



INSTITUTO DE
PESQUISAS
TECNOLÓGICAS

CERTIFICATE OF REFERENCE MATERIAL N° 2 400-103

VISCOSITY STANDARD

MINERAL OIL OP 10

IPT 78

This certified reference material is composed of oils mixture without additives, homogenized and certified at IPT, using standard methods. It can be used for calibration, verification of accuracy and precision and for demonstrating traceability of results of viscosity measuring methods.

Temperature (°C)	Kinematic Viscosity (mm ² /s)		Dinamic Viscosity (mPa.s)		Density (g/cm ³)	
	Certified Values	Expanded Uncertainties	Certified Values	Expanded Uncertainties	Certified Values	Expanded Uncertainties
20,0	20,96	0,06	17,84	0,05	0,8510	0,0001
25,0	17,08	0,05	14,48	0,04	0,8478	0,0001
30,0	14,13	0,04	11,93	0,03	0,8445	0,0001
37,8	10,79	0,03	9,053	0,026	0,8394	0,0001
40,0	10,05	0,03	8,418	0,024	0,8380	0,0001
50,0	7,489	0,021	6,227	0,018	0,8314	0,0001
60,0	5,782	0,017	4,770	0,014	0,8249	0,0001
70,0	4,597	0,013	3,762	0,011	0,8184	0,0001
80,0	3,745	0,011	3,041	0,009	0,8119	0,0001
90,0	3,116	0,009	2,509	0,007	0,8054	0,0001
98,9	2,685	0,008	2,147	0,006	0,7995	0,0001
100,0	2,639	0,008	2,108	0,006	0,7988	0,0001

Lot Number : 20
Package Volume : 500 mL

Certification Date: 10/03/2022
Valid until : 10/31/2024

The certified values and uncertainties are assured by the validity period, considering that the material is handled and stored in accordance with the given instructions, except in case of damage or contamination. IPT will monitor periodically the properties of this reference material during its validity period, and any observed significant change will be reported to the user.

São Paulo, October 20th, 2022.

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Uncertainties

The expanded uncertainties of the certified values of viscosity were estimated by the combination of uncertainties of characterization, homogeneity and stability, according to ISO Guide 35/2017 - Reference materials - Guidance for characterization and assessment of homogeneity and stability. Was used the coverage factor $k=2$, giving a confidence level of approximately 95 %.

Metrological Traceability

The certified values are traceable to the International System of Units (SI) through calibration of the instruments used in measurements. The viscometers were calibrated at National Institute of Metrology, Quality and Technology - INMETRO and auxiliary instruments were calibrated at Brazilian Calibration Network - RBC.

Methods

This material was certified in compliance with the requirements of ABNT NBR ISO 17034/2017 - General requirements for the competence of reference material producers. The measurements were performed in accordance with ASTM D445/2021e2 - Standard test method for kinematic viscosity of transparent and opaque liquids (and calculation of dynamic viscosity) and ASTM D1480/2021 - Standard test method for density and relative density (specific gravity) of viscous materials by Bingham pycnometer.

Handling and Storage

Keep the material in its original bottle, tightly closed.

It is not recommended to return samples of the product to the original bottle.

Store the material at room temperature, protected against incident light and away from heat sources.

Safety Informations

This material is non-flammable, according to ABNT NBR 14725-2/2019 - Chemicals - Information about safety, health and environment - Part 2: Hazard classification system. The MSDS - Material Safety Data Sheet of this material is available for consultation (Portuguese) in <http://www.ipt.br/nmr.htm>.

Additional Information

In addition to the capillary kinematic viscometers, this reference material may be used in many other types of instruments viscosity measuring as flow cups, Saybolt viscometers and Stormer viscometers.

The tables below present the typical flow time for this material, calculated from the equations presented in the technical standards.

Note 1: Check the standards to meet the minimum and maximum acceptable time and necessary care for measurement.

Standard: ASTM D4212/2016 Temperature: 25 °C		Standard: ASTM D1200/2010 (2018) Temperature: 25 °C		Standard: DIN 53211/1987 Temperature: 25 °C	
INSTRUMENT	TIME (s)	INSTRUMENT	TIME (s)	INSTRUMENT	TIME (s)
Shell 1	-	Ford 1	69,9	*DIN 3	26,5
Shell 2	34,7	Ford 2	-	DIN 4	-
Shell 2½	21,5	Ford 3	-	*DIN 6	-
Shell 3	-	Ford 4	-	*DIN 8	-
Shell 3½	-	Ford 5	-	Standard: ISO 2431/2019 Temperature: 25 °C	
Shell 4	-	*Ford 6	-	INSTRUMENT	TIME (s)
Shell 5	-	*Ford 8	-	ISO 3	48,0
Shell 6	-	Standard: ASTM D2161/2020 Temperature: 37,8 °C; 50,0 °C; 98,9 °C		ISO 4	-
Standard: ASTM D4212/2016 Temperature: 25 °C		INSTRUMENT	TIME	ISO 5	-
INSTRUMENT	TIME (s)	Saybolt Universal 37,8 °C (SUS)	61,6	ISO 6	-
Zahn 1	44,5	Saybolt Universal 98,9 °C (SUS)	35,1	Standard: ASTM D562/2010 (2018) Temperature: 25 °C	
Zahn 2	-	Saybolt Furol 50,0 °C (SFS)	-	INSTRUMENT	KU
Zahn 3	-	Standard: ASTM D562/2010 (2018) Temperature: 25 °C		Stormer	-
Zahn 4	-	Standard: ASTM D562/2010 (2018) Temperature: 25 °C			
Zahn 5	-	Standard: ASTM D562/2010 (2018) Temperature: 25 °C			

* **Note 2:** Flow Cups Ford 6 and 8, and DIN 3, 6 and 8 are not standardized instruments. The flow times presented in this certificate, were calculated using the equations obtained from studies conducted at IPT to meet the demand of its users. These results are available in IPT's Technical Report N° 36017 concluded in September, 1998.

Certification Team

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The latest version of the Certificates of IPT Reference Materials are available for download at: www.iptirm.com.