.007	489.180	20.009
First filling, efflux time 5, temperature 5	162.370	20.008	489.440	20.007
Mean value	162.408	20.005	489.220	20.009
Second filling, efflux time 1, temperature 1	162.470	19.998	489.680	20.009
Second filling, efflux time 2, temperature 2	162.470	19.996	489.910	20.008
Second filling, efflux time 3, temperature 3	162.440	20.001	489.633	19.993
Second filling, efflux time 4, temperature 4	162.530	19.996	490.030	19.996
Second filling, efflux time 5, temperature 5	162.500	20.002	489.410	19.990
Mean value	162.482	19.999	489.733	19.999
Overall mean value	162.445	20.002	489.476	20.004

Mean value of viscosity of the two viscometers*	4.8799	mm²/s
Mean value of the temperature	20.003	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid		A, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 20 °C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.027	1/K	0.000032	1/K		50
Density of the sample	0.80900	g/cm³	0.00012	g/cm³		50
Surface tension of the sample	28.07	mN/m	0.18	mN/m		50
Time measuring device				s		
Flow time measurements		s		s		
Inclination of viscometers to vertical axis	neglected	°		°		
Reference temperature of thermostat	15.00	°C		K		
Instability of temperature control of thermostat	0.01	°C		K		
Temperature gradient of thermostat		°C		K		
		°C		K		
Viscometer Number 1, Viscometer constant		mm²/s²		mm²/s²	0,0037mm²/s	
Flow time measurements	311.590	s	0.300	s	0,006 mm²/s	50
Sample temperature		°C		K		
Individual surface tension correction factor c_S (1)	4.35E-04		1.73E-05		0,029 mm²/s	∞
Kinetic energy correction t_{KE} (1)	3.00E-01	s	3.75E-04	s	1,7e-3 mm²/s	∞
Ageing of viscometer glass		%		%		
additional uncertainty/ observer influence	0		0.003		2,9e-3 mm²/s	∞

UNCERTAINTY OF MEASUREMENT RESULTS 1

Rel. combined standard uncertainty of viscosity, u_c	0.002
Effective degrees of freedom, ν_{eff}	
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.000
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0032

Viscometer Number 2, Viscometer constant		mm²/s²		mm²/s²		
Flow time measurements	311.590	s	0.300	s	0,15 mm²/s	50
Sample temperature		°C		K		
Individual surface tension correction factor c_S (2)	4.35E-04		1.73E-05		0,022 mm²/s	∞
Kinetic energy correction t_{KE} (2)	3.00E-01	s	3.75E-04	s	1,4e-6 mm²/s	∞
Ageing of viscometer glass		%		%		
additional uncertainty/ observer influence	0		0.003		2,9e-3 mm²/s	∞

UNCERTAINTY OF MEASUREMENT RESULTS 2

Rel. combined standard uncertainty of viscosity, u_c	
Effective degrees of freedom, ν_{eff}	
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 20 °C**

Name of participating laboratory	Bundesamt für Eich- und Vermessungswesen (BEV)
Country	Austria

MEASUREMENT **STANDARD LIQUID B, 20 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	7th Nov. 2012	
Remarks on the liquid (package, seals)	ok	
Date of test	Nov.-Dec. 2012	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	TP Cal 100/25; 25 Ohm Pt-r	
Time measuring device (type)	Stop Watch 8 Hanhart mem	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	883		882	
Capillary length (nominal)	90	mm	90	mm
Flow volume (nominal)	5.7	cm³	5.7	cm³
Viscometer constant	10.03000	mm²/s²	4.82600	mm²/s²
Correction factor due to acceleration of free fall	0.999582		0.999582	

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	21.30	°C
Air pressure	995.00	hPa
Relative humidity	35.00	%

participating lab (abbreviation), standard liquid	BEV	B, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 20 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	196.9400	19.988	409.4700	19.995
First filling, efflux time 2, temperature 2	197.1600	19.997	410.2000	19.996
First filling, efflux time 3, temperature 3	196.9600	19.996	409.3200	20.001
First filling, efflux time 4, temperature 4	196.8500	20.000	409.3900	20.003
First filling, efflux time 5, temperature 5	196.9200	20.004	409.2500	20.002
Mean value	196.9660	19.997	409.5260	19.999
Second filling, efflux time 1, temperature 1	196.8500	19.991	408.6300	20.007
Second filling, efflux time 2, temperature 2	196.7500	19.993	408.4700	20.003
Second filling, efflux time 3, temperature 3	196.8500	20.009	408.8500	19.999
Second filling, efflux time 4, temperature 4	196.4100	20.015	408.7200	20.005
Second filling, efflux time 5, temperature 5	196.3700	20.015	408.8700	20.002
Mean value	196.6460	20.005	408.7080	20.003
Overall mean value	196.8060	20.001	409.1170	20.001

Mean value of viscosity of the two viscometers*	1975.30	mm²/s
Mean value of the temperature	19.9987	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid		B, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 20°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.082	1/K	0.000074	1/K		50
Density of the sample	0.88127	g/cm³	0.00013	g/cm³		50
Surface tension of the sample	32.83	mN/m	0.18	mN/m		50
Time measuring device				s		
Flow time measurements		s		s		
Inclination of viscometers to vertical axis	neglected	°		°		
Reference temperature of thermostat	15.00	°C		K		
Instability of temperature control of thermostat	0.01	°C		K		
Temperature gradient of thermostat		°C		K		
		°C		K		
Viscometer Number 1, Viscometer constant		mm²/s²	0.00751	mm²/s²	1,5 mm²/s	
Flow time measurements	311.590	s	0.300	s	0,15 mm²/s	50
Sample temperature		°C		K		
Individual surface tension correction factor c_S (1)	4.35E-04		1.73E-05		0,022 mm²/s	∞
Kinetic energy correction t_{KE} (1)	3.00E-01	s	3.75E-04	s	1,4e-6 mm²/s	∞
Ageing of viscometer glass		%		%		
additional uncertainty/ observer influence	0		0.003		2,9e-3 mm²/s	∞

UNCERTAINTY OF MEASUREMENT RESULTS 1

Rel. combined standard uncertainty of viscosity, u_c	0.0027
Effective degrees of freedom, ν_{eff}	
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.0000
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0053

Viscometer Number 2, Viscometer constant		mm²/s²		mm²/s²		
Flow time measurements	311.590	s	0.300	s	0,15 mm²/s	50
Sample temperature		°C		K		
Individual surface tension correction factor c_S (2)	4.35E-04		1.73E-05		0,022 mm²/s	∞
Kinetic energy correction t_{KE} (2)	3.00E-01	s	3.75E-04	s	1,4e-6 mm²/s	∞
Ageing of viscometer glass		%		%		
additional uncertainty/ observer influence	0		0.003		2,9e-3 mm²/s	∞

UNCERTAINTY OF MEASUREMENT RESULTS 2

Rel. combined standard uncertainty of viscosity, u_c	
Effective degrees of freedom, ν_{eff}	
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 40 °C**

Name of participating laboratory	Bundesamt für Eich- und Vermessungswesen (BEV)
Country	Austria

MEASUREMENT **STANDARD LIQUID B, 40 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	7th Nov. 2012	
Remarks on the liquid (package, seals)	ok	
Date of test	Nov.-Dec. 2012	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	TP Cal 100/25; 25 Ohm Pt-r	
Time measuring device (type)	Stop Watch 8 Hanhart mem	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	881		878	
Capillary length (nominal)	90	mm	90	mm
Flow volume (nominal)	5.7	cm³	5.7	cm³
Viscometer constant	3.07300	mm²/s²	1.00500	mm²/s²
Correction factor due to acceleration of free fall	0.999582		0.999582	

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	21.30	°C
Air pressure	995.00	hPa
Relative humidity	35.00	%

participating lab (abbreviation), standard liquid	BEV	B, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 40 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	154.5000	39.982	471.9200	39.996
First filling, efflux time 2, temperature 2	154.2500	39.978	471.3300	40.000
First filling, efflux time 3, temperature 3	154.5900	39.988	471.0400	40.006
First filling, efflux time 4, temperature 4	154.1800	39.995	471.7700	39.994
First filling, efflux time 5, temperature 5	154.3700	39.989	471.2200	40.000
Mean value	154.3780	39.986	471.4560	39.999
Second filling, efflux time 1, temperature 1	153.9100	40.002	470.3500	39.990
Second filling, efflux time 2, temperature 2	153.7800	39.998	470.6800	40.002
Second filling, efflux time 3, temperature 3	153.9700	39.990	470.5900	40.000
Second filling, efflux time 4, temperature 4	153.7500	40.003	470.6800	40.002
Second filling, efflux time 5, temperature 5	153.6300	39.995	471.0000	40.004
Mean value	153.8080	39.998	470.6600	40.001
Overall mean value	154.0930	39.992	471.0580	40.000

Mean value of viscosity of the two viscometers*	473.757	mm²/s
Mean value of the temperature	39.9955	°C

39.99554 473.7568

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid		B, 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.063	1/K	0.000037	1/K		50
Density of the sample	0.86920	g/cm³	0.00018	g/cm³		50
Surface tension of the sample	31.04	mN/m	0.22	mN/m		50
Time measuring device				s		
Flow time measurements		s		s		
Inclination of viscometers to vertical axis	neglected	°		°		
Reference temperature of thermostat	15.00	°C		K		
Instability of temperature control of thermostat	0.01	°C		K		
Temperature gradient of thermostat		°C		K		
		°C		K		
Viscometer Number 1, Viscometer constant		mm²/s²	0.00230	mm²/s²	0,35mm²/s	
Flow time measurements	311.590	s	0.300	s	1,5 mm²/s	50
Sample temperature		°C		K		
Individual surface tension correction factor c_S (1)	4.35E-04		1.73E-05		0,022 mm²/s	∞
Kinetic energy correction t_{KE} (1)	3.00E-01	s	3.75E-04	s	1,4e-6 mm²/s	∞
Ageing of viscometer glass		%		%		
additional uncertainty/ observer influence	0		0.003		2,9e-3 mm²/s	∞

UNCERTAINTY OF MEASUREMENT RESULTS 1

Rel. combined standard uncertainty of viscosity, u_c	0.0034
Effective degrees of freedom, ν_{eff}	
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.0000
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0067

Viscometer Number 2, Viscometer constant		mm²/s²		mm²/s²		
Flow time measurements	311.590	s	0.300	s	0,15 mm²/s	50
Sample temperature		°C		K		
Individual surface tension correction factor c_S (2)	4.35E-04		1.73E-05		0,022 mm²/s	∞
Kinetic energy correction t_{KE} (2)	3.00E-01	s	3.75E-04	s	1,4e-6 mm²/s	∞
Ageing of viscometer glass		%		%		
additional uncertainty/ observer influence	0		0.003		2,9e-3 mm²/s	∞

UNCERTAINTY OF MEASUREMENT RESULTS 2

Rel. combined standard uncertainty of viscosity, u_c	
Effective degrees of freedom, ν_{eff}	
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID C, 20°C**

Name of participating laboratory	Bundesamt für Eich- und Vermessungswesen (BEV)
Country	Austria

MEASUREMENT **STANDARD LIQUID C, 20°C**

Name of standard liquid	C	
Date of arrival of the liquid at the laboratory	7th Nov. 2012	
Remarks on the liquid (package, seals)	ok	
Date of test	Nov.-Dec. 2012	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	TP Cal 100/25; 25 Ohm Pt	
Time measuring device (type)	Stop Watch 8 Hanhart mer	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	886		886	
Capillary length (nominal)	90	mm	90	mm
Flow volume (nominal)	5.7	cm³	5.7	cm³
Viscometer constant	50.36000	mm²/s²	50.36000	mm²/s²
Correction factor due to acceleration of free fall	0.999582		0.999582	

AMBIENT CONDITIONS

Quantity	Mean value	Unit	
Air temperature	21.30	°C	
Air pressure	995.00	hPa	
Relative humidity	35.00	%	
participating lab (abbreviation), standard liquid	BEV		C, 20 °C

MEASUREMENT RESULTS **BEV**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	3073.0900	19.991	3075.6300	19.995
First filling, efflux time 2, temperature 2	3076.7500	19.989	3074.5000	19.990
First filling, efflux time 3, temperature 3	3076.0600	19.987	3077.3500	19.998
First filling, efflux time 4, temperature 4	3077.9100	19.993	3076.2200	20.000
First filling, efflux time 5, temperature 5	3075.5900	19.995	3078.9700	20.003
Mean value	3076.6660	19.996	3076.6640	20.001
Second filling, efflux time 1, temperature 1	3075.6300	19.995	3077.2800	20.005
Second filling, efflux time 2, temperature 2	3074.5000	19.990	3076.4100	20.003
Second filling, efflux time 3, temperature 3	3077.3500	19.998	3076.6800	20.001
Second filling, efflux time 4, temperature 4	3076.2200	20.000	3077.2200	20.001
Second filling, efflux time 5, temperature 5	3078.9700	20.003	3076.7200	19.999
Mean value	3076.8640	19.999	3076.8620	20.002
Overall mean value	3076.7650	19.998	3076.7630	20.001

Mean value of viscosity of the two viscometers*	155022.0	mm²/s
Mean value of the temperature	19.9977	°C

*Please do not correct the result to target temperature

Notes or observations:		
participating lab (abbreviation), standard liquid		C, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID C, 20°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.101	1/K	0.00020	1/K		50
Density of the sample	0.89632	g/cm³	0.00018	g/cm³		50
Surface tension of the sample	32.45	mN/m	0.48	mN/m		50
Time measuring device				s		
Flow time measurements		s		s		
Inclination of viscometers to vertical axis		°		°		
Sample temperature		°C		K		
Viscometer Number 1, Viscometer constant		mm²/s²	0.00230	mm²/s²	120mm²/s	
Flow time measurements	311.590	s	0.300	s	250 mm²/s	50
Sample temperature		°C		K		
Individual surface tension correction factor c_S (1)	4.35E-04		1.73E-05		0,022 mm²/s	∞
Kinetic energy correction t_{KE} (1)	3.00E-01	s	3.75E-04	s	1,4e-6 mm²/s	∞
Ageing of viscometer glass		%		%		
additional uncertainty/ observer influence	0		0.003		2,9e-3 mm²/s	∞

UNCERTAINTY OF MEASUREMENT RESULTS 1

Rel. combined standard uncertainty of viscosity, u_c	0.0018
Effective degrees of freedom, ν_{eff}	
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.0000
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0036

Viscometer Number 2, Viscometer constant		mm²/s²		mm²/s²		
Flow time measurements	311.590	s	0.300	s	0,15 mm²/s	50
Sample temperature		°C		K		
Individual surface tension correction factor c_S (2)	4.35E-04		1.73E-05		0,022 mm²/s	∞
Kinetic energy correction t_{KE} (2)	3.00E-01	s	3.75E-04	s	1,4e-6 mm²/s	∞
Ageing of viscometer glass		%		%		
additional uncertainty/ observer influence	0		0.003		2,9e-3 mm²/s	∞

UNCERTAINTY OF MEASUREMENT RESULTS 2

Rel. combined standard uncertainty of viscosity, u_c	
Effective degrees of freedom, ν_{eff}	
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID C , 40 °C**

Name of participating laboratory	Bundesamt für Eich- und Vermessungswesen (BEV)
Country	Austria

MEASUREMENT **STANDARD LIQUID C, 40 °C**

Name of standard liquid	C	
Date of arrival of the liquid at the laboratory	7th Nov. 2012	
Remarks on the liquid (package, seals)	ok	
Date of test	Nov.-Dec. 2012	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	TP Cal 100/25; 25 Ohm Pt	
Time measuring device (type)	Stop Watch 8 Hanhart mer	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	886		884	
Capillary length (nominal)	90	mm	90	mm
Flow volume (nominal)	5.7	cm³	5.7	cm³
Viscometer constant	50.36000	mm²/s²	26.71000	mm²/s²
Correction factor due to acceleration of free fall	0.999582		0.999582	

AMBIENT CONDITIONS

Quantity	Mean value	Unit	
Air temperature	21.30	°C	
Air pressure	995.00	hPa	
Relative humidity	35.00	%	
participating lab (abbreviation), standard liquid	BEV		C, 40 °C

MEASUREMENT RESULTS **BEV**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	499.1700	39.982	940.6300	39.996
First filling, efflux time 2, temperature 2	498.2200	40.019	938.3700	40.019
First filling, efflux time 3, temperature 3	498.6800	39.990	938.0600	39.998
First filling, efflux time 4, temperature 4	497.9100	40.022	940.3500	40.000
First filling, efflux time 5, temperature 5	499.0900	39.987	938.3500	40.024
Mean value	498.6140	40.000	939.1520	40.001
Second filling, efflux time 1, temperature 1	498.5000	40.000	940.0600	40.002
Second filling, efflux time 2, temperature 2	499.1800	39.994	940.2200	40.012
Second filling, efflux time 3, temperature 3	499.2700	39.986	939.8500	40.007
Second filling, efflux time 4, temperature 4	498.0000	40.012	940.5600	40.006
Second filling, efflux time 5, temperature 5	498.2200	40.007	940.4400	40.002
Mean value	498.6340	40.000	940.2260	40.006
Overall mean value	498.6240	40.000	939.6890	40.003

Mean value of viscosity of the two viscometers*	25118.3	mm²/s	40.00096491	25118.335
Mean value of the temperature	40.0010	°C		

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid		C, 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID C, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.083	1/K	0.00013	1/K		50
Density of the sample	0.88514	g/cm³	0.00019	g/cm³		50
Surface tension of the sample	31.40	mN/m	0.36	mN/m		50
Time measuring device				s		
Flow time measurements		s		s		
Inclination of viscometers to vertical axis		°		°		
Sample temperature		°C		K		
Viscometer Number 1, Viscometer constant		mm²/s²	0.00230	mm²/s²	19mm²/s	
Flow time measurements	311.590	s	0.300	s	130 mm²/s	50
Sample temperature		°C		K		
Individual surface tension correction factor c_S (1)	4.35E-04		1.73E-05		0,022 mm²/s	∞
Kinetic energy correction t_{KE} (1)	3.00E-01	s	3.75E-04	s	1,4e-6 mm²/s	∞
Ageing of viscometer glass		%		%		
additional uncertainty/ observer influence	0		0.003		2,9e-3 mm²/s	∞

UNCERTAINTY OF MEASUREMENT RESULTS 1

Rel. combined standard uncertainty of viscosity, u_c	0.0050
Effective degrees of freedom, ν_{eff}	
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.0000
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0100

Viscometer Number 2, Viscometer constant		mm²/s²		mm²/s²		
Flow time measurements	311.590	s	0.300	s	0,15 mm²/s	50
Sample temperature		°C		K		
Individual surface tension correction factor c_S (2)	4.35E-04		1.73E-05		0,022 mm²/s	∞
Kinetic energy correction t_{KE} (2)	3.00E-01	s	3.75E-04	s	1,4e-6 mm²/s	∞
Ageing of viscometer glass		%		%		
additional uncertainty/ observer influence	0		0.003		2,9e-3 mm²/s	∞

UNCERTAINTY OF MEASUREMENT RESULTS 2

Rel. combined standard uncertainty of viscosity, u_c	
Effective degrees of freedom, ν_{eff}	
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.0000
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 15 °C**

Name of participating laboratory	Instituto Português da Qualidade
Country	Portugal

MEASUREMENT **STANDARD LIQUID A, 15 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	2012-11-08	
Remarks on the liquid (package, seals)	OK	
Date of test	2012-11-26 and 27	
Nominal measuring temperature	15	°C
Temperature measuring instrument (type)	PRT100, ASL F250 RH, SB250	
Time measuring device (type)	Electronic timer, LH 666092	
Type of viscometer	Ubbelohde 50 10 / 10 I	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	900295		900293	
Capillary length (nominal)	90	mm	90	mm
Flow volume (nominal)	5.7	cm³	5.7	cm³
Viscometer constant	0.01005	mm²/s²	0.01012	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	23.92	°C
Air pressure	998.13	hPa
Relative humidity	37.97	%

participating lab (abbreviation), standard liquid	IPQ	A, 15 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 15 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	556.91	14.955	553.03	14.955
First filling, efflux time 2, temperature 2	556.97	14.954	552.85	14.955
First filling, efflux time 3, temperature 3	556.90	14.954	552.89	14.956
First filling, efflux time 4, temperature 4	556.93	14.954	552.96	14.956
First filling, efflux time 5, temperature 5	557.00	14.955	552.75	14.955
Mean value	556.94	14.955	552.89	14.955
Second filling, efflux time 1, temperature 1	557.04	14.955	552.79	14.955
Second filling, efflux time 2, temperature 2	557.10	14.955	552.90	14.955
Second filling, efflux time 3, temperature 3	557.04	14.955	553.02	14.955
Second filling, efflux time 4, temperature 4	557.10	14.955	552.86	14.956
Second filling, efflux time 5, temperature 5	557.14	14.956	552.98	14.955
Mean value	557.08	14.955	552.91	14.955
Overall mean value	557.01	14.955	552.90	14.955

Mean value of viscosity of the two viscometers*	5.589	mm²/s
Mean value of the temperature	14.955	°C

*Please do not correct the result to target temperature

Notes or observations: Mean value of viscosity of the two viscometers for target temperature is 5,5815 mm^2/s

participating lab (abbreviation), standard liquid	IPQ	A , 15 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 15°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.028	1/K	3.36E-05	1/K	-8.51E-08	50
Density of the sample	812.428	kg/m³	1.22E-01	kg/m³	1.22E-06	50
Surface tension of the sample	0.0285	N/m	1.92E-04	N/m	1.12E-03	50
Time measuring device			3.90E-03	s	3.91E-05	50
Flow time measurements	554.96	s	1.27E-02	s	1.27E-04	19
Inclination of viscometers to vertical axis		°	2.50E-02	°	5.58E-04	50
Sample temperature	14.955	°C	2.26E-03	K	3.54E-04	103
Viscometer Number 1, Viscometer constant	0.01005	mm²/s²	5.03E-06	mm²/s²	2.79E-03	50
Individual surface tension correction factor cS (1)			1.12E-03		1.12E-03	50
Kinetic energy correction tKE (1)	0.00000	s	2.69E-04	s	-2.70E-06	1000000
Viscometer Number 2, Viscometer constant	0.01012	mm²/s²	5.06E-06	mm²/s²	2.79E-03	50
Individual surface tension correction factor cS (2)			1.12E-03		1.12E-03	50
Kinetic energy correction tKE (2)	0.00000	s	2.71E-04	s	-2.74E-06	1000000
Changing/ageing of the viscometers glass		mm²/s	6.70E-04	mm²/s	6.70E-04	1000000
Manual starting/stopping of the stopwatch		s	2.50E-02	s	2.51E-04	1000000

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.0008
Effective degrees of freedom, ν_{eff}	163
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	1.9746
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0016

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 20 °C**

Name of participating laboratory	Instituto Português da Qualidade
Country	Portugal

MEASUREMENT **STANDARD LIQUID A, 20 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	2012-11-08	
Remarks on the liquid (package, seals)	OK	
Date of test	2012-11-14, 23 and 28	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	PRT100, ASL F250 RH, SB250	
Time measuring device (type)	Electronic timer, LH 666092	
Type of viscometer	Ubbelohde 50 10 / 10 I	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	900295		900293	
Capillary length (nominal)	90	mm	90	mm
Flow volume (nominal)	5.7	cm³	5.7	cm³
Viscometer constant	0.01005	mm²/s²	0.01012	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	23.96	°C
Air pressure	998.64	hPa
Relative humidity	37.36	%

participating lab (abbreviation), standard liquid	IPQ	A, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 20°C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	485.08	20.013	481.97	20.019
First filling, efflux time 2, temperature 2	485.31	20.013	482.04	20.019
First filling, efflux time 3, temperature 3	485.21	20.012	481.99	20.019
First filling, efflux time 4, temperature 4	485.30	20.012	481.95	20.019
First filling, efflux time 5, temperature 5	485.23	20.012	482.00	20.018
Mean value	485.23	20.012	481.99	20.019
Second filling, efflux time 1, temperature 1	485.37	20.020	482.04	20.022
Second filling, efflux time 2, temperature 2	485.30	20.019	482.02	20.021
Second filling, efflux time 3, temperature 3	485.51	20.019	481.84	20.022
Second filling, efflux time 4, temperature 4	485.24	20.018	482.00	20.021
Second filling, efflux time 5, temperature 5	485.25	20.019	481.82	20.021
Mean value	485.34	20.019	481.95	20.021
Overall mean value	485.28	20.016	481.97	20.020

Mean value of viscosity of the two viscometers*	4.8702	mm²/s
Mean value of the temperature	20.018	°C

*Please do not correct the result to target temperature

Notes or observations: Mean value of viscosity of the two viscometers for target temperature is 4,8726 mm^2/s

participating lab (abbreviation), standard liquid	IPQ	A, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 20 °C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.027	1/K	3.2E-05	1/K	2.48E-08	50
Density of the sample	809.003	kg/m³	1.2E-01	kg/m³	1.08E-06	50
Surface tension of the sample	0.0281	N/m	1.8E-04	N/m	9.75E-04	50
Time measuring device			3.4E-03	s	3.41E-05	50
Flow time measurements	483.63	s	1.4E-02	s	1.37E-04	19
Inclination of viscometers to vertical axis		°	2.5E-02	°	4.87E-04	50
Sample temperature	20.018	°C	2.2E-03	K	3.06E-04	101
Viscometer Number 1, Viscometer constant	0.01005	mm²/s²	5.0E-06	mm²/s²	2.44E-03	50
Individual surface tension correction factor c_S (1)			9.7E-04		9.74E-04	50
Kinetic energy correction t_{KE} (1)	0.000000	s	3.1E-04	s	-3.10E-06	1000000
Viscometer Number 2, Viscometer constant	0.01012	mm²/s²	5.1E-06	mm²/s²	2.44E-03	50
Individual surface tension correction factor c_S (2)			9.7E-04		9.74E-04	50
Kinetic energy correction t_{KE} (2)	0.000000	s	3.1E-04	s	-3.15E-06	1000000
Changing/ageing of the viscometers glass		mm²/s	5.8E-04	mm²/s	5.85E-04	1000000
Manual starting/stopping of the stopwatch		s	2.5E-02	s	2.51E-04	1000000

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.0008
Effective degrees of freedom, ν_{eff}	163
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	1.975
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0016

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 20 °C**

Name of participating laboratory	Instituto Português da Qualidade
Country	Portugal

MEASUREMENT **STANDARD LIQUID B, 20 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	2012-11-08	
Remarks on the liquid (package, seals)	OK	
Date of test	2012-11-15, 16, 22 and 28	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	PRT100, ASL F250 RH, SB250	
Time measuring device (type)	Electronic timer, LH 666092	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	900404		900397	
Capillary length (nominal)	90	mm	90.0000	mm
Flow volume (nominal)	5.7	cm³	5.7	cm³
Viscometer constant	4.942	mm²/s²	4.863	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	24.17	°C
Air pressure	1000.68	hPa
Relative humidity	34.26	%

participating lab (abbreviation), standard liquid	IPQ	B, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 20 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	398.40	20.019	404.48	20.018
First filling, efflux time 2, temperature 2	398.42	20.018	404.63	20.019
First filling, efflux time 3, temperature 3	398.47	20.018	404.51	20.019
First filling, efflux time 4, temperature 4	398.37	20.018	404.60	20.018
First filling, efflux time 5, temperature 5	398.39	20.018	404.41	20.018
Mean value	398.41	20.018	404.52	20.018
Second filling, efflux time 1, temperature 1	397.96	20.021	404.44	20.019
Second filling, efflux time 2, temperature 2	398.00	20.022	404.39	20.022
Second filling, efflux time 3, temperature 3	397.96	20.021	404.39	20.021
Second filling, efflux time 4, temperature 4	397.96	20.022	404.38	20.022
Second filling, efflux time 5, temperature 5	398.00	20.022	404.35	20.021
Mean value	397.97	20.022	404.39	20.021
Overall mean value	398.19	20.020	404.46	20.020

Mean value of viscosity of the two viscometers*	1962.03	mm²/s
Mean value of the temperature	20.020	°C

*Please do not correct the result to target temperature

Notes or observations: Mean value of viscosity of the two viscometers for target temperature is 1965,216 mm^2/s

participating lab (abbreviation), standard liquid	IPQ	B, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 20°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.082	1/K	7.4E-05	1/K	1.4E-02	50
Density of the sample	881.268	kg/m³	1.3E-01	kg/m³	3.9E-04	50
Surface tension of the sample	0.0328	N/m	1.8E-04	N/m	3.9E-01	50
Time measuring device			2.8E-03	s	1.4E-02	50
Flow time measurements	401.32	s	2.5E-02	s	1.2E-01	19
Inclination of viscometers to vertical axis		°	2.5E-02	°	2.0E-01	50
Sample temperature	20.020	°C	2.4E-03	K	3.8E-01	99
Viscometer Number 1, Viscometer constant	4.942	mm²/s²	7.9E-03	mm²/s²	3.1E+00	50
Individual surface tension correction factor cS (1)			3.9E-01		3.9E-01	50
Kinetic energy correction tKE (1)	1.00000	s	3.8E-04	s	-1.9E-03	1000000
Viscometer Number 2, Viscometer constant	4.863	mm²/s²	7.8E-03	mm²/s²	3.1E+00	50
Individual surface tension correction factor cS (2)			3.9E-01		3.9E-01	50
Kinetic energy correction tKE (2)	0.00000	s	3.7E-04	s	-1.8E-03	1000000
Changing/ageing of the viscometers glass		mm²/s	2.4E-01	mm²/s	2.4E-01	1000000
Manual starting/stopping of the stopwatch		s	2.5E-02	s	1.2E-01	1000000

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.0023
Effective degrees of freedom, ν_{eff}	107
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	1.98
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0046

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 40 °C**

Name of participating laboratory	Instituto Português da Qualidade
Country	Portugal

MEASUREMENT **STANDARD LIQUID B, 40 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	2012-11-08	
Remarks on the liquid (package, seals)	OK	
Date of test	2012-11-19, 20, 21 and 29	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	PRT100, ASL F250 RH, SB250	
Time measuring device (type)	Electronic timer, LH 666092	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	900487		900462	
Capillary length (nominal)	90	mm	90	mm
Flow volume (nominal)	5.7	cm³	5.7	cm³
Viscometer constant	1.004	mm²/s²	0.9931	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	24.61	°C
Air pressure	1000.96	hPa
Relative humidity	33.46	%

participating lab (abbreviation), standard liquid	IPQ	B, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 40 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	469.75	40.070	474.36	40.068
First filling, efflux time 2, temperature 2	469.72	40.070	474.43	40.068
First filling, efflux time 3, temperature 3	469.53	40.068	474.25	40.067
First filling, efflux time 4, temperature 4	469.75	40.068	474.42	40.068
First filling, efflux time 5, temperature 5	469.63	40.068	474.29	40.068
Mean value	469.68	40.069	474.35	40.068
Second filling, efflux time 1, temperature 1	469.62	40.073	474.81	40.073
Second filling, efflux time 2, temperature 2	469.58	40.073	474.80	40.073
Second filling, efflux time 3, temperature 3	469.55	40.073	474.79	40.073
Second filling, efflux time 4, temperature 4	469.48	40.073	474.77	40.072
Second filling, efflux time 5, temperature 5	469.45	40.073	474.75	40.072
Mean value	469.54	40.073	474.79	40.072
Overall mean value	469.61	40.071	474.57	40.070

Mean value of viscosity of the two viscometers*	469.974	mm²/s
Mean value of the temperature	40.070	°C

*Please do not correct the result to target temperature

Notes or observations: Mean value of viscosity of the two viscometers for target temperature is 472,0597 mm^2/s

participating lab (abbreviation), standard liquid	IPQ	B, 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.063	1/K	3.7E-05	1/K	1.2E-03	50
Density of the sample	869.200	kg/m³	1.8E-01	kg/m³	1.3E-04	50
Surface tension of the sample	0.0310	N/m	2.2E-04	N/m	9.4E-02	50
Time measuring device			3.3E-03	s	3.3E-03	50
Flow time measurements	472.09	s	2.6E-02	s	2.6E-02	19
Inclination of viscometers to vertical axis		°	2.5E-02	°	4.7E-02	50
Sample temperature	40.070	°C	2.2E-03	K	6.6E-02	99
Viscometer Number 1, Viscometer constant	1.004	mm²/s²	1.0E-03	mm²/s²	4.7E-01	50
Individual surface tension correction factor cS (1)			9.4E-02		9.4E-02	50
Kinetic energy correction tKE (1)	1.00000	s	3.2E-04	s	-3.2E-04	1000000
Viscometer Number 2, Viscometer constant	0.99310	mm²/s²	9.9E-04	mm²/s²	4.7E-01	50
Individual surface tension correction factor cS (2)			9.4E-02		9.4E-02	50
Kinetic energy correction tKE (2)	0.00000	s	3.2E-04	s	-3.1E-04	1000000
Changing/ageing of the viscometers glass		mm²/s	5.7E-02	mm²/s	5.7E-02	1000000
Manual starting/stopping of the stopwatch		s	2.5E-02	s	2.5E-02	1000000

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.0015
Effective degrees of freedom, ν_{eff}	117
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	1.98
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0029

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 20 °C**

Name of participating laboratory	Kenya Bureau of Standards (KEBS)
Country	Kenya

MEASUREMENT	**STANDARD LIQUID A, 20 °C**	
Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	9th November 2012	
Remarks on the liquid (package, seals)	Intact	
Date of test	16th January 2013	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	Ref Liquid-in-glass thermometer	
Time measuring device (type)	Digital timer	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	I/201010		1037307	
Capillary length (nominal)	90	mm	90	mm
Flow volume (nominal)	5.7	cm³	5.7	cm³
Viscometer constant	0.009821	mm²/s²	0.009701	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	23	°C
Air pressure	836	hPa
Relative humidity	50	%

participating lab (abbreviation), standard liquid	KEBS	A, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 20°C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	496.35	20.00	502.50	20.00
First filling, efflux time 2, temperature 2	496.41	20.00	502.50	20.00
First filling, efflux time 3, temperature 3	496.37	20.00	502.53	20.00
First filling, efflux time 4, temperature 4	496.32	20.00	502.59	20.00
First filling, efflux time 5, temperature 5	496.41	20.00	502.50	20.00
Mean value	496.372	20.00	502.524	20.00
Second filling, efflux time 1, temperature 1	496.50	20.00	502.56	20.00
Second filling, efflux time 2, temperature 2	496.41	20.00	502.56	20.00
Second filling, efflux time 3, temperature 3	496.44	20.00	502.59	20.00
Second filling, efflux time 4, temperature 4	496.50	20.00	502.63	20.00
Second filling, efflux time 5, temperature 5	496.44	20.00	502.63	20.00
Mean value	496.458	20.00	502.594	20.00
Overall mean value	496.415	20.00	502.559	20.00

Mean value of viscosity of the two viscometers*	4.875308	mm²/s
Mean value of the temperature	20.00	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	KEBS	A, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 20 °C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.027	1/K	0.000032	1/K		50
Density of the sample	0.80900	g/cm³	0.00012	g/cm³	negligible	50
Surface tension of the sample	28.07	mN/m	0.18	mN/m	negligible	50
Time measuring device			0.1544	s	$1{,}73 \cdot 10^{-4}$	1000000
Flow time measurements	499.487	s	0.05874	s	$3{,}74 \cdot 10^{-5}$	9
Inclination of viscometers to vertical axis	0	°		°	$3{,}46 \cdot 10^{-4}$	1000000
Sample temperature	20.00	°C	0.02571	K	$4{,}01 \cdot 10^{-4}$	1000000
Viscometer Number 1, Viscometer constant	0.009821	mm²/s²	$9{,}82 \cdot 10^{-6}$	mm²/s²	$5{,}00 \cdot 10^{-4}$	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	0.009701	mm²/s²	$7{,}08 \cdot 10^{-5}$	mm²/s²	$3{,}65 \cdot 10^{-3}$	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	$2{,}11 \cdot 10^{-3}$
Effective degrees of freedom, ν_{eff}	54
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	$4{,}22 \cdot 10^{-3}$

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 20 °C**

Name of participating laboratory	Kenya Bureau of Standards (KEBS)
Country	Kenya

MEASUREMENT **STANDARD LIQUID B, 20 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	9th November 2012	
Remarks on the liquid (package, seals)	Intact	
Date of test	18th January 2013	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	Ref Liquid-in-glass thermometer	
Time measuring device (type)	Digital timer	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	IIIc/201033		1038168	
Capillary length (nominal)	90	mm	90	mm
Flow volume (nominal)	5.7	cm³	5.7	cm³
Viscometer constant	3.0255	mm²/s²	2.9959	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	23	°C
Air pressure	836	hPa
Relative humidity	50	%

participating lab (abbreviation), standard liquid	KEBS	B, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 20 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	650.72	20.00	657.03	20.00
First filling, efflux time 2, temperature 2	650.56	20.00	657.16	20.00
First filling, efflux time 3, temperature 3	650.72	20.00	657.06	20.00
First filling, efflux time 4, temperature 4	650.56	20.00	657.03	20.00
First filling, efflux time 5, temperature 5	650.75	20.00	657.16	20.00
Mean value	650.662	20.00	657.088	20.00
Second filling, efflux time 1, temperature 1	650.63	20.00	657.16	20.00
Second filling, efflux time 2, temperature 2	650.75	20.00	657.13	20.00
Second filling, efflux time 3, temperature 3	650.63	20.00	657.03	20.00
Second filling, efflux time 4, temperature 4	650.75	20.00	657.03	20.00
Second filling, efflux time 5, temperature 5	650.75	20.00	657.16	20.00
Mean value	650.702	20.00	657.102	20.00
Overall mean value	650.682	20.00	657.095	20.00

Mean value of viscosity of the two viscometers*	1968.6147	mm²/s
Mean value of the temperature	20.00	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	KEBS	B, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 20°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.082	1/K	0.000074	1/K		50
Density of the sample	0.88127	g/cm³	0.00013	g/cm³	negligible	50
Surface tension of the sample	32.83	mN/m	0.18	mN/m	negligible	50
Time measuring device			0.1544	s	$1{,}73 \cdot 10^{-4}$	1000000
Flow time measurements	653.889	s	0.07927	s	$3{,}85 \cdot 10^{-5}$	9
Inclination of viscometers to vertical axis	0	°		°	$3{,}46 \cdot 10^{-4}$	1000000
Sample temperature	20.00	°C	0.02571	K	$4{,}01 \cdot 10^{-4}$	1000000
Viscometer Number 1, Viscometer constant	3.0255	mm²/s²	0.006051	mm²/s²	$1{,}00 \cdot 10^{-3}$	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	2.9959	mm²/s²	0.022769	mm²/s²	$3{,}80 \cdot 10^{-3}$	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	$2{,}56 \cdot 10^{-3}$
Effective degrees of freedom, ν_{eff}	65
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	$5{,}12 \cdot 10^{-3}$

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 40 °C**

Name of participating laboratory	Kenya Bureau of Standards (KEBS)
Country	Kenya

MEASUREMENT	**STANDARD LIQUID B, 40 °C**	
Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	9th November 2012	
Remarks on the liquid (package, seals)	Intact	
Date of test	18th January 2013	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	Ref Liquid-in-glass thermometer	
Time measuring device (type)	Digital timer	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	III/201030		1036925	
Capillary length (nominal)	90	mm	90	mm
Flow volume (nominal)	5.7	cm³	5.7	cm³
Viscometer constant	0.98734	mm²/s²	0.9841	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	23	°C
Air pressure	836	hPa
Relative humidity	50	%

participating lab (abbreviation), standard liquid	KEBS	B, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 40 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	477.82	40.00	479.47	40.00
First filling, efflux time 2, temperature 2	477.72	40.00	479.37	40.00
First filling, efflux time 3, temperature 3	477.85	40.00	479.37	40.00
First filling, efflux time 4, temperature 4	477.78	40.00	479.32	40.00
First filling, efflux time 5, temperature 5	477.75	40.00	479.41	40.00
Mean value	477.784	40.00	479.388	40.00
Second filling, efflux time 1, temperature 1	477.78	40.00	479.35	40.00
Second filling, efflux time 2, temperature 2	477.75	40.00	479.25	40.00
Second filling, efflux time 3, temperature 3	477.78	40.00	479.38	40.00
Second filling, efflux time 4, temperature 4	477.82	40.00	479.28	40.00
Second filling, efflux time 5, temperature 5	477.68	40.00	479.32	40.00
Mean value	477.762	40.00	479.316	40.00
Overall mean value	477.773	40.00	479.352	40.00

Mean value of viscosity of the two viscometers*	471.7274	mm²/s
Mean value of the temperature	40.00	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	KEBS	B, 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.063	1/K	0.000037	1/K		50
Density of the sample	0.86920	g/cm³	0.00018	g/cm³	negligible	50
Surface tension of the sample	31.04	mN/m	0.22	mN/m	negligible	50
Time measuring device			0.1544	s	$1{,}73 \cdot 10^{-4}$	1000000
Flow time measurements	478.5625	s	0.06356	s	$4{,}19 \cdot 10^{-5}$	9
Inclination of viscometers to vertical axis	0	°		°	$3{,}46 \cdot 10^{-4}$	1000000
Sample temperature	40.00	°C	0.02571	K	$9{,}35 \cdot 10^{-4}$	1000000
Viscometer Number 1, Viscometer constant	0.98734	mm²/s²	0.001975	mm²/s²	$1{,}00 \cdot 10^{-3}$	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	0.9841	mm²/s²	0.007381	mm²/s²	$3{,}75 \cdot 10^{-3}$	50
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	$2{,}48 \cdot 10^{-3}$
Effective degrees of freedom, ν_{eff}	60
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	$4{,}96 \cdot 10^{-3}$

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 15 °C**

Name of participating laboratory	National Insitiute for Standards
Country	Egypt

MEASUREMENT **STANDARD LIQUID A, 15 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	2012/12/11	
Remarks on the liquid (package, seals)	ok	
Date of test	2012/12/12	
Nominal measuring temperature	15	°C
Temperature measuring instrument (type)	SPRT	
Time measuring device (type)	StopeWatch	
Type of viscometer	pelohde Viscometer	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	N6686		N6695	
Capillary length (nominal)	100.0000	mm	100.0000	mm
Flow volume (nominal)	25.0000	cm³	25.0000	cm³
Viscometer constant	0.01046	mm²/s²	0.02993	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	25.00000	°C
Air pressure	76.20	hPa
Relative humidity	37.00	%

participating lab (abbreviation), standard liquid	NIS	A, 15 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 15 °C**

	Viscometer 1		Viscometer 2		
	s	°C	s	°C	
First filling, efflux time 1, temperature 1	535.780	15.00005	187.210	15.00005	0.42068991
First filling, efflux time 2, temperature 2	535.130	15.00005	187.160	15.00005	0.091378334
First filling, efflux time 3, temperature 3	535.860	15.00005	187.170	15.00005	0.111669154
First filling, efflux time 4, temperature 4	535.520	15.00005	187.180	15.00005	0.053572381
First filling, efflux time 5, temperature 5	534.880	15.00005	187.380	15.00005	0.169327445
Mean value	535.434	15.00005	187.220	15.00005	
	5.601		5.603		
Second filling, efflux time 1, temperature 1	534.790	15.00005	186.850	15.00005	
Second filling, efflux time 2, temperature 2	534.590	15.00005	186.950	15.00005	
Second filling, efflux time 3, temperature 3	534.880	15.00005	186.880	15.00005	
Second filling, efflux time 4, temperature 4	534.840	15.00005	186.960	15.00005	
Second filling, efflux time 5, temperature 5	534.760	15.00005	186.970	15.00005	
Mean value	534.772	15.00005	186.922	15.00005	
	5.594		5.595		
Overall mean value	5.597		5.599		

Mean value of viscosity of the two viscometers*	5.598	mm²/s
Mean value of the temperature	15.00005	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid		A , 15 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	to be specified	1/K		1/K		50
Density of the sample	to be specified	g/cm³		g/cm³		50
Surface tension of the sample	to be specified	mN/m		mN/m		50
Time measuring device			0.02000	s		50
Flow time measurements	535.10300	s	0.05357	s	0.0001	50
Inclination of viscometers to vertical axis	0.00000	°	0.00000	°		50
Sample temperature	15.00005	°C	0.00200	K	0.0001	50
Viscometer Number 1, Viscometer constant	0.01046	mm²/s²	0.00024	mm²/s²	0.0225	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	0.02993	mm²/s²	0.00067	mm²/s²	0.0225	
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.0225
Effective degrees of freedom, ν_{eff}	50.0000
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.0000
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0450

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 20 °C**

Name of participating laboratory	National Institute for Standards
Country	Egypt

MEASUREMENT **STANDARD LIQUID A, 20 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	2012/12/11	
Remarks on the liquid (package, seals)	ok	
Date of test	2012/12/20	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	SPRT	
Time measuring device (type)	StopeWatch	
Type of viscometer	Ubbelohde Viscometer	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	N6686		N6695	
Capillary length (nominal)	100.0000	mm	100.0000	mm
Flow volume (nominal)	25.0000	cm^3	25.0000	cm^3
Viscometer constant	0.01046	mm^2/s^2	0.02993	mm^2/s^2
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	25.00000	°C
Air pressure	76.20	hPa
Relative humidity	37.00	%

participating lab (abbreviation), standard liquid	NIS	A, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 20°C**

	Viscometer 1		Viscometer 2		
	s	°C	s	°C	
First filling, efflux time 1, temperature 1	466.950	20.00007	163.340	20.00007	0.137731623
First filling, efflux time 2, temperature 2	466.660	20.00007	163.560	20.00007	0.159154013
First filling, efflux time 3, temperature 3	466.790	20.00007	163.190	20.00007	0.265744238
First filling, efflux time 4, temperature 4	466.720	20.00007	163.180	20.00007	0.122759928
First filling, efflux time 5, temperature 5	466.590	20.00007	163.410	20.00007	0.171347451
Mean value	466.742	20.00007	163.336	20.00007	0.214184313
	4.882		4.889		
Second filling, efflux time 1, temperature 1	467.560	20.00007	163.190	20.00007	
Second filling, efflux time 2, temperature 2	467.600	20.00007	163.070	20.00007	
Second filling, efflux time 3, temperature 3	467.270	20.00007	163.060	20.00007	
Second filling, efflux time 4, temperature 4	467.900	20.00007	163.300	20.00007	
Second filling, efflux time 5, temperature 5	467.260	20.00007	163.320	20.00007	
Mean value	467.518	20.00007	163.188	20.00007	
	4.890		4.884		
Overall mean value	4.886		4.886		

Mean value of viscosity of the two viscometers*	4.886	mm^2/s
Mean value of the temperature	20.00007	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid		A, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 20 °C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	to be specified	1/K		1/K		50
Density of the sample	to be specified	g/cm^3		g/cm^3		50
Surface tension of the sample	to be specified	mN/m		mN/m		50
Time measuring device			0.02000	s		50
Flow time measurements	467.13000	s	0.21418	s	0.0005	50
Inclination of viscometers to vertical axis	0.00000	°	0.00000	°		50
Sample temperature	20.00007	°C	0.00200	K	0.0001	50
Viscometer Number 1, Viscometer constant	0.01046	mm^2/s^2	0.00024	mm^2/s^2	0.0225	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	0.02993	mm^2/s^2	0.00067	mm^2/s^2	0.0225	
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.0225
Effective degrees of freedom, ν_{eff}	50.0000
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.0000
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0450

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 20 °C**

Name of participating laboratory	National Institute for Standards
Country	Egypt

MEASUREMENT **STANDARD LIQUID B, 20 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	2012/12/11	
Remarks on the liquid (package, seals)	ok	
Date of test	2012/12/18	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	SPRT	
Time measuring device (type)	StopeWatch	
Type of viscometer	Ubbelohde Viscometer	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	29204		39757	
Capillary length (nominal)	100.0000	mm	100.0000	mm
Flow volume (nominal)	25.0000	cm^3	25.0000	cm^3
Viscometer constant	4.3730	mm^2/s^2	2.7670	mm^2/s^2
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	25.00000	°C
Air pressure	76.20	hPa
Relative humidity	37.00	%

participating lab (abbreviation), standard liquid	NIS	B, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 20 °C**

	Viscometer 1		Viscometer 2		
	s	°C	s	°C	
First filling, efflux time 1, temperature 1	452.020	20.00007	715.090	20.00007	0.242218909
First filling, efflux time 2, temperature 2	451.890	20.00007	714.060	20.00007	0.395132889
First filling, efflux time 3, temperature 3	451.950	20.00007	714.320	20.00007	0.225055549
First filling, efflux time 4, temperature 4	451.740	20.00007	714.230	20.00007	0.421449878
First filling, efflux time 5, temperature 5	452.390	20.00007	714.430	20.00007	0.320964306
Mean value	451.998	20.00007	714.426	20.00007	0.401205383
	1976.587		1976.817		
Second filling, efflux time 1, temperature 1	452.690	20.00007	715.170	20.00007	
Second filling, efflux time 2, temperature 2	452.080	20.00007	715.270	20.00007	
Second filling, efflux time 3, temperature 3	452.340	20.00007	715.020	20.00007	
Second filling, efflux time 4, temperature 4	452.230	20.00007	715.970	20.00007	
Second filling, efflux time 5, temperature 5	452.310	20.00007	715.830	20.00007	
Mean value	452.330	20.00007	715.452	20.00007	
	1978.039		1979.656		
Overall mean value	1977.313	20.00007	1978.236	20.00007	

Mean value of viscosity of the two viscometers*	1977.775	mm^2/s
Mean value of the temperature	20.00007	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid		B, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 20°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	to be specified	1/K		1/K		50
Density of the sample	to be specified	g/cm^3		g/cm^3		50
Surface tension of the sample	to be specified	mN/m		mN/m		50
Time measuring device			0.02000	s		50
Flow time measurements	452.16400	s	0.40120	s	0.0009	50
Inclination of viscometers to vertical axis	0.00000	°	0.00000	°		50
Sample temperature	20.00007	°C	0.00200	K	0.0001	50
Viscometer Number 1, Viscometer constant	4.37300	mm^2/s^2	0.09839	mm^2/s^2	0.0225	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	2.76700	mm^2/s^2	0.06226	mm^2/s^2	0.0225	
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.0225
Effective degrees of freedom, ν_{eff}	50.0000
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.0000
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0450

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 40 °C**

Name of participating laboratory	National Institute for Standards
Country	Egypt

MEASUREMENT **STANDARD LIQUID B, 40 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	2012/12/11	
Remarks on the liquid (package, seals)	ok	
Date of test	2013/1/1	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	SPRT	
Time measuring device (type)	StopeWatch	
Type of viscometer	Ubbelohde Viscometer	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	29204		39757	
Capillary length (nominal)		mm	100.0000	mm
Flow volume (nominal)		cm³	25.0000	cm³
Viscometer constant	4.3730	mm²/s²	2.7670	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	25.00000	°C
Air pressure	76.20	hPa
Relative humidity	37.00	%

participating lab (abbreviation), standard liquid	NIS	B, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 40 °C**

	Viscometer 1		Viscometer 2		
	s	°C	s	°C	
First filling, efflux time 1, temperature 1	108.540	40.00020	172.020	40.00020	0.15533834
First filling, efflux time 2, temperature 2	108.730	40.00020	171.850	40.00020	0.236495243
First filling, efflux time 3, temperature 3	108.560	40.00020	171.600	40.00020	0.164225455
First filling, efflux time 4, temperature 4	108.630	40.00020	171.400	40.00020	0.121531889
First filling, efflux time 5, temperature 5	108.310	40.00020	171.710	40.00020	0.169397732
Mean value	108.554	40.00020	171.716	40.00020	0.211747165
	474.707		475.138		
Second filling, efflux time 1, temperature 1	108.430	40.00020	171.400	40.00020	
Second filling, efflux time 2, temperature 2	108.790	40.00020	171.610	40.00020	
Second filling, efflux time 3, temperature 3	108.400	40.00020	171.630	40.00020	
Second filling, efflux time 4, temperature 4	108.510	40.00020	171.590	40.00020	
Second filling, efflux time 5, temperature 5	108.660	40.00020	171.380	40.00020	
Mean value	108.558	40.00020	171.522	40.00020	
	474.724		474.601		
Overall mean value	474.715	40.00020	474.870	40.00020	

Mean value of viscosity of the two viscometers*	474.793	mm²/s
Mean value of the temperature	40.00020	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid		B, 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	to be specified	1/K		1/K		50
Density of the sample	to be specified	g/cm³		g/cm³		50
Surface tension of the sample	to be specified	mN/m		mN/m		50
Time measuring device			0.02000	s		50
Flow time measurements	108.55600	s	0.21170	s	0.0020	50
Inclination of viscometers to vertical axis	0.00000	°	0.00000	°		50
Sample temperature	40.00020	°C	0.00200	K	0.0000	50
Viscometer Number 1, Viscometer constant	4.37300	mm²/s²	0.09839	mm²/s²	0.0225	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	2.76700	mm²/s²	0.06226	mm²/s²	0.0225	
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.0226
Effective degrees of freedom, ν_{eff}	50.0000
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.0000
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0452

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID C, 20°C**

Name of participating laboratory	National Institute for Standards
Country	Egypt

MEASUREMENT **STANDARD LIQUID C, 20°C**

Name of standard liquid	C	
Date of arrival of the liquid at the laboratory	2012/12/11	
Remarks on the liquid (package, seals)	ok	
Date of test	2013/1/6	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	SPRT	
Time measuring device (type)	StopeWatch	
Type of viscometer	Ubbelohde Viscometer	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	7255		16076	
Capillary length (nominal)	100.0000	mm	100.0000	mm
Flow volume (nominal)	25.0000	cm³	25.0000	cm³
Viscometer constant	97.9400	mm²/s²	42.4400	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	25.00000	°C
Air pressure	76.20	hPa
Relative humidity	37.00	%
participating lab (abbreviation), standard liquid	NIS	C, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID C, 20°C**

	Viscometer 1		Viscometer 2		
	s	°C	s	°C	
First filling, efflux time 1, temperature 1	1572.450	20.00007	3634.560	20.00007	4.934964032
First filling, efflux time 2, temperature 2	1564.000	20.00007	3642.930	20.00007	5.461965763
First filling, efflux time 3, temperature 3	1574.880	20.00007	3649.230	20.00007	6.771938423
First filling, efflux time 4, temperature 4	1564.890	20.00007	3645.880	20.00007	9.12137983
First filling, efflux time 5, temperature 5	1565.690	20.00007	3641.990	20.00007	6.572562012
Mean value	1568.382	20.00007	3642.918	20.00007	6.572562012
	156838.200		154605.440		
Second filling, efflux time 1, temperature 1	1556.660	20.00007	3638.930	20.00007	
Second filling, efflux time 2, temperature 2	1550.290	20.00007	3640.390	20.00007	
Second filling, efflux time 3, temperature 3	1539.330	20.00007	3641.020	20.00007	
Second filling, efflux time 4, temperature 4	1552.630	20.00007	3626.030	20.00007	
Second filling, efflux time 5, temperature 5	1554.540	20.00007	3621.520	20.00007	
Mean value	1550.690	20.00007	3633.578	20.00007	
	155069.000		154209.050		
Overall mean value	155953.600	20.00007	154407.245	20.00007	

Mean value of viscosity of the two viscometers*	155180.423	mm²/s
Mean value of the temperature	20.00007	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid		C, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID C, 20°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	to be specified	1/K		1/K		50
Density of the sample	to be specified	g/cm³		g/cm³		50
Surface tension of the sample	to be specified	mN/m		mN/m		50
Time measuring device			0.02000	s		50
Flow time measurements	1560.11500	s	6.57260	s	0.0042	50
Inclination of viscometers to vertical axis	0.00000	°	0.00000	°		50
Sample temperature	20.00007	°C	0.00200	K	0.0001	50
Viscometer Number 1, Viscometer constant	97.94000	mm²/s²	2.20365	mm²/s²	0.0225	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	42.44000	mm²/s²	0.95490	mm²/s²	0.0225	
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.0229
Effective degrees of freedom, ν_{eff}	50.0000
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.0000
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0458

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID C , 40 °C**

Name of participating laboratory	National Institute for Standards
Country	Egypt

MEASUREMENT **STANDARD LIQUID C, 40°C**

Name of standard liquid	C	
Date of arrival of the liquid at the laboratory	2012/12/11	
Remarks on the liquid (package, seals)	ok	
Date of test	2013/1/14	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	SPRT	
Time measuring device (type)	StopeWatch	
Type of viscometer	Ubbelohde Viscometer	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	7255		16076	
Capillary length (nominal)	100.0000	mm	100.0000	mm
Flow volume (nominal)	25.0000	cm³	25.0000	cm³
Viscometer constant	97.9400	mm²/s²	42.4400	mm²/s²
Correction factor due to acceleration of free fall				

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	25.00000	°C
Air pressure	76.20	hPa
Relative humidity	37.00	%
participating lab (abbreviation), standard liquid	NIS	C, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID C, 20°C**

	Viscometer 1		Viscometer 2		
	s	°C	s	°C	
First filling, efflux time 1, temperature 1	255.070	40.00020	591.730	40.00020	0.869154762
First filling, efflux time 2, temperature 2	254.200	40.00020	589.390	40.00020	1.77795388
First filling, efflux time 3, temperature 3	255.820	40.00020	589.470	40.00020	1.232428497
First filling, efflux time 4, temperature 4	253.740	40.00020	593.630	40.00020	0.791372226
First filling, efflux time 5, temperature 5	253.950	40.00020	591.640	40.00020	1.167727341
Mean value	254.556	40.00020	591.172	40.00020	1.459659177
	25455.600		25089.340		
Second filling, efflux time 1, temperature 1	253.090	40.00020	588.580	40.00020	
Second filling, efflux time 2, temperature 2	251.780	40.00020	587.990	40.00020	
Second filling, efflux time 3, temperature 3	253.200	40.00020	588.700	40.00020	
Second filling, efflux time 4, temperature 4	251.820	40.00020	589.990	40.00020	
Second filling, efflux time 5, temperature 5	254.780	40.00020	588.130	40.00020	
Mean value	252.934	40.00020	588.678	40.00020	
	25293.400		24983.494		
Overall mean value	25374.500	40.00020	25036.417	40.00020	

Mean value of viscosity of the two viscometers*	25205.459	mm²/s
Mean value of the temperature	40.00020	°C

*Please do not correct the result to target temperature

Notes or observations:		
participating lab (abbreviation), standard liquid		C, 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID C, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	to be specified	1/K		1/K		50
Density of the sample	to be specified	g/cm³		g/cm³		50
Surface tension of the sample	to be specified	mN/m		mN/m		50
Time measuring device			0.02000	s		50
Flow time measurements	254.36500	s	1.45970	s	0.0057	50
Inclination of viscometers to vertical axis	0.00000	°	0.00000	°		50
Sample temperature	40.00020	°C	0.00200	K	0.0000	50
Viscometer Number 1, Viscometer constant	97.94000	mm²/s²	2.20365	mm²/s²	0.0225	50
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	42.44000	mm²/s²	0.95490	mm²/s²	0.0225	
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.0232
Effective degrees of freedom, ν_{eff}	50.0000
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.0000
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.0464

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 15 °C**

Name of participating laboratory	NMISA - National Metrology Institute of South Africa
Country	South Africa

MEASUREMENT **STANDARD LIQUID A, 15 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	26/ October 2012	
Remarks on the liquid (package, seals)	Received in good condition	
Date of test	2012/11/12 & 2012/11/19	
Nominal measuring temperature	15	°C
Temperature measuring instrument (type)	6 x Pt100's	
Time measuring device (type)	Sanji Stopwatch (Sport-210	
Type of viscometer	PSL Ubbelohde	

	Viscometer 1		Viscometer 2	
Identification number	37299 & 37300		37301	
Capillary length (nominal)	400	mm	400	mm
Flow volume (nominal)	19	cm³	19	cm³
Viscometer constant	0.015248 (S/N 3	mm²/s²	0.015407	mm²/s²
Correction factor due to acceleration of free fall	See note 1 below		See note 1 below	

Yellow cells: please input data

Blue cells: please don't change

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	26.0	°C
Air pressure	870.0	hPa
Relative humidity	46.0	%

participating lab (abbreviation), standard liquid	NMISA	A, 15 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 15 °C**

	Viscometer 1		Viscometer 2		
	s	°C	s	°C	Viscometer 1 First filling S/N 37300 C=0.015195 mm²/s²
First filling, efflux time 1, temperature 1	366.973	15.06	361.814	15.06	
First filling, efflux time 2, temperature 2	366.943	15.06	361.794	15.06	
First filling, efflux time 3, temperature 3	366.963	15.06	361.794	15.06	
First filling, efflux time 4, temperature 4	366.873	15.06	361.874	15.06	
First filling, efflux time 5, temperature 5	366.903	15.06	361.834	15.06	Viscometer 1
Mean value	366.931	15.06	361.822	15.06	Second filling S/N 37299 C=0.015248 mm²/s²
Second filling, efflux time 1, temperature 1	365.603	15.07	361.844	15.07	
Second filling, efflux time 2, temperature 2	365.623	15.07	361.874	15.07	
Second filling, efflux time 3, temperature 3	365.683	15.07	361.844	15.07	
Second filling, efflux time 4, temperature 4	365.753	15.07	361.914	15.07	
Second filling, efflux time 5, temperature 5	365.623	15.07	361.954	15.07	
Mean value	365.657	15.07	361.886	15.07	
Overall mean value	366.294	15.07	361.854	15.07	

Mean value of viscosity of the two viscometers*	5.57531	mm²/s
Mean value of the temperature	15.07	°C

*Please do not correct the result to target temperature

Notes or observations: 1) Viscometer constant calculated to include local acceleration due to gravity.

participating lab (abbreviation), standard liquid	NMISA	A , 15 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 15°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.028	1/K	0.000034	1/K		50
Density of the sample	0.81243	g/cm³	0.00012	g/cm³		50
Surface tension of the sample	28.50	mN/m	0.19	mN/m		50
Time measuring device			0.01500	s	4.1022E-05	1000000
Flow time measurements	365.65740	s	0.06148	s	1.6812E-04	4
Inclination of viscometers to vertical axis	1.0	°	0.57735	°	5.0769E-05	1000000
Sample temperature	15.06844	°C	0.00500	K	1.4000E-04	1000000
Viscometer Number 1, Viscometer constant	0.015407	mm²/s²	0.00003	mm²/s²	1.7500E-03	1000000
Individual surface tension correction factor c_S (1)	0		0		0.0000E+00	
Kinetic energy correction t_{KE} (1)	0	s	0	s	0.0000E+00	
Viscometer Number 2, Viscometer constant		mm²/s²		mm²/s²		
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
Ageing of viscometer glass	0.05%	%	0.02887%	%	2.8868E-04	1000000
Instability of temperature control of thermostat	0.030	°C	0.00866	K	2.4249E-04	1000000
Temperature gradient of thermostat	0.011	°C	0.00318	K	8.8912E-05	1000000

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.18%
Effective degrees of freedom, ν_{eff}	50965.45
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.00
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.36%

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 20 °C**

Name of participating laboratory	NMISA - National Metrology Institute of South Africa
Country	South Africa

MEASUREMENT **STANDARD LIQUID A, 20 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	26/ October 2012	
Remarks on the liquid (package, seals)	Received in good condition	
Date of test	2012/11/20 & 2012/12/04	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	6 x Pt100's	
Time measuring device (type)	Sanji Stopwatch (Sport-210	
Type of viscometer	PSL Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	37296 & 37298		37297	
Capillary length (nominal)	400	mm	400	mm
Flow volume (nominal)	19	cm³	19	cm³
Viscometer constant	0.0084536 (S/N 37	mm²/s²	0.0080449	mm²/s²
Correction factor due to acceleration of free fall	See note 1 below		See note 1 below	

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	26.0	°C
Air pressure	870.0	hPa
Relative humidity	49.0	%

participating lab (abbreviation), standard liquid	NMISA	A, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 20°C**

	Viscometer 1		Viscometer 2		
	s	°C	s	°C	Viscometer 1 First filling
First filling, efflux time 1, temperature 1	576.000	20.06	605.519	20.06	S/N 37296
First filling, efflux time 2, temperature 2	575.970	20.06	605.279	20.06	C=0.0084536 mm²/s²
First filling, efflux time 3, temperature 3	575.950	20.06	605.129	20.06	
First filling, efflux time 4, temperature 4	576.080	20.06	605.129	20.06	
First filling, efflux time 5, temperature 5	576.040	20.06	605.129	20.06	Viscometer 1
Mean value	576.008	20.06	605.237	20.06	Second filling
					S/N 37298
Second filling, efflux time 1, temperature 1	555.406	20.06	605.219	20.06	C=0.0087651 mm²/s²
Second filling, efflux time 2, temperature 2	555.416	20.06	605.199	20.06	
Second filling, efflux time 3, temperature 3	555.386	20.06	605.149	20.06	
Second filling, efflux time 4, temperature 4	555.386	20.06	605.069	20.06	
Second filling, efflux time 5, temperature 5	555.376	20.06	605.019	20.06	
Mean value	555.394	20.06	605.131	20.06	
Overall mean value	565.701	20.06	605.184	20.06	

Mean value of viscosity of the two viscometers*	4.86868	mm²/s
Mean value of the temperature	20.06	°C

*Please do not correct the result to target temperature

Notes or observations: 1) Viscometer constant calculated to include local acceleration due to gravity.

participating lab (abbreviation), standard liquid	NMISA	A, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 20 °C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sampl	0.027	1/K	0.000032	1/K		50
Density of the sample	0.80900	g/cm³	0.00012	g/cm³		50
Surface tension of the sample	28.07	mN/m	0.18	mN/m		50
Time measuring device			0.00500	s	8.2612E-06	1000000
Flow time measurements	605.23748	s	0.17048	s	2.8168E-04	4
Inclination of viscometers to vertical axis	1.0	°	0.57735	°	5.0769E-05	1000000
Sample temperature	20.06249	°C	0.00500	K	1.3500E-04	1000000
Viscometer Number 1, Viscometer constant	0.0080449	mm²/s²	0.00001	mm²/s²	1.5000E-03	1000000
Individual surface tension correction factor c_S (1)	0		0		0.0000E+00	
Kinetic energy correction t_{KE} (1)	0	s	0		0.0000E+00	
Viscometer Number 2, Viscometer constant		mm²/s²		mm²/s²		
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
Ageing of viscometer glass	0.05%	%	0.02887%	%	2.8868E-04	1000000
Instability of temperature control of thermostat	0.020	°C	0.00577	K	1.5588E-04	1000000
Temperature gradient of thermostat	0.013661	°C	0.00394	K	1.0648E-04	1000000

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.16%
Effective degrees of freedom, ν_{eff}	3861.54
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.00
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.31%

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 20 °C**

Name of participating laboratory	NMISA - National Metrology Institute of South Africa
Country	South Africa

MEASUREMENT **STANDARD LIQUID B, 20 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	26/ October 2012	
Remarks on the liquid (package, seals)	Received in good condition	
Date of test	2012/11/21 & 2012/12/05	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	6 x Pt100's	
Time measuring device (type)	Sanji Stopwatch (Sport-2100	
Type of viscometer	PSL Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	38204		38205	
Capillary length (nominal)	400	mm	400	mm
Flow volume (nominal)	20	cm³	20	cm³
Viscometer constant	2.9604	mm²/s²	2.9360	mm²/s²
Correction factor due to acceleration of free fall	See note 1 below		See note 1 below	

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	26.0	°C
Air pressure	870.0	hPa
Relative humidity	47.0	%

participating lab (abbreviation), standard liquid	NMISA	B, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 20 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	662.527	20.06	668.150	20.06
First filling, efflux time 2, temperature 2	662.478	20.06	667.960	20.06
First filling, efflux time 3, temperature 3	662.537	20.06	668.120	20.06
First filling, efflux time 4, temperature 4	662.527	20.06	667.910	20.06
First filling, efflux time 5, temperature 5	662.428	20.06	668.010	20.06
Mean value	662.499	20.06	668.030	20.06
Second filling, efflux time 1, temperature 1	662.444	20.06	667.976	20.06
Second filling, efflux time 2, temperature 2	662.414	20.06	667.996	20.06
Second filling, efflux time 3, temperature 3	662.404	20.06	667.636	20.06
Second filling, efflux time 4, temperature 4	662.374	20.06	667.886	20.06
Second filling, efflux time 5, temperature 5	662.334	20.06	667.726	20.06
Mean value	662.394	20.06	667.844	20.06
Overall mean value	662.447	20.06	667.937	20.06

Mean value of viscosity of the two viscometers*	1961.08533	mm²/s
Mean value of the temperature	20.06	°C

*Please do not correct the result to target temperature

Notes or observations: 1) Viscometer constant calculated to include local acceleration due to gravity.

participating lab (abbreviation), standard liquid	NMISA	B, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 20°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.082	1/K	0.000074	1/K		50
Density of the sample	0.88127	g/cm³	0.00013	g/cm³		50
Surface tension of the sample	32.83	mN/m	0.18	mN/m		50
Time measuring device			0.01500	s	2.2460E-05	1000000
Flow time measurements	667.84443	s	0.15767	s	2.3609E-04	4
Inclination of viscometers to vertical axis	1.0	°	0.57735	°	5.0769E-05	1000000
Sample temperature	20.06337	°C	0.00500	K	4.1000E-04	1000000
Viscometer Number 1, Viscometer constant	2.96040	mm²/s²	0.03330	mm²/s²	1.1250E-02	1000000
Individual surface tension correction factor c_S (1)	0		0.00000		0.0000E+00	
Kinetic energy correction t_{KE} (1)	0	s	0.00000		0.0000E+00	
Viscometer Number 2, Viscometer constant		mm²/s²		mm²/s²		
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
Ageing of viscometer glass	0.05%	%	0.02887%	%	2.8868E-04	1000000
Instability of temperature control of thermostat	0.030	°C	0.00866	K	7.1014E-04	1000000
Temperature gradient of thermostat	0.030	°C	0.00866	K	7.1014E-04	1000000

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	1.13%
Effective degrees of freedom, ν_{eff}	973703.95
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.00
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	2.26%

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 40 °C**

Name of participating laboratory	NMISA - National Metrology Institute of South Africa
Country	South Africa

MEASUREMENT **STANDARD LIQUID B, 40 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	26/ October 2012	
Remarks on the liquid (package, seals)	Received in good condition	
Date of test	2012/11/22 & 2012/12/06	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	6 x Pt100's	
Time measuring device (type)	Sanji Stopwatch (Sport-210	
Type of viscometer	PSL Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	37313 & 37314		37312	
Capillary length (nominal)	400	mm	400	mm
Flow volume (nominal)	20	cm³	20	cm³
Viscometer constant	1.1535 (S/N 373	mm²/s²	1.1658	mm²/s²
Correction factor due to acceleration of free fall	See note 1 below		See note 1 below	

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	26.0	°C
Air pressure	870.0	hPa
Relative humidity	44.0	%

participating lab (abbreviation), standard liquid	NMISA	B, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 40 °C**

	Viscometer 1		Viscometer 2		
	s	°C	s	°C	Viscometer 1 First filling
First filling, efflux time 1, temperature 1	409.591	40.01	405.370	40.01	S/N 37313
First filling, efflux time 2, temperature 2	409.601	40.01	405.360	40.01	C=1.1535 mm²/s²
First filling, efflux time 3, temperature 3	409.681	40.01	405.330	40.01	
First filling, efflux time 4, temperature 4	409.591	40.01	405.290	40.01	
First filling, efflux time 5, temperature 5	409.611	40.01	405.350	40.01	Viscometer 1
Mean value	409.615	40.01	405.340	40.01	Second filling
					S/N 37314
Second filling, efflux time 1, temperature 1	408.651	40.01	405.440	40.01	C=1.1566 mm²/s²
Second filling, efflux time 2, temperature 2	408.511	40.01	405.450	40.01	
Second filling, efflux time 3, temperature 3	408.621	40.01	405.320	40.01	
Second filling, efflux time 4, temperature 4	408.531	40.01	405.470	40.01	
Second filling, efflux time 5, temperature 5	408.691	40.01	405.350	40.01	
Mean value	408.601	40.01	405.406	40.01	
Overall mean value	409.108	40.01	405.373	40.01	

Mean value of viscosity of the two viscometers*	472.56158	mm²/s
Mean value of the temperature	40.01	°C

*Please do not correct the result to target temperature

Notes or observations: 1) Viscometer constant calculated to include local acceleration due to gravity.

participating lab (abbreviation), standard liquid	NMISA	B, 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.063	1/K	0.000037	1/K		50
Density of the sample	0.86920	g/cm³	0.00018	g/cm³		50
Surface tension of the sample	31.04	mN/m	0.22	mN/m		50
Time measuring device			0.00500	s	1.2237E-05	1000000
Flow time measurements	408.60086	s	0.07747	s	1.8959E-04	4
Inclination of viscometers to vertical axis	1.0	°	0.57735	°	5.0769E-05	1000000
Sample temperature	40.00638	°C	0.00500	K	3.1500E-04	1000000
Viscometer Number 1, Viscometer constant	1.16580	mm²/s²	0.00408	mm²/s²	3.5000E-03	1000000
Individual surface tension correction factor c_S (1)	0		0.00000		0.0000E+00	
Kinetic energy correction t_{KE} (1)	0	s	0.00000		0.0000E+00	
Viscometer Number 2, Viscometer constant		mm²/s²		mm²/s²		
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
Ageing of viscometer glass	0.05%	%	0.02887%	%	2.8868E-04	1000000
Instability of temperature control of thermostat	0.030	°C	0.00866	K	5.4560E-04	1000000
Temperature gradient of thermostat	0.030	°C	0.00866	K	5.4560E-04	1000000

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.36%
Effective degrees of freedom, ν_{eff}	360768.53
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.00
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.72%

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID C , 40 °C**

Name of participating laboratory	NMISA - National Metrology Institute of South Africa
Country	South Africa

MEASUREMENT **STANDARD LIQUID C, 40 °C**

Name of standard liquid	C	
Date of arrival of the liquid at the laboratory	26/ October 2012	
Remarks on the liquid (package, seals)	Received in good condition	
Date of test	2012/11/27 & 2012/11/30	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	6 x Pt100's	
Time measuring device (type)	Sanji Stopwatch (Sport-210	
Type of viscometer	PSL Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	38195		38196	
Capillary length (nominal)	400	mm	400	mm
Flow volume (nominal)		cm³		cm³
Viscometer constant	45.660	mm²/s²	45.187	mm²/s²
Correction factor due to acceleration of free fall	See note 1 below		See note 1 below	

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	26.0	°C
Air pressure	870.0	hPa
Relative humidity	40.0	%
participating lab (abbreviation), standard liquid	NMISA	C, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID C, 40°C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	552.445	40.01	564.270	40.01
First filling, efflux time 2, temperature 2	553.475	40.01	563.220	40.01
First filling, efflux time 3, temperature 3	552.945	40.01	572.490	40.01
First filling, efflux time 4, temperature 4	551.125	40.01	564.660	40.01
First filling, efflux time 5, temperature 5	551.225	40.01	570.140	40.01
Mean value	552.243	40.01	566.956	40.01
Second filling, efflux time 1, temperature 1	555.084	40.01	561.506	40.01
Second filling, efflux time 2, temperature 2	558.274	40.01	562.716	40.01
Second filling, efflux time 3, temperature 3	569.303	40.01	579.868	40.01
Second filling, efflux time 4, temperature 4	555.154	40.01	561.776	40.01
Second filling, efflux time 5, temperature 5	581.642	40.01	582.798	40.01
Mean value	563.892	40.01	569.733	40.01
Overall mean value	558.067	40.01	568.345	40.01

Mean value of viscosity of the two viscometers*	25581.56517	mm²/s
Mean value of the temperature	40.01	°C

*Please do not correct the result to target temperature

Notes or observations: 1) Viscometer constant calculated to include local acceleration due to gravity.

participating lab (abbreviation), standard liquid	NMISA	C, 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID C, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.083	1/K	0.00013	1/K		50
Density of the sample	0.88514	g/cm³	0.00019	g/cm³		50
Surface tension of the sample	31.40	mN/m	0.36	mN/m		50
Time measuring device			0.00500	s	8.8670E-06	1000000
Flow time measurements	563.89161	s	11.50883	s	2.0410E-02	4
Inclination of viscometers to vertical axis	1.0	°	0.57735	°	5.0769E-05	1000000
Sample temperature	40.00696	°C	0.00500	K	4.1500E-04	1000000
Viscometer Number 1, Viscometer constant	45.6600	mm²/s²	0.51368	mm²/s²	1.1250E-02	1000000
Individual surface tension correction factor c_S (1)	0		0.00000		0.0000E+00	
Kinetic energy correction t_{KE} (1)	0	s	0.00000		0.0000E+00	
Viscometer Number 2, Viscometer constant		mm²/s²		mm²/s²		
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
Instability of temperature control of thermostat	0.02585	°C	0.00746	K	6.1941E-04	1000000
Ageing of viscometer glass	0.05%	%	0.02887%	%	2.8868E-04	1000000
Temperature gradient of thermostat	0.01668	°C	0.00482	K	3.9970E-04	1000000

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	2.33%
Effective degrees of freedom, ν_{eff}	6.8200
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.52
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	5.88%

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 15 °C**

Name of participating laboratory	National Physical Laboratory
Country	India

MEASUREMENT **STANDARD LIQUID A, 15 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	25.10.2012	
Remarks on the liquid (package, seals)	OK	
Date of test	20.11.2012	
Nominal measuring temperature	15	°C
Temperature measuring instrument (type)	Glass thermometer	
Time measuring device (type)	Stop watch (digital)	
Type of viscometer	Ubbelohde viscometer	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	I_1		I_2	
Capillary length (nominal)	90.0	mm	90.0	mm
Flow volume (nominal)	4.0	cm³	4.0	cm³
Viscometer constant	0.009 744	mm²/s²	0.009 749	mm²/s²
Correction factor due to acceleration of free fall	Negligible		Negligible	

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	25.84	°C
Air pressure	976.21	hPa
Relative humidity	46.49	%

participating lab (abbreviation), standard liquid	NPLI	A, 15 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 15 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	571.56	15.00	570.15	15.00
First filling, efflux time 2, temperature 2	571.18	15.00	570.65	15.00
First filling, efflux time 3, temperature 3	570.96	15.01	570.27	15.01
First filling, efflux time 4, temperature 4	571.32	15.01	570.25	15.01
First filling, efflux time 5, temperature 5	571.09	15.00	570.62	15.00
Mean value	**571.22**	**15.00**	**570.39**	**15.00**
Second filling, efflux time 1, temperature 1	570.76	15.01	570.59	15.02
Second filling, efflux time 2, temperature 2	570.58	15.01	570.23	15.02
Second filling, efflux time 3, temperature 3	570.40	15.01	570.87	15.01
Second filling, efflux time 4, temperature 4	570.87	15.00	570.99	15.01
Second filling, efflux time 5, temperature 5	571.04	15.02	570.97	15.01
Mean value	**570.73**	**15.01**	**570.73**	**15.01**
Overall mean value	**570.975**	**15.005**	**570.560**	**15.005**

Mean value of viscosity of the two viscometers*	**5.563 0**	mm²/s
Mean value of the temperature	**15.005**	°C

*Please do not correct the result to target temperature

Notes or observations: **Followed ASTM D445 & D446 methods for viscosity measurements. Also followed the paper entitled "Status of NPL, India in CCM.V-K1 Intercomparison in Viscosity" by T. Lal & S. S. Yadav published in Mapan, Vol. 21, No. 1 (2006), 47-59 (copy attached).**

participating lab (abbreviation), standard liquid	NPLI	A , 15 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.028	1/K	0.000034	1/K		50
Density of the sample	0.81243	g/cm³	0.00012	g/cm³		50
Surface tension of the sample	28.50	mN/m	0.19	mN/m		50
Time measuring device			0.39968	s	0.000 7	50
Flow time measurements	570.768	s	0.109	s	0.000 2	9
Inclination of viscometers to vertical axis	Negligible	°	Negligible	°	Negligible	-
Sample temperature	15.005	°C	0.002	°C	0.000 13	∞
Viscometer Number 1, Viscometer constant	0.009 744	mm²/s²	0.000 014	mm²/s²	0.001 4	∞
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	0.009 749	mm²/s²	0.000 014	mm²/s²	0.001 4	∞
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.001 6
Effective degrees of freedom, ν_{eff}	3928
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.00
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.003 2

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 20 °C**

Name of participating laboratory	National Physical Laboratory
Country	India

MEASUREMENT **STANDARD LIQUID A, 20 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	25.10.2012	
Remarks on the liquid (package, seals)	OK	
Date of test	15.11.2012	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	Glass thermometer	
Time measuring device (type)	Digital stop watch	
Type of viscometer	Ubbelohde Viscometer	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	I_1		I_2	
Capillary length (nominal)	90.0	mm	90.0	mm
Flow volume (nominal)	4.0	cm³	4.0	cm³
Viscometer constant	0.009 744	mm²/s²	0.009 749	mm²/s²
Correction factor due to acceleration of free fall	Negligible		Negligible	

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	24.24	°C
Air pressure	978.78	hPa
Relative humidity	49.12	%

participating lab (abbreviation), standard liquid	NPLI, India	A, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 20°C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	495.75	20.01	495.22	20.01
First filling, efflux time 2, temperature 2	495.08	20.01	495.19	20.01
First filling, efflux time 3, temperature 3	495.44	20.01	495.28	20.01
First filling, efflux time 4, temperature 4	495.52	20.01	495.07	20.01
First filling, efflux time 5, temperature 5	495.46	20.00	495.17	20.00
Mean value	**495.45**	**20.01**	**495.19**	**20.01**
Second filling, efflux time 1, temperature 1	495.32	20.02	495.89	20.02
Second filling, efflux time 2, temperature 2	495.35	20.02	495.26	20.02
Second filling, efflux time 3, temperature 3	495.45	20.02	495.30	20.02
Second filling, efflux time 4, temperature 4	495.26	20.01	495.56	20.01
Second filling, efflux time 5, temperature 5	495.34	20.01	495.52	20.01
Mean value	**495.34**	**20.02**	**495.51**	**20.02**
Overall mean value	**495.395**	**20.015**	**495.350**	**20.015**

Mean value of viscosity of the two viscometers*	**4.828 1**	mm²/s
Mean value of the temperature	**20.015**	°C

*Please do not correct the result to target temperature

Notes or observations: **Followed ASTM D445 & D446 methods for viscosity measurements. Also followed the paper entitled "Status of NPL, India in CCM.V-K1 Intercomparison in Viscosity" by T. Lal & S. S. Yadav published in Mapan, Vol. 21, No. 1 (2006), 47-59 (copy attached).**

participating lab (abbreviation), standard liquid	NPLI	A, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 20 °C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sampl	0.027	1/K	0.000032	1/K		50
Density of the sample	0.80900	g/cm³	0.00012	g/cm³		50
Surface tension of the sample	28.07	mN/m	0.18	mN/m		50
Time measuring device			0.34678	s	0.000 7	50
Flow time measurements	495.373	s	0.077	s	0.000 2	9
Inclination of viscometers to vertical axis	Negligible	°	Negligible	°	Negligible	-
Sample temperature	20.015	°C	0.001	°C	0.000 05	∝
Viscometer Number 1, Viscometer constant	0.009 744	mm²/s²	0.000 014	mm²/s²	0.001 4	∝
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	0.009 749	mm²/s²	0.000 014	mm²/s²	0.001 4	∝
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.001 6
Effective degrees of freedom, ν_{eff}	3883
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.00
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.003 2

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 20 °C**

Name of participating laboratory	National Physical Laboratory
Country	India

MEASUREMENT **STANDARD LIQUID B, 20 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	25.10.2012	
Remarks on the liquid (package, seals)	OK	
Date of test	05.12.2012	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	Glass thermometer	
Time measuring device (type)	Digital stop watch	
Type of viscometer	Ubbelohde Viscometer	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	III_1		III_2	
Capillary length (nominal)	90.0	mm	90.0	mm
Flow volume (nominal)	4.0	cm³	4.0	cm³
Viscometer constant	0.974 01	mm²/s²	0.980 54	mm²/s²
Correction factor due to acceleration of free fall	Negligible		Negligible	

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	24.54	°C
Air pressure	975.32	hPa
Relative humidity	51.30	%

participating lab (abbreviation), standard liquid	NPLI	B, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 20 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	1714.25	20.01	1709.06	20.01
First filling, efflux time 2, temperature 2	1714.44	20.01	1708.97	20.01
First filling, efflux time 3, temperature 3	1714.90	20.01	1709.12	20.01
First filling, efflux time 4, temperature 4	1715.41	20.01	1709.60	20.01
First filling, efflux time 5, temperature 5	1715.98	20.01	1709.62	20.01
Mean value	**1715.00**	**20.01**	**1709.27**	**20.01**
Second filling, efflux time 1, temperature 1	1716.54	20.00	1710.92	20.00
Second filling, efflux time 2, temperature 2	1717.09	20.00	1710.36	20.00
Second filling, efflux time 3, temperature 3	1716.92	20.01	1710.54	20.01
Second filling, efflux time 4, temperature 4	1716.16	20.01	1710.19	20.01
Second filling, efflux time 5, temperature 5	1717.01	20.02	1710.51	20.02
Mean value	**1716.74**	**20.01**	**1710.50**	**20.01**
Overall mean value	**1715.870**	**20.010**	**1709.885**	**20.010**

Mean value of viscosity of the two viscometers*	**1673.942 6**	mm²/s
Mean value of the temperature	**20.010**	°C

*Please do not correct the result to target temperature

Notes or observations: **Followed ASTM D445 & D446 methods for viscosity measurements. Also followed the paper entitled "Status of NPL, India in CCM.V-K1 Intercomparison in Viscosity" by T. Lal & S. S. Yadav published in Mapan, Vol. 21, No. 1 (2006), 47-59 (copy attached).**

participating lab (abbreviation), standard liquid	NPLI	B, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 20°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.082	1/K	0.000074	1/K		50
Density of the sample	0.88127	g/cm³	0.00013	g/cm³		50
Surface tension of the sample	32.83	mN/m	0.18	mN/m		50
Time measuring device			1.20111	s	0.000 7	50
Flow time measurements	1712.878	s	0.338	s	0.000 2	9
Inclination of viscometers to vertical axis	Negligible	°	Negligible	°	Negligible	-
Sample temperature	20.010	°C	0.001	°C	0.000 05	∝
Viscometer Number 1, Viscometer constant	0.974 01	mm²/s²	0.001 66	mm²/s²	0.001 7	∝
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	0.980 54	mm²/s²	0.001 67	mm²/s²	0.001 7	∝
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.001 9
Effective degrees of freedom, ν_{eff}	7321
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.00
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.003 7

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 40 °C**

Name of participating laboratory	National Physical Laboratory
Country	India

MEASUREMENT **STANDARD LIQUID B, 40 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	25.10.2012	
Remarks on the liquid (package, seals)	OK	
Date of test	03.12.2012	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	Glass thermometer	
Time measuring device (type)	Digital stop watch	
Type of viscometer	Ubbelohde Viscometer	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	III_1		III_2	
Capillary length (nominal)	90.0	mm	90.0	mm
Flow volume (nominal)	4.0	cm³	4.0	cm³
Viscometer constant	0.974 01	mm²/s²	0.980 54	mm²/s²
Correction factor due to acceleration of free fall	Negligible		Negligible	

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	24.25	°C
Air pressure	977.18	hPa
Relative humidity	48.24	%

participating lab (abbreviation), standard liquid	NPLI	B, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 40 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	467.39	40.00	463.17	40.00
First filling, efflux time 2, temperature 2	467.46	40.01	463.60	40.01
First filling, efflux time 3, temperature 3	467.34	40.00	463.26	40.00
First filling, efflux time 4, temperature 4	467.22	40.00	463.50	40.00
First filling, efflux time 5, temperature 5	467.26	40.01	463.39	40.01
Mean value	**467.33**	**40.00**	**463.38**	**40.00**
Second filling, efflux time 1, temperature 1	467.14	40.01	463.89	40.01
Second filling, efflux time 2, temperature 2	467.40	40.01	463.21	40.01
Second filling, efflux time 3, temperature 3	467.26	40.01	463.76	40.01
Second filling, efflux time 4, temperature 4	467.53	40.02	463.27	40.02
Second filling, efflux time 5, temperature 5	467.32	40.02	463.19	40.02
Mean value	**467.33**	**40.01**	**463.46**	**40.01**
Overall mean value	**467.330**	**40.005**	**463.420**	**40.005**

Mean value of viscosity of the two viscometers*	**454.793 0**	mm²/s
Mean value of the temperature	**40.005**	°C

*Please do not correct the result to target temperature

Notes or observations: **Followed ASTM D445 & D446 methods for viscosity measurements. Also followed the paper entitled "Status of NPL, India in CCM.V-K1 Intercomparison in Viscosity" by T. Lal & S. S. Yadav published in Mapan, Vol. 21, No. 1 (2006), 47-59 (copy attached).**

participating lab (abbreviation), standard liquid	NPLI	B, 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.063	1/K	0.000037	1/K		50
Density of the sample	0.86920	g/cm³	0.00018	g/cm³		50
Surface tension of the sample	31.04	mN/m	0.22	mN/m		50
Time measuring device			0.32713	s	0.000 7	50
Flow time measurements	465.375	s	0.081	s	0.000 2	9
Inclination of viscometers to vertical axis	Negligible	°	Negligible	°	Negligible	-
Sample temperature	40.005	°C	0.002	°C	0.000 05	∝
Viscometer Number 1, Viscometer constant	0.974 01	mm²/s²	0.001 66	mm²/s²	0.001 7	∝
Individual surface tension correction factor c_S (1)						
Kinetic energy correction t_{KE} (1)		s		s		
Viscometer Number 2, Viscometer constant	0.980 54	mm²/s²	0.001 67	mm²/s²	0.001 7	∝
Individual surface tension correction factor c_S (2)						
Kinetic energy correction t_{KE} (2)		s		s		
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.001 9
Effective degrees of freedom, ν_{eff}	7321
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.00
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.003 7

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID A, 20 °C**

Name of participating laboratory	National Metrology Laboratory, SIRIM Berhad
Country	Malaysia

MEASUREMENT **STANDARD LIQUID A, 20 °C**

Name of standard liquid	A	
Date of arrival of the liquid at the laboratory	October 31st 2012	
Remarks on the liquid (package, seals)	OK	
Date of test	December 26th 2012	
Nominal measuring temperature	20	°C
Temperature measuring instrument (type)	Pt 100, ASL F250	
Time measuring device (type)	Digital Stopwatch	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	1 (M7)		1(M9)	
Capillary length (nominal)	400.0000	mm	400.0000	mm
Flow volume (nominal)	5.1000	cm³	5.1000	cm³
Viscometer constant	0.010076	mm²/s²	0.009741	mm²/s²
Correction factor due to acceleration of free fall	0.9979		0.9979	

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	21.30	°C
Air pressure	1010.00	hPa
Relative humidity	52.00	%

participating lab (abbreviation), standard liquid	NML, SIRIM Bhd	A, 20 °C

MEASUREMENT RESULTS **STANDARD LIQUID A, 20°C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	484.740	20.010	501.200	20.010
First filling, efflux time 2, temperature 2	484.800	20.000	501.290	20.010
First filling, efflux time 3, temperature 3	484.610	20.010	501.210	20.010
First filling, efflux time 4, temperature 4	484.710	20.000	501.270	20.000
First filling, efflux time 5, temperature 5	484.660	20.000	501.270	20.000
Mean value	484.704	20.004	501.248	20.006
Second filling, efflux time 1, temperature 1	484.560	20.010	501.300	20.000
Second filling, efflux time 2, temperature 2	484.730	20.000	501.210	20.010
Second filling, efflux time 3, temperature 3	484.640	20.000	501.320	20.000
Second filling, efflux time 4, temperature 4	484.590	20.000	501.250	20.000
Second filling, efflux time 5, temperature 5	484.620	20.000	501.180	20.010
Mean value	484.628	20.002	501.252	20.004
Overall mean value	484.666	20.003	501.250	20.005

Mean value of viscosity of the two viscometers*	4.873	mm²/s
Mean value of the temperature	20.004	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	SIRIM	A, 20 °C

UNCERTAINTY BUDGET **STANDARD LIQUID A, 20 °C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.027	1/K	0.000032	1/K	can be neglec	50
Density of the sample	0.80900	g/cm³	0.00012	g/cm³	can be neglec	50
Surface tension of the sample	28.07	mN/m	0.18	mN/m	can be neglec	50
Time measuring device			0.01000	s	0.000014	50
Flow time measurements	492.958000	s	0.06197	s	0.000089	19
Inclination of viscometers to vertical axis	0.400000	°	0.00720	°	0.000018	10000000
Sample temperature	20.004000	°C	0.00578	K	0.000156	19
Viscometer Number 1, Viscometer constant	0.010076	mm²/s²	0.00001	mm²/s²	0.000800	50
Individual surface tension correction factor c_S (1)	-		-		-	-
Kinetic energy correction t_{KE} (1)	-	s	-	s	-	-
Viscometer Number 2, Viscometer constant	0.009741	mm²/s²	0.00001	mm²/s²	0.000800	50
Individual surface tension correction factor c_S (2)	-		-		-	-
Kinetic energy correction t_{KE} (2)	-	s	-	s	-	-
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.00082
Effective degrees of freedom, ν_{eff}	54.9707
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.00
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.00164

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID B, 40 °C**

Name of participating laboratory	National Metrology Laboratory, SIRIM Berhad
Country	Malaysia

MEASUREMENT **STANDARD LIQUID B, 40 °C**

Name of standard liquid	B	
Date of arrival of the liquid at the laboratory	October 31st 2012	
Remarks on the liquid (package, seals)	OK	
Date of test	January 2nd 2013	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	Pt 100, ASL F250	
Time measuring device (type)	Digital Stopwatch	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	3(M33)		3(M34)	
Capillary length (nominal)	400.0000	mm	400.0000	mm
Flow volume (nominal)	5.1000	cm³	5.1000	cm³
Viscometer constant	0.9431	mm²/s²	0.9343	mm²/s²
Correction factor due to acceleration of free fall	0.9979		0.9979	

AMBIENT CONDITIONS

Quantity	Mean value	Unit
Air temperature	21.40	°C
Air pressure	1009.00	hPa
Relative humidity	52.00	%

participating lab (abbreviation), standard liquid	NML, SIRIM Bhd	B, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID B, 40 °C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	502.830	40.010	507.460	40.010
First filling, efflux time 2, temperature 2	502.850	40.010	507.570	40.010
First filling, efflux time 3, temperature 3	503.010	40.000	507.760	40.000
First filling, efflux time 4, temperature 4	502.930	40.000	507.780	40.000
First filling, efflux time 5, temperature 5	503.040	40.000	507.700	40.000
Mean value	502.932	40.004	507.654	40.004
Second filling, efflux time 1, temperature 1	502.980	40.000	507.680	40.000
Second filling, efflux time 2, temperature 2	502.810	40.000	507.650	40.000
Second filling, efflux time 3, temperature 3	503.120	39.990	507.810	39.990
Second filling, efflux time 4, temperature 4	503.020	40.000	507.590	40.000
Second filling, efflux time 5, temperature 5	502.920	40.000	507.690	40.000
Mean value	502.970	39.998	507.684	39.998
Overall mean value	502.951	40.001	507.669	40.001

Mean value of viscosity of the two viscometers*	473.337	mm²/s
Mean value of the temperature	40.001	°C

*Please do not correct the result to target temperature

Notes or observations:

participating lab (abbreviation), standard liquid	SIRIM	B, 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID B, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.063	1/K	0.000037	1/K	can be neglec	50
Density of the sample	0.86920	g/cm³	0.00018	g/cm³	can be neglec	50
Surface tension of the sample	31.04	mN/m	0.22	mN/m	can be neglec	50
Time measuring device			0.01000	s	0.000014	50
Flow time measurements	505.310000	s	0.10372	s	0.000145	19
Inclination of viscometers to vertical axis	0.400000	°	0.00720	°	0.000018	10000000
Sample temperature	40.001000	°C	0.00593	K	0.000374	19
Viscometer Number 1, Viscometer constant	0.943100	mm²/s²	0.00137	mm²/s²	0.001450	50
Individual surface tension correction factor c_S (1)	-		-		-	-
Kinetic energy correction t_{KE} (1)	-	s	-	s	-	-
Viscometer Number 2, Viscometer constant	0.934300	mm²/s²	0.00135	mm²/s²	0.001450	50
Individual surface tension correction factor c_S (2)	-		-		-	-
Kinetic energy correction t_{KE} (2)	-	s	-	s	-	-
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.00150
Effective degrees of freedom, ν_{eff}	57.2646
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.00
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.00301

CCM key comparison on viscosity: CCM.V-K3

Report Form : Measurement results **STANDARD LIQUID C , 40 °C**

Name of participating laboratory	National Metrology Laboratory, SIRIM Berhad
Country	Malaysia

MEASUREMENT **STANDARD LIQUID C, 40 °C**

Name of standard liquid	C	
Date of arrival of the liquid at the laboratory	October 31st 2012	
Remarks on the liquid (package, seals)	OK	
Date of test	January 11th 2013	
Nominal measuring temperature	40	°C
Temperature measuring instrument (type)	Pt 100, ASL F250	
Time measuring device (type)	Digital Stopwatch	
Type of viscometer	Ubbelohde	

Yellow cells: please input data

Blue cells: please don't change

	Viscometer 1		Viscometer 2	
Identification number	4B(M1)		4B(M2)	
Capillary length (nominal)	400.0000	mm	400.0000	mm
Flow volume (nominal)	5.1000	cm³	5.1000	cm³
Viscometer constant	49.9700	mm²/s²	49.2700	mm²/s²
Correction factor due to acceleration of free fall	0.9979		0.9979	

AMBIENT CONDITIONS

Quantity	Mean value	Unit	
Air temperature	21.10	°C	
Air pressure	1009.00	hPa	
Relative humidity	52.00	%	
participating lab (abbreviation), standard liquid	NML, SIRIM Bhd		C, 40 °C

MEASUREMENT RESULTS **STANDARD LIQUID C, 40°C**

	Viscometer 1		Viscometer 2	
	s	°C	s	°C
First filling, efflux time 1, temperature 1	501.620	40.000	508.230	40.000
First filling, efflux time 2, temperature 2	501.280	39.990	508.510	39.990
First filling, efflux time 3, temperature 3	501.480	40.000	508.300	40.000
First filling, efflux time 4, temperature 4	501.620	39.990	508.690	39.990
First filling, efflux time 5, temperature 5	501.390	40.000	508.480	40.000
Mean value	501.478	39.996	508.442	39.996
Second filling, efflux time 1, temperature 1	501.350	40.000	508.570	39.990
Second filling, efflux time 2, temperature 2	501.460	40.000	508.280	40.000
Second filling, efflux time 3, temperature 3	501.710	39.990	508.490	40.000
Second filling, efflux time 4, temperature 4	501.470	39.990	508.520	40.000
Second filling, efflux time 5, temperature 5	501.290	40.000	508.490	40.000
Mean value	501.456	39.996	508.470	39.998
Overall mean value	501.467	39.996	508.456	39.997

Mean value of viscosity of the two viscometers*	25002.827	mm²/s
Mean value of the temperature	39.997	°C

*Please do not correct the result to target temperature

Notes or observations:		
participating lab (abbreviation), standard liquid	SIRIM	C, 40 °C

UNCERTAINTY BUDGET **STANDARD LIQUID C, 40°C**

Influence quantity	Value or mean value	Unit	Standard uncertainty	Unit	Rel. uncertainty in viscosity	Degrees of freedom
kin. viscosity - temperature coefficient of the sample	0.083	1/K	0.00013	1/K	can be neglecte	50
Density of the sample	0.88514	g/cm³	0.00019	g/cm³	can be neglecte	50
Surface tension of the sample	31.40	mN/m	0.36	mN/m	can be neglecte	50
Time measuring device			0.01000	s	0.000014	50
Flow time measurements	504.961500	s	0.14453	s	0.000202	19
Inclination of viscometers to vertical axis	0.400000	°	0.00720	°	0.000018	10000000
Sample temperature	39.996500	°C	0.00574	K	0.000477	19
Viscometer Number 1, Viscometer constant	49.970000	mm²/s²	0.10993	mm²/s²	0.002200	50
Individual surface tension correction factor c_S (1)	-		-		-	-
Kinetic energy correction t_{KE} (1)	-	s	-	s	-	-
Viscometer Number 2, Viscometer constant	49.270000	mm²/s²	0.10839	mm²/s²	0.002200	50
Individual surface tension correction factor c_S (2)	-		-		-	-
Kinetic energy correction t_{KE} (2)	-	s	-	s	-	-
additional uncertainty component 1						
additional uncertainty component 2						

UNCERTAINTY OF MEASUREMENT RESULTS

Rel. combined standard uncertainty of viscosity, u_c	0.00226
Effective degrees of freedom, ν_{eff}	55.3744
Coverage faktor $k_{95} = t_{95}(\nu_{eff})$	2.00
Relative expanded uncertainty of viscosity, $U_{95} = k_{95} \cdot u_c$	0.00453