RESOLUTION OIV-OENO 437-2012

UPDATE OF THE METHOD FOR DETERMINING THE DENSITY OF WINE (METHOD OIV-MA-AS2-01A)

THE GENERAL ASSEMBLY

IN VIEW of article 2, paragraph 2 iv of the Agreement dated 3 April 2001, establishing the International Organisation of Vine and Wine,

FOLLOWING a proposal made by the Methods of Analysis Sub-commission,

CONSIDERING the method relating to the determination of the density and specific gravity at 20°C (METHOD OIV-MA-AS2-01A) of wine updated in 2009,

IN VIEW of the studies presented to the Methods of Analysis Sub-commission,

HAS DECIDED to: modify point 2, introduce the determination by electronic densimetry using an oscillating cell (point 5) and replace point 5 with point 6 in type I analysis method AS2-01A, included in Appendix A of the Compendium of International Methods of Analysis of Wine and Musts, as follows:

*the original language from which this text was translated is: FR

Title	Type of method
Density and specific gravity at 20°c (method OIV-MA-AS2-01A	I

2. Principle

The density and specific gravity at 20°C are determined on the sample under test:

A	by pycnometry, or
B	by electronic densimetry using an oscillating cell
C	or by densimetry with a hydrostatic balance

Note: For very accurate measurement, the density must be corrected for the presence

Certified in conformity Izmir, 22nd June 2012
The Director General of the OIV
Secretary of the General Assembly
Frederico CASTELLUCCI

of sulphur dioxide.

$\rho_{20} = \rho'_{20} - 0.0006 \text{ x S}$

ρ_{20} = the corrected density

ρ'_{20} = the observed density

S = total sulphur dioxide in g/l

5. Density at 20°C and specific gravity at 20°C measured by electronic densimetry using an oscillating cell

5.1. Principle

The density of the wine is measured by electronic densimetry using an oscillating cell. The principle consists of measuring the oscillation frequency of a tube containing the sample and subjected to an electromagnetic field. The density is related to the oscillation frequency by the following equation:

$$\rho = T^2 \times \left(\frac{C}{4\pi^2 V}\right) - \left(\frac{M}{V}\right) \text{ (1)}$$

ρ = density of the sample

T = induced oscillation frequency

M = mass of the empty tube

C = spring constant

V = volume of the oscillated sample

This relationship is of the form: $\rho = A\,T^2 - B(2)$, there is therefore a linear relationship between the density and the square of the frequency. The constants A and B are specific for each oscillator and are estimated by measuring the period of fluids of known density.

5.2 Equipment

5.2.1. Electronic oscillating cell densimeter

The electronic densimeter consists of the following elements:

- A measuring cell containing a measuring tube and a temperature controller,
- A system for oscillating the tube and measuring the oscillation frequency,

- A timer,
- A digital display and if necessary a calculator.

The densimeter is placed on a perfectly stable support, isolated from all vibrations.

5.3. Reagents and materials

5.3.1 Reference fluids

Two reference fluids are used to adjust the densimeter. The densities of the reference fluids must include those of the wines to be measured. A difference in density between the reference fluids of more than 0.01000 g/ml is recommended. The density must be known with an uncertainty of less than +/- 0.00005 g/ml, at a temperature of 20.00 +/- 0.05°C.

The reference fluids used to measure the density of the wines by electronic densimetry are:

- Dry air (uncontaminated),
- Double distilled water, or water of equivalent analytical purity,
- Aqueous-alcoholic solutions, or wines whose density has been determined by pycnometry,
- Solutions connected to national standards with a viscosity of less than 2 mm^2/s.

5.3.2. Cleaning and drying products

- detergents, acids, etc.
- organic solvents: ethanol 96% vol., pure acetone, etc.

5.4. Equipment inspection and calibration

5.4.1 Temperature control of measuring cell

The measuring tube is located in a temperature-controlled device. The variation in temperature must be less than +/- 0.02°C.

When provided as a feature by the densimeter, the temperature of the measuring cell must be controlled since it has a significant impact on the results of the determinations. The density of an aqueous-alcoholic solution with an alcoholic strength by volume (ASV) of 10% vol. is 0.98471 g/ml at 20°C and 0.98447 g/ml at 21°C, i.e. a difference of 0.00024 g/ml.

The test temperature is 20°C. The cell temperature is measured with a thermometer that offers a resolution of less than 0.01°C and connected to national standards. It must ensure that the temperature is measured with an uncertainty of less than +/- 0.07°C.

5.4.2 Equipment calibration

The equipment must be calibrated before being used for the first time, then every six months or if the verification is unsatisfactory. The objective is to use two reference fluids to calculate the constants A and B (cf. (2)). For details about the calibration refer to the instructions for the equipment. In principle, this calibration is carried out using dry air (taking atmospheric pressure into consideration) and very pure water (double-distilled and/or microfiltered with a very high resistivity, e.g. > 18 MΩ.cm).

5.4.3 Verifying the calibration

The calibration is verified by measuring the density of the reference fluids.

- An air density verification is performed every day. A difference between the theoretical and measured density of more than 0.00008 g/ml may indicate that the tube is soiled. It must then be cleaned. After cleaning, the air density is verified again, and if this verification does not comply then the equipment must be adjusted.
- The density of water must also be verified; if the difference between the theoretical and measured density is greater than 0.00008 g/ml then the apparatus must be adjusted.
- If the verification of the cell temperature is problematic then the density of a hydroalcoholic solution whose density is comparable with those of the wines analysed can be checked directly.

5.4.4 Checks

When the difference between the theoretical density of a reference solution (known with an uncertainty of +/- 0.00005 g/ml) and the measured density is greater than 0.00008 g/ml then the calibration of the device must be checked.

5.5. Procedure

The operator must ensure that the temperature of the measuring cell is stable. The wine in the densimeter cell must not contain bubbles of gas and must be homogeneous. If an internal light can be used to check for the absence of bubbles, extinguish it quickly after performing the check since the heat generated by the lamp has an impact on the measured temperature.

If the equipment only gives the frequency, the density is calculated using the constants A and B (refer to the instructions for the equipment).

5.6 Precision parameters for the density measuring method using an oscillating cell

n	3800
min	0.99187
max	1.01233
r	0.00011
r%	0.011
s_r	0.000038
R	0.00025
s_R	0.000091
R%	0.025

Key:

- n: number of values selected
- min: lower limit of range of measurement
- max: upper limit of range of measurement

- r: repeatability
- s_r: Repeatability standard deviation
- r%: Relative repeatability (sr x 100 / mean value)
- R: reproducibility
- s_R: Reproducibility standard deviation
- R%: Relative reproducibility (sR x 100 / mean value)

6. Density at 20°C and specific gravity at 20°C measured using the hydrostatic balance

6.1 Principle

The density of wine may be measured by densimetry with a hydrostatic balance which relies on the phenomenon defined by Archimedes' principle, namely that any object immersed in a fluid experiences an upwards force equal to the weight of the fluid displaced by the object.

6.2 Equipment and materials

Standard laboratory equipment, including:

6.2.1. Single-pan hydrostatic balance with a precision of 1 mg.

6.2.2. Float with a volume of at least 20 ml, specific to the balance, suspended by a thread with a diameter less than or equal to 0.1 mm.

6.2.3. Measuring cylinder with a level mark. The float must be capable of being completely contained in the volume below the mark; the surface of the liquid must be penetrated only by the supporting thread. The internal diameter of the measuring cylinder must be at least 6 mm more than that of the float.

6.2.4. Thermometer (or temperature probe) with degree and tenth of a degree graduations, from 10 to 40°C, calibrated to ± 0.06°C.

6.2.5. Weights calibrated by a recognised certification body.

6.3 Reagents

Unless otherwise indicated, only use analytical quality reagents during the analysis with at least class 3 water corresponding to the definition given in standard ISO

3696:1987.

6.3.1. Washing solution for the float (sodium hydroxide, 30% m/v).

To prepare 100 ml of solution, dissolve 30 g of sodium hydroxide in ethanol 96% vol.

6.4. Procedure

After each measurement, the float and the cylinder must be cleaned with distilled water, wiped with soft laboratory paper which does not shed its fibres and rinsed with the solution whose density is to be determined. The measurements must be performed when the equipment is stable so as to minimise alcohol loss through evaporation.

6.4.1. Balance calibration

Although balances usually have an internal calibration system, the hydrostatic balance must be calibrated with weights that are checked by an official certification body.

6.4.2. Float calibration

Fill the cylinder up to the mark with double-distilled water (or with water of equivalent purity, e.g. microfiltered water with a conductivity of 18.2 M□.cm), whose temperature must be between 15 and 25°C, and ideally at 20°C.

Immerse the float and the thermometer in the liquid, stir, read the density of the liquid indicated by the equipment, and, if necessary, adjust this reading such that it is equal to that of the water at the temperature at which the reading was taken.

6.4.3. Verification using a solution of known density

Fill the cylinder up to the mark with a solution of known density, whose temperature is between 15 and 25°C, and ideally at 20°C.

Immerse the float and the thermometer in the liquid, stir, read the density of the liquid indicated by the equipment and record the density and the temperature if the density is measured at t°C (□ t)

6.4.4. If necessary, correct □ using the table of densities □ t for water-alcohol mixtures [Table II of Annex II of the OIV's Compendium of international analysis methods].

The density determined in this way must be identical to the previously determined density.

Note: This solution of known density can be used instead of double-distilled water for the calibration of the float.

6.4.5. Measuring the density of a wine

Pour the sample under test into the cylinder up to the mark.

Immerse the float and the thermometer in the liquid, stir, read the density of the

liquid indicated by the apparatus. Record the temperature if the density is measured at t°C (□ t).
Correct □ using the table of densities □ t for water-alcohol mixtures [Table II of Annex II of the OIV's Compendium of international analysis methods].
6.4.6. Cleaning the float and the cylinder.
Immerse the float in the washing solution poured into the cylinder.
Leave to soak for one hour, rotating the float frequently.
Rinse thoroughly with tap water, then with distilled water.
Wipe with soft laboratory paper that does not shed fibres.
Perform these operations when the float is used for the first time, and then regularly as required.

6.5. Precision parameters for measuring the density using the hydrostatic balance

n	4347
min	0.99189
max	1.01229
r	0.00025
s_r	0.000090
r%	0.025
R	0.00067
s_R	0.00024
R%	0.067

Key:

- n: number of values selected

- min: lower limit of range of measurement
- max: upper limit of range of measurement
- r: repeatability
- s_r: Repeatability standard deviation
- r%: Relative repeatability (sr x 100 /mean value)
- R: reproducibility
- s_R: Reproducibility standard deviation
- R%: Relative reproducibility (sR x 100 /mean value)

6.6. Comparison of results for the density measuring methods using an oscillating cell or an hydrostatic balance

Using samples with a density between 0.992 and 1.012 g/ml repeatability and reproducibility were measured during an inter-laboratory ring test. The density of different samples as measured using the hydrostatic balance and the electronic densimeter and the repeatability and reproducibility values derived from an extensive multiannual inter-comparison exercise were compared.

6.6.1. Samples

Wines of different density and alcoholic strength prepared each month on an industrial scale, taken from a properly stored stock of bottles and delivered as anonymous products to the laboratories.

6.6.2. Laboratories

Laboratories participating in the monthly ring test organised by the Unione Italiana Vini (Verona, Italy) according to ISO 5725 (UNI 9225) rules and the International Protocol of Proficiency Testing for chemical analysis laboratories established by AOAC, ISO and IUPAC and ISO 43 and ILAC G13 guidelines. An annual report is supplied by this organisation to all participants.

6.6.3. Equipment

6.6.3.1. Electronic hydrostatic balance (accurate to 5 decimal places), if possible with a data processing device:

6.6.3.2. Electronic densimeter, if possible with autosampler.

6.6.4. Analysis

According to the rules for the validation of methods, each sample was analysed twice consecutively to determine the alcoholic strength.

6.6.5. Result

Table 1 shows the results of the measurements obtained by the laboratories using the hydrostatic balance.
Table 2 shows the results obtained by the laboratories using an electronic densimeter.

6.6.6. Evaluations of the results

6.6.6.1. The trial results were examined for evidence of individual systematic error ($p < 0{,}025$) using Cochran's and Grubb's tests successively, by procedures described in the internationally agreed Protocol for the Design, Conduct and Interpretation of Method-Performance Studies.
6.6.6.2. Repeatability (r) and reproducibility (R)
Calculations for repeatability (r) and reproducibility (R) as defined by that protocol were carried out on those results remaining after the removal of outliers. When assessing a new method there is often no validated reference or statutory method with which to compare precision criteria, hence it is useful to compare the precision data obtained from a collaborative trial with 'predicted' levels of precision. These 'predicted' levels are calculated from the Horwitz equation. Comparison of the trial results and the predicted levels give an indication as to whether the method is sufficiently precise for the level of analyte being measured. The Horwitz predicted value is calculated from the Horwitz equation.

$$RSDR = 2^{(1-0{,}5\,logC)}$$

where C = measured concentration of analyte expressed as a decimal (e.g. 1 g/100 g = 0.01).
The Horrat value gives a comparison of the actual precision measured with the precision predicted by the Horwitz equation for a method measuring at that particular level of analyte. It is calculated as follows:
HoR = RSDR(measured)/RSDR(Horwitz)
6.6.6.3. Interlaboratory precision
A Horrat value of 1 usually indicates satisfactory inter-laboratory precision, whereas a

value of 2 usually indicates unsatisfactory precision, i.e. one that is too variable for most analytical purposes or where the variation obtained is greater than that expected for the type of method employed. Hor is also calculated, and used to assess intra-laboratory precision, using the following approximation:

RSDr(Horwitz) = 0,66 RSDR(Horwitz) (this assumes the approximation r = 0,66 R).

Table 3 shows the differences between the measurements obtained by laboratories using electronic densimetry and those using a hydrostatic balance.

6.6.6.4. Precision parameters

Table 4 shows the average overall precision parameters computed from all monthly trials carried out from January 2008 until December 2010.

Table 1: Hydrostatic balance (HB)

Sample	Mean	Total values	Values selected	repeatability	sr	RSDr	Hor	Reproducibility	sR	RSDRcalc	HoR	n replies	CrD95
01/08	0,995491	130	120	0,0001701	0,0000607	0,0061016	0,0046193	0,0005979	0,0002135	0,0214502	0,0107178	2	0,0004141
02/08	1,011475	146	125	0,0004714	0,0001684	0,0166457	0,0126320	0,0008705	0,0003109	0,0307366	0,0153947	2	0,0005686
03/08	0,992473	174	161	0,0001470	0,0000525	0,0052898	0,0040029	0,0004311	0,0001540	0,0155140	0,0077482	2	0,0002959
04/08	0,993147	172	155	0,0002761	0,0000986	0,0099274	0,0075130	0,0005446	0,0001945	0,0195839	0,0097818	2	0,0003595
05/08	1,004836	150	138	0,0001882	0,0000672	0,0066905	0,0050723	0,0007495	0,0002677	0,0266373	0,0133283	2	0,0005215
06/08	0,993992	152	136	0,0001486	0,0000531	0,0053391	0,0040411	0,0005302	0,0001894	0,0190506	0,0095167	2	0,0003675
07/08	0,992447	162	150	0,0002660	0,0000950	0,0095709	0,0072424	0,0006046	0,0002159	0,0217575	0,0108664	2	0,0004063
08/08	0,992210	162	151	0,0002619	0,0000935	0,0094281	0,0071341	0,0006309	0,0002253	0,0227108	0,0113420	2	0,0004265
09/08	1,002600	148	131	0,0001093	0,0000390	0,0038920	0,0029496	0,0007000	0,0002500	0,0249341	0,0124719	2	0,0004919
10/08	0,994482	174	152	0,0001228	0,0000439	0,0044105	0,0033385	0,0004250	0,0001518	0,0152645	0,0076259	2	0,0002942
11/08	0,992010	136	125	0,0000909	0,0000325	0,0032742	0,0024775	0,0004256	0,0001520	0,0153217	0,0076516	2	0,0002975
01/09	0,994184	174	152	0,0001655	0,0000591	0,0059435	0,0044987	0,0005439	0,0001942	0,0195384	0,0097606	2	0,0003756
02/09	0,992266	118	101	0,0001742	0,0000622	0,0062682	0,0047431	0,0005210	0,0001861	0,0187534	0,0093658	2	0,0003580
03/09	0,991886	164	135	0,0001850	0,0000661	0,0066603	0,0050395	0,0004781	0,0001707	0,0172136	0,0085963	2	0,0003251
04/09	0,993632	180	150	0,0001523	0,0000544	0,0054754	0,0041440	0,0004270	0,0001525	0,0153476	0,0076664	2	0,0002922
05/09	1,011061	116	100	0,0003659	0,0001307	0,0129234	0,0098067	0,0008338	0,0002978	0,0294527	0,0147508	2	0,0005605
06/09	0,992063	114	105	0,0002923	0,0001044	0,0105238	0,0079631	0,0005257	0,0001877	0,0189240	0,0094507	2	0,0003418
07/09	0,992708	172	155	0,0002892	0,0001033	0,0104040	0,0078732	0,0006156	0,0002199	0,0221478	0,0110617	2	0,0004106
08/09	0,993064	136	127	0,0002926	0,0001045	0,0105224	0,0079632	0,0007520	0,0002686	0,0270446	0,0135081	2	0,0005112
09/09	1,005285	118	110	0,0002946	0,0001052	0,0104661	0,0079352	0,0007226	0,0002581	0,0256704	0,0128454	2	0,0004892
10/09	0,992905	150	132	0,0002234	0,0000798	0,0080358	0,0060812	0,0004498	0,0001607	0,0161803	0,0080815	2	0,0002978
11/09	0,994016	142	127	0,0001896	0,0000677	0,0068114	0,0051555	0,0004739	0,0001693	0,0170278	0,0085062	2	0,0003214
01/10	0,994734	170	152	0,0002125	0,0000759	0,0076288	0,0057748	0,0005406	0,0001931	0,0194104	0,0096975	2	0,0003672
02/10	0,993177	120	110	0,0002210	0,0000789	0,0079467	0,0060140	0,0005800	0,0002071	0,0208565	0,0104175	2	0,0003950
03/10	0,992799	148	136	0,0002277	0,0000813	0,0081923	0,0061995	0,0015157	0,0005413	0,0545262	0,0272335	2	0,0010657

04/10	0,995420	172	157	0,0002644	0,0000944	0,0094866	0,0071819	0,0006286	0,0002245	0,0225542	0,0112693	2	0,0004244
05/10	1,002963	120	108	0,0007086	0,0002531	0,0252330	0,0191244	0,0013667	0,0004881	0,0486677	0,0243447	2	0,0008991
06/10	0,992546	120	113	0,0001737	0,0000620	0,0062506	0,0047300	0,0005435	0,0001941	0,0195567	0,0097673	2	0,0003744
07/10	0,992831	174	152	0,0003003	0,0001073	0,0108031	0,0081753	0,0006976	0,0002492	0,0250959	0,0125344	2	0,0004699
08/10	0,993184	144	130	0,0001799	0,0000642	0,0064674	0,0048945	0,0005951	0,0002125	0,0213984	0,0106882	2	0,0004111
09/10	1,012293	114	103	0,0002265	0,0000809	0,0079907	0,0060647	0,0014586	0,0005209	0,0514596	0,0257772	2	0,0010251
10/10	0,992289	154	136	0,0006386	0,0002281	0,0229860	0,0173933	0,0007033	0,0002512	0,0253124	0,0126415	2	0,0003812
11/10	0,994649	130	112	0,0002902	0,0001036	0,0104200	0,0078876	0,0005287	0,0001888	0,0189830	0,0094838	2	0,0003445

Table 2: Electronic densimetry (ED)

Sample	Mean	Total values	Values selected	repeatability	sr	RSDr	Hor	Reproducibility	sR	RSDRcalc	HoR	n replies	CrD95
01/08	0,995504	114	108	0,0000755	0,0000270	0,0027085	0,0020505	0,0001571	0,0000561	0,0056361	0,0028162	2	0,0001045
02/08	1,011493	132	125	0,0001921	0,0000686	0,0067837	0,0051480	0,0004435	0,0001584	0,0156582	0,0078426	2	0,0002985
03/08	0,992491	138	118	0,0000746	0,0000266	0,0026830	0,0020303	0,0002745	0,0000980	0,0098776	0,0049332	2	0,0001905
04/08	0,993129	132	120	0,0001230	0,0000439	0,0044247	0,0033486	0,0002863	0,0001023	0,0102965	0,0051429	2	0,0001929
05/08	1,004892	136	116	0,0000926	0,0000331	0,0032893	0,0024937	0,0004777	0,0001706	0,0169785	0,0084955	2	0,0003346
06/08	0,994063	142	123	0,0000558	0,0000199	0,0020051	0,0015177	0,0001776	0,0000634	0,0063791	0,0031867	2	0,0001224
07/08	0,992498	136	125	0,0000822	0,0000294	0,0029576	0,0022381	0,0002094	0,0000748	0,0075368	0,0037641	2	0,0001423
08/08	0,992270	130	115	0,0000515	0,0000184	0,0018537	0,0014027	0,0001665	0,0000595	0,0059940	0,0029935	2	0,0001149
09/08	1,002603	136	121	0,0000821	0,0000293	0,0029236	0,0022157	0,0003328	0,0001189	0,0118565	0,0059306	2	0,0002318
10/08	0,994493	128	117	0,0000667	0,0000238	0,0023954	0,0018132	0,0001429	0,0000510	0,0051309	0,0025633	2	0,0000954
11/08	0,992017	118	104	0,0000842	0,0000301	0,0030309	0,0022933	0,0001962	0,0000701	0,0070644	0,0035279	2	0,0001322
01/09	0,994216	148	131	0,0000830	0,0000297	0,0029832	0,0022580	0,0001551	0,0000554	0,0055712	0,0027832	2	0,0001015
02/09	0,992251	104	88	0,0000947	0,0000338	0,0034097	0,0025801	0,0002846	0,0001017	0,0102451	0,0051165	2	0,0001956
03/09	0,991875	126	108	0,0001271	0,0000454	0,0045777	0,0034637	0,0002067	0,0000738	0,0074421	0,0037165	2	0,0001316
04/09	0,993654	134	114	0,0001166	0,0000416	0,0041899	0,0031711	0,0002043	0,0000730	0,0073417	0,0036673	2	0,0001322
05/09	1,011035	128	104	0,0002388	0,0000853	0,0084361	0,0064016	0,0003554	0,0001269	0,0125542	0,0062875	2	0,0002211
06/09	0,992104	116	106	0,0001005	0,0000359	0,0036178	0,0027375	0,0003169	0,0001132	0,0114088	0,0056976	2	0,0002184
07/09	0,992720	144	140	0,0001579	0,0000564	0,0056815	0,0042995	0,0002916	0,0001042	0,0104923	0,0052404	2	0,0001905
08/09	0,993139	110	102	0,0001175	0,0000420	0,0042242	0,0031969	0,0003603	0,0001287	0,0129577	0,0064721	2	0,0002479
09/09	1,005276	112	108	0,0001100	0,0000393	0,0039070	0,0029622	0,0003522	0,0001258	0,0125134	0,0062617	2	0,0002429
10/09	0,992912	122	111	0,0000705	0,0000252	0,0025365	0,0019195	0,0002122	0,0000758	0,0076315	0,0038117	2	0,0001458
11/09	0,994031	128	118	0,0000718	0,0000256	0,0025784	0,0019516	0,0001639	0,0000585	0,0058883	0,0029415	2	0,0001102
01/10	0,994752	144	136	0,0000773	0,0000276	0,0027765	0,0021017	0,0001787	0,0000638	0,0064144	0,0032046	2	0,0001203
02/10	0,993181	108	98	0,0001471	0,0000525	0,0052893	0,0040029	0,0001693	0,0000605	0,0060884	0,0030410	2	0,0000945
03/10	0,992665	140	127	0,0001714	0,0000612	0,0061683	0,0046678	0,0002378	0,0000849	0,0085559	0,0042732	2	0,0001447
04/10	0,995502	142	128	0,0001175	0,0000419	0,0042138	0,0031901	0,0002320	0,0000829	0,0083248	0,0041596	2	0,0001532
05/10	1,002851	130	119	0,0001195	0,0000427	0,0042555	0,0032253	0,0002971	0,0001061	0,0105815	0,0052930	2	0,0002014
06/10	0,992607	106	99	0,0001228	0,0000438	0,0044172	0,0033427	0,0002226	0,0000795	0,0080092	0,0040001	2	0,0001449
07/10	0,992871	160	150	0,0001438	0,0000513	0,0051712	0,0039134	0,0003732	0,0001333	0,0134258	0,0067057	2	0,0002539
08/10	0,993235	104	93	0,0000895	0,0000320	0,0032182	0,0024356	0,0002458	0,0000878	0,0088399	0,0044154	2	0,0001680

Certified in conformity Izmir, 22nd June 2012
The Director General of the OIV
Secretary of the General Assembly
Frederico CASTELLUCCI

09/10	1,012328	112	105	0,0000870	0,0000311	0,0030692	0,0023295	0,0003395	0,0001213	0,0119781	0,0060001	2	0,0002361
10/10	0,992308	128	115	0,0000606	0,0000216	0,0021811	0,0016504	0,0001635	0,0000584	0,0058845	0,0029388	2	0,0001116
11/10	0,994683	120	108	0,0001127	0,0000402	0,0040450	0,0030620	0,0001597	0,0000570	0,0057339	0,0028647	2	0,0000979

Table 3: Comparison of results between hydrostatic balance (HB) and electronic densimetry (DE)

Density - Hydrostatic balance				Density - Oscillating cell				Comparision
Sample	Mean value	Total values	Selected values	Sample	Mean value	Total values	Selected values	Δ(Bi-DE)
01/08	0,995491	130	120	01/08	0,995504	114	108	-0,000013
02/08	1,011475	146	125	02/08	1,011493	132	125	-0,000018
03/08	0,992473	174	161	03/08	0,992491	138	118	-0,000018
04/08	0,993147	172	155	04/08	0,993129	132	120	0,000018
05/08	1,004836	150	138	05/08	1,004892	136	116	-0,000056
06/08	0,993992	152	136	06/08	0,994063	142	123	-0,000071
07/08	0,992447	162	150	07/08	0,992498	136	125	-0,000051
08/08	0,992210	162	151	08/08	0,992270	130	115	-0,000060
09/08	1,002600	148	131	09/08	1,002603	136	121	-0,000003
10/08	0,994482	174	152	10/08	0,994493	128	117	-0,000011
11/08	0,992010	136	125	11/08	0,992017	118	104	-0,000007
01/09	0,994184	174	152	01/09	0,994216	148	131	-0,000031
02/09	0,992266	118	101	02/09	0,992251	104	88	0,000015
03/09	0,991886	164	135	03/09	0,991875	126	108	0,000011
04/09	0,993632	180	150	04/09	0,993654	134	114	-0,000022
05/09	1,011061	116	100	05/09	1,011035	128	104	0,000026

06/09	0,992063	114	105	06/09	0,992104	116	106	-0,000041
07/09	0,992708	172	155	07/09	0,992720	144	140	-0,000012
08/09	0,993064	136	127	08/09	0,993139	110	102	-0,000075
09/09	1,005285	118	110	09/09	1,005276	112	108	0,000009
10/09	0,992905	150	132	10/09	0,992912	122	111	-0,000008
11/09	0,994016	142	127	11/09	0,994031	128	118	-0,000015
01/10	0,994734	170	152	01/10	0,994752	144	136	-0,000018
02/10	0,993177	120	110	02/10	0,993181	108	98	-0,000005
03/10	0,992799	148	136	03/10	0,992665	140	127	0,000134
04/10	0,995420	172	157	04/10	0,995502	142	128	-0,000082
05/10	1,002963	120	108	05/10	1,002851	130	119	0,000112
06/10	0,992546	120	113	06/10	0,992607	106	99	-0,000061
07/10	0,992831	174	152	07/10	0,992871	160	150	-0,000040
08/10	0,993184	144	130	08/10	0,993235	104	93	-0,000052
09/10	1,012293	114	103	09/10	1,012328	112	105	-0,000035
10/10	0,992289	154	136	10/10	0,992308	128	115	-0,000019
11/10	0,994649	130	112	11/10	0,994683	120	108	-0,000035
						average	Δ(Bi-DE)	-0,0000162
						Std. dev.	Δ(Bi-DE)	0,0000447

Table 4: Precision parameters

	hydrostatic balance (HB)	*electronic densimetry (DE)*
n° selected values	4347	3800

min	0,99189	0,99187
max	1,01229	1,01233
R	0,00067	0,00025
s_R	0,00024	0,000091
R%	0,067	0,025
r	0,00025	0,00011
s_r	0,000090	0,000038
r%	0,025	0,011