### ISO/FDIS 23581:2023(E)

ISO-<u>/\_TC-\_28<del>/WG-17</del> Date: 2023-12-04</u>

Secretariat:-\_NEN

Date: 2024-xx

# Petroleum products and related products-\_— Determination of kinematic viscosity — Method by Stabinger type viscometer

Produits pétroliers et produits connexes — Détermination de la viscosité cinématique — Méthode avec lepar viscosimètre <u>type</u> Stabinger

# (https://standards.iteh. Document Preview

FDIS stage DIS 23581

https://standards.iteh.ai/catalog/standards/iso/2257a218-12c0-4197-b85f-6

For	matted	[]
Styl	e Definition	<u></u>
Styl	e Definition	 
/ >	e Definition	
·	a Definition	<u> </u>
		<u>(</u>
$\searrow$		(
Styl	e Definition	
Styl	e Definition	
Styl	e Definition	
Stvl	e Definition	
	e Definition	<u></u>
		<u> </u>
	e Definition	<u></u>
		[
Styl	e Definition	()
Styl	e Definition	
Styl	e Definition	( )
Styl	e Definition	
Styl	e Definition	
Styl	e Definition	
		<u> </u>
		<u></u>
	e Definition	<u></u>
Styl	e Definition	
Styl	e Definition	
Styl	e Definition	<u></u>
Styl	e Definition	
Styl	e Definition	
	e Definition	
		<u> </u>
	e Definition	<u></u>
	e Definition	(
Styl	e Definition	
Styl	e Definition	
Styl		<u></u>
Deg -	e Definition	ι
	e Definition	
Styl	#U72U/IBU=IUIB=22201	
Styl Styl	e Definition e Definition	
Styl Styl Styl	e Definition e Definition e Definition	
Styl Styl Styl Styl	e Definition e Definition e Definition e Definition	
Styl Styl Styl Styl Styl	e Definition e Definition e Definition e Definition e Definition	
Styl Styl Styl Styl Styl Styl	e Definition e Definition e Definition e Definition e Definition e Definition	
Styl Styl Styl Styl Styl Styl	e Definition e Definition e Definition e Definition e Definition	
Styl Styl Styl Styl Styl Styl Styl	e Definition e Definition e Definition e Definition e Definition e Definition	
Styl Styl Styl Styl Styl Styl Styl	e Definition e Definition e Definition e Definition e Definition e Definition e Definition	
Styl Styl Styl Styl Styl Styl Styl Styl	e Definition	
Styl Styl Styl Styl Styl Styl Styl Styl	e Definition	
Styl Styl Styl Styl Styl Styl Styl Styl	e Definition	
Styl Styl Styl Styl Styl Styl Styl Styl	e Definition	
Styl Styl Styl Styl Styl Styl Styl Styl	e Definition	
Styl Styl Styl Styl Styl Styl Styl Styl	e Definition	
Styl Styl Styl Styl Styl Styl Styl Styl	e Definition	
Styl Styl Styl Styl Styl Styl Styl Styl	e Definition	
Styl Styl Styl Styl Styl Styl Styl Styl	e Definition	
Styl Styl Styl Styl Styl Styl Styl Styl	e Definition	
Styl Styl Styl Styl Styl Styl Styl Styl	e Definition	
Styl Styl Styl Styl Styl Styl Styl Styl	e Definition	
Styl Styl Styl Styl Styl Styl Styl Styl	e Definition	
Styl Styl Styl Styl Styl Styl Styl Styl	e Definition	
Styl Styl Styl Styl Styl Styl Styl Styl	e Definition	
Styl           Styl	e Definition	
Styl           Styl	e Definition	
Styl           Styl	e Definition	
Styl           Styl	e Definition	
Styl           Styl	e Definition	
Styl           Styl	e Definition	
Styl           Styl	e Definition	
Styl           Styl	e Definition e Def	

### © <u>ISO <del>202</del>32024</u>

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office CP 401 • Ch. de Blandonnet 8 CH-1214 Vernier, Geneva Phone: + 41 22 749 01 11 EmailE-mail: copyright@iso.org Website: www.iso.orgwww.iso.org

Published in Switzerland

ii

-	Formatted: Font: 11 pt, Bold, Font color: Auto						
$\mathbb{H}$	Formatted: Font: 11 pt, Bold, Font color: Auto						
Ń	Formatted: Font: Bold						
)	Formatted: HeaderCentered						
	Formatted: Left: 1.5 cm, Right: 1.5 cm, Gutter: 0 cm, Header distance from edge: 1.27 cm						
	<b>Commented [eXtyles1]:</b> The reference is to a withdrawn standard which has been replaced						
	ISO 20344, Personal protective equipment — Test methods for footwear						
	Formatted: Default Paragraph Font						
	<b>Formatted:</b> Adjust space between Latin and Asian text, Adjust space between Asian text and numbers						
	Formatted: French (France)						
$\langle \rangle$	Formatted: French (France)						
	Formatted: French (France)						

© ISO 2023 - All rights reserved

Formatted: FooterPageRomanNumber

© ISO 2024 – All rights reserved

ii

	<b>JSO/FDIS 23581:<del>2023(E</del>2024(en)</b>	•	Formatted: Font: 11 pt, Bold, Font color: Auto
		J.	Formatted: Font: 11 pt, Bold, Font color: Auto
			Formatted: Font: Bold
Con	tents		Formatted: HeaderCentered, Left
<u>Fore</u>	word	7	<b>Formatted:</b> Adjust space between Latin and Asian text, Adjust space between Asian text and numbers, Tab stops:
1	Scope	L	Not at 0.71 cm
2	Normative references	L	
3	Terms and definitions	L	
4	Principle	2	
5	Reagents and materials	2	
6	Apparatus	3	
7	Sampling and sample handling	5	
7.1	Sampling	5	
7.2	Sample handling	5	
<u>7.2.1</u>	General sample handling	5	
7.2.2	Conditioning of residual fuel oils	5	
8	Calibration and verification	7	
<u>8.1</u>	General	7	
8.2	Instrument	7	
9	Apparatus preparation	7	
<u>10</u>	Procedure	32	
<u>10.1</u>	Measuring procedure	3	
<u>10.2</u>	Manual filling and cleaning using syringes	3	
<u>10.3</u>	Manual filling using sample displacement	Ð	
	Automatic filling and cleaning by a sample changer/sample handler1		
<u>10.5</u>	Procedure for temperature scanning	)	
<u>11</u>	Calculationlanditabi/aatala.g/standondg/iga/0257.021812.a04107b854	llda	
<u>11.1</u>	Kinematic viscosity, dynamic viscosity and density1	L	
<u>11.2</u>	Viscosity index	L	
<u>11.3</u>	Density extrapolation	L	
<u>12</u>	Expression of results1	L	
<u>13</u>	Precision11	L	
<u>13.1</u>	Repeatability, r1	L	
<u>13.2</u>	Reproducibility, R	2	
<u>13.3</u>	Bias13	3	
<u>13.3</u>	<u>1 General</u> 13	3	
<u>13.3</u>		1	
	<u>M D445</u>	ł	
<u>13.4</u>	Interlaboratory study1		
<u>14</u>	<u>Test report</u> 11	7	Formatted: FooterPageRomanNumber, Left
©-l	SO 2023 – All rights reserved iii		
	© ISO 2024 – All rights reserved	/	
	iii	*	

ISO/FDIS 23581:2023(E2024(en))

Annex A (normative)	Calculation	of acceptable	tolerance	zone	(band)	for	determination of
conformance with a ref	erence materi	al					<u> </u>
Bibliography							21

Formatted: Font: 11 pt, Bold, Font color: Auto Formatted: Font: 11 pt, Bold, Font color: Auto Formatted: Font: Bold Formatted: HeaderCentered

<del>6.6</del>	-Screen-4	
<del>6.7</del>	- Magnet 4	
<del>6.8</del>	Ultrasonic bath, unheated 4	
7.1	Sampling 4	
7.2	Sample handling 5	
7.2.1	General sample handling 5	
7.2.2	Conditioning of residual fuel oils	$\rightarrow$ <b>D</b>
8.1	General 6	

10.1	Measuring procedure 7		
10.2	Manual filling and cleaning using syringes	7	

<del>10.3</del>	Manual filling using sample displacement starg lards/iso/2257a218-12c0-4197-b85f-61	
<del>10.4</del>	Automatic filling and cleaning by a sample changer / sample handler 9	

10.4	-Automatic filling and cleaning by a sample changer ,	-sample hand
10.5	Procedure for temperature scanning 9	
11.1	Kinematic viscosity, dynamic viscosity and density	10

105	Procedure to	<u>nr tomnoraturo ccanning</u> (	1
10.0	i i occuui e io	r temperature seaming	- I

6.1 Stabinger type viscometer 3 6.1.1 Viscosity measurement 3 6.1.2 Density measurement 3 6.1.3 Temperature control 3 6.2 Syringes 4

6.3 Flow-through or pressure adapter 4

6.5 Sample changer or sample handler 4

6.4 Hot filling adapter 4

-1	1	- 1	1 Kinomatic	viccocity d	unamic w	iccocity and	doncity	10
т	-		<u> </u>	viscosity, a	ynanne v	iscosity and	r uchisity	10

11.2 Viscosity index 10

11.3 Density extrapolation 10

13.1 Repeatability, r10

Instrument 6

13.2 Reproducibility, R 11

```
13.3 Bias 12
```

13.3.1\_General 12

13.3.2 Degree of agreement between results by test method ASTM D7042 and test method ASTM D445

13.4 Interlaboratory study 14

i₩

<u>— 12</u>

8.2

© ISO 2023 - All rights reserved

Formatted: FooterPageRomanNumber

© ISO 2024 – All rights reserved

JSO/FDIS 23581: <del>2023(E2024(en))</del>	-	Formatted: Font: 11 pt, Bold, Font color: Auto
	L	Formatted: Font: 11 pt, Bold, Font color: Auto
		Formatted: Font: Bold
Foreword	*	Formatted: HeaderCentered, Left
ISO (the International Organization for Standardization) is a worldwide federation of national standard bodies (ISO member bodies). The work of preparing International Standards is normally carried out throug ISO technical committees. Each member body interested in a subject for which a technical committee has bee established has the right to be represented on that committee. International organizations, governmental an non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.	h n d	Formatted: Adjust space between Latin and Asian text, Adjust space between Asian text and numbers
The procedures used to develop this document and those intended for its further maintenance are describe in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see <u>www.iso.org/directives</u> ).	of	Formatted: English (United Kingdom)
ISO draws attention to the possibility that the implementation of this document may involve the use of (a patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent right	S	
in respect thereof. As of the date of publication of this document, ISO [had/had not] received notice of (a patent(s) which may be required to implement this document. However, implementers are cautioned that th may not represent the latest information, which may be obtained from the patent database available a www.iso.org/patents. ISO shall not be held responsible for identifying any or all suc patent rights.	s it	Formatted: Font: Not Italic
Any trade name used in this document is information given for the convenience of users and does no constitute an endorsement.	t	
For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expression related to conformity assessment, as well as information about ISO's adherence to the World Trace Organization (WTO) principles in the Technical Barriers to Trade (TBT), see <a href="http://www.iso.org/iso/foreword.htm">www.iso.org/iso/foreword.htm</a>	e	Formatted: English (United Kingdom)
This document was prepared by Technical Committee ISO/TC 28, <i>Petroleum and related products, fuels an lubricants from natural or synthetic sources</i> , in collaboration with the European Committee for Standardizatio (CEN) Technical Committee CEN/TC 19, <i>Gaseous and liquid fuels, lubricants and related products of petroleur synthetic and biological origin</i> , in accordance with the Agreement on technical cooperation between ISO an CEN (Vienna Agreement).	n 1, d	Field Code Changed
This second edition cancels and replaces the first edition (ISO 23581:2020), which has been technical	v	Formatted: Default Paragraph Font
revised.	$\leq$	Formatted: Default Paragraph Font
mi · i · · i		Formatted: Default Paragraph Font
The main changes are as follows:		
— — base oils, formulated oils, jet fuels and residual fuel oils have been included in the scope;	•	<b>Formatted:</b> Adjust space between Latin and Asian text, Adjust space between Asian text and numbers, Tab stops:
<ul> <li>— the apparatus description, sample handling procedures and determinability criteria have bee updated to accommodate the new scope.</li> </ul>	h	Not at 0.7 cm + 1.4 cm + 2.1 cm + 2.8 cm + 3.5 cm + 4.2 cm + 4.9 cm + 5.6 cm + 6.3 cm + 7 cm
Any feedback or questions on this document should be directed to the user's national standards body. complete listing of these bodies can be found at <u>www.iso.org/members.html</u> .	A	<b>Formatted:</b> Adjust space between Latin and Asian text, Adjust space between Asian text and numbers
	$\langle \rangle$	Formatted: English (United Kingdom)
		Field Code Changed
© 1SO 2023 – All rights reserved ¥	/	Formatted: FooterPageRomanNumber, Left
© ISO 2024 – All rights reserved	/	
V	-	

## iTeh Standards (https://standards.iteh.ai) Document Preview

**ISO/FDIS 2358** 

https://standards.iteh.ai/catalog/standards/iso/2257a218-12c0-4197-b85f-61ddb35db936/iso-fdis-23581

FINAL DRAFT INTERNATIONAL STANDARD

#### ISO/FDIS 23581:2023(E)

Formatted: Space After: 0 pt

Header distance from edge: 1.27 cm

### Petroleum products and related products—— Determination of kinematic viscosity — Method by Stabinger type viscometer

WARNING-\_— The use of this document can involve hazardous materials, operations and equipment. This document does not purport to address all of the safety problems associated with its use. It is the responsibility of users of this document to take appropriate measures to ensure the safety and health of personnel prior to application of this document and fulfil other applicable requirements for this purpose.

#### 1 Scope

This document specifies a procedure for the determination of kinematic viscosity  $(\nu)_{\lambda}$  by calculation from dynamic viscosity  $(\nu)_{\lambda}$  and density  $(\nu)_{\lambda}$  of both transparent and opaque liquid petroleum products and crude oils using the Stabinger type viscometer.

The result obtained using the procedure described in this document depends on the rheological behaviour df the sample. This document is predominantly applicable to liquids whose shear stress and shear rate are proportional (Newtonian flow behaviour). If the viscosity changes significantly with the shear rate, comparison with other measuring methods is not possible except at similar shear rates.

The precision has been determined only for the materials, density ranges and temperatures described in <u>Clause 13. Clause 13.</u> The test method can be applied to a wider range of viscosity, density, temperature and materials. It is possible that the precision and bias are applicable for materials which are not listed in <u>Clause 13. Clause 13.</u>

#### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

<std>ISO 3104, Petroleum products — Transparent and opaque liquids — Determination of kinematic viscosity and calculation of dynamic viscosity

<std>ISO 3170, Petroleum liquids Manual sampling</std>

<std>ISO 3171, Petroleum liquids — Automatic pipeline sampling</std>

<std>ISO 12185, Crude petroleum and petroleum products — Determination of density — Oscillating U-tube method</std>

ISO 3170, Petroleum liquids — Manual sampling

ISO 3171, Petroleum liquids — Automatic pipeline sampling

ISO 12185, Crude petroleum and petroleum products — Determination of density — Oscillating U-tube method

#### 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

© ISO 2023 - All rights reserved

**Formatted:** Adjust space between Latin and Asian text, Adjust space between Asian text and numbers

Formatted: Adjust space between Latin and Asian text, Adjust space between Asian text and numbers, Tab stops:

Not at 0.7 cm + 1.4 cm + 2.1 cm + 2.8 cm + 3.5 cm + 4.2

Commented [eXtyles2]: ISO 12185: current stage is 50.20

Formatted: Default Paragraph Font

Formatted: Default Paragraph Font Formatted: Default Paragraph Font

cm + 4.9 cm + 5.6 cm + 6.3 cm + 7 cm

Formatted: Left

1

Formatted: Left: 1.5 cm, Right: 1.5 cm, Gutter: 0 cm,

JSO/FDIS 23581: <del>2023(E2024(en))</del>		Formatted: Font: 11 pt, Bold, Font color: Auto
	$\square$	Formatted: Font: 11 pt, Bold, Font color: Auto
	$\backslash$	Formatted: Font: Bold
ISO and IEC maintain terminology databases for use in standardization at the following addresses:	Y	Formatted: HeaderCentered
<ul> <li>— ISO Online browsing platform: available at <u>https://www.iso.org/obp</u>https://www.iso.org/obp</li> <li>— IEC Electropedia: available at <u>https://www.electropedia.org/</u>https://www.electropedia.org/</li> </ul>		<b>Formatted:</b> Adjust space between Latin and Asian text, Adjust space between Asian text and numbers, Tab stops: Not at 0.7 cm + 1.4 cm + 2.1 cm + 2.8 cm + 3.5 cm + 4.2 cm + 4.9 cm + 5.6 cm + 6.3 cm + 7 cm
3.1 dynamic viscosity	(	<b>Formatted:</b> Adjust space between Latin and Asian text, Adjust space between Asian text and numbers
		<b>Commented [eXtyles3]:</b> The term " $\eta$ " can not be checked
ratio of the applied shear stress to the resulting shear rate of a liquid	1	Formatted: Regular Italic, Font: Bold, Not Italic
3.2 kinematic viscosity		<b>Commented [eXtyles4]:</b> The term "v" can not be checked
ratio of the <i>dynamic viscosity</i> $(3.1)(3.1)$ to the <i>density</i> $(3.3)(3.3)$ of a liquid at the same temperature and		Formatted: Regular, Font: Bold
pressure		
Note 1-to-entry: The kinematic viscosity is a measure of a liquid's resistance to flow under gravity.		<b>Formatted:</b> Adjust space between Latin and Asian text, Adjust space between Asian text and numbers, Tab stops: Not at 0.7 cm + 1.4 cm + 2.1 cm + 2.8 cm + 3.5 cm + 4.2 cm + 4.9 cm + 5.6 cm + 6.3 cm + 7 cm
p mass of a substance divided by its volume at a given temperature		<b>Formatted:</b> Adjust space between Latin and Asian text, Adjust space between Asian text and numbers
	$\mathbb{N}$	<b>Commented [eXtyles5]:</b> The term " $\rho$ " can not be checked
3.4	Y	Formatted: Regular Italic, Font: Bold, Not Italic
determinability quantitative measure of the variability associated with the same operator in a given laboratory obtaining		Commented [eXtyles6]: The term "d" has not been used anywhere in this document
successive determined values using the same apparatus for a series of operations leading to a single result	٦	Formatted: Regular Italic, Font: Bold, Not Italic
Note_1-to_entry:-Determinability is the difference between two such single determined values that would be exceeded- about 5 % of the time (one case in 20 in the long run) in the normal and correct operation of the test method. 3.5		<b>Formatted:</b> Adjust space between Latin and Asian text, Adjust space between Asian text and numbers, Tab stops: Not at 0.7 cm + 1.4 cm + 2.1 cm + 2.8 cm + 3.5 cm + 4.2 cm + 4.9 cm + 5.6 cm + 6.3 cm + 7 cm
<b>test specimen</b> standards technolocatalog/standards/iso/2257a218-12c0-4197-b85f-61 portion or volume of the sample obtained from the laboratory sample, which is delivered to the measuring cells	ddb	<b>Formatted:</b> Adjust space between Latin and Asian text, Adjust space between Asian text and numbers

© ISO 2023 - All rights reserved

#### 4 Principle

2

A test specimen is introduced into the measuring cells, at a controlled and known temperature. The measuring cells consist of a pair of rotating concentric cylinders and an oscillating U-tube. The dynamic viscosity is determined from the equilibrium rotational speed of the inner cylinder under the influence of the shear stress of the test specimen and an eddy current brake in conjunction with adjustment data. The density is determined by the oscillation frequency of the U-tube in conjunction with adjustment data. The kinematic viscosity is calculated by dividing the dynamic viscosity by the density.

#### 5 Reagents and materials

**5.1 Cleaning solvent**, able to remove the sample from the measuring cell after the measurement and completely miscible with all constituents of the sample. Commercially available volatile petroleum spirit or cleaner's naphtha of technical grade or better have been proven suitable as cleaning solvents.

Formatted: Adjust space between Latin and Asian text, Adjust space between Asian text and numbers, Tab stops: Not at 0.7 cm + 1.4 cm + 2.1 cm + 2.8 cm + 3.5 cm + 4.2 cm + 4.9 cm + 5.6 cm + 6.3 cm + 7 cm

Formatted: FooterPageRomanNumber

© ISC	) 2024 -	All	rights	reserved



#### JSO/FDIS 23581:2023(E2024(en))

**5.2 Drying solvent**, highly volatile and miscible with the cleaning solvent, shall be filtered before use and shall be of an appropriate purity so that no residues remain in the instrument. *n*-Hexane, *n*-heptane (recommended due to lower toxicity) or, depending on the sample, concentrated ethanol ( $\geq$ 96 %) are suitable.

NOTE 1 A separate drying solvent is not needed if the cleaning solvent also meets the requirements of the drying solvent.

NOTE 2 When measuring residual fuel, asphaltic material can be removed by pre-washing with an aromatic solver t (e.g. toluene or xylene).

**5.3 Compressed air**, oil-free and filtered with a dew point lower than the lowest measuring cell temperature at which the instrument should be dried.

The pressure should be limited to 100 kPa.

It is also possible to use inert gases, for example technical nitrogen. The requirements given for compressed air are also valid here.

**5.4 Certified reference liquids**, for kinematic viscosity and density, which shall be identical to the reference standards for kinematic viscosity and density cited in JSO 3104 and JSO 12185, respectively.

5.5 Reference thermometer and probe, for verification of the temperature calibration.

The measuring uncertainty of the reference thermometer, including the probe, shall not exceed 0,01 °C. The resolution shall be at least 0,001 °C.

The probe used for the calibration (with an adapter if necessary) shall have a shape which fits the geometry of the viscosity cell. The probe replaces the measuring system (tube and measuring rotor).

#### 6 Apparatus

Usual laboratory apparatus and glassware shall be used, in particular the following

#### 6.1 <u>Stabinger type viscometer.</u>

#### 6.1.1 Viscosity measurement

The Stabinger type viscometer is a concentric rotating viscometer, containing an outer rotor and an inner rotor (see Figure 1). Figure 1). The small concentric gap between these rotors is filled with the sample. The outer rotor is driven at constant speed, which makes the inner rotor rotate due to the sample's viscosity. The lightweight inner rotor is centred in the heavier sample due to the centrifugal forces. The equilibrated speed ratio depends on the driving viscous shear force and the opposing magnetic induction force (eddy current). The dynamic viscosity is a function of the equilibrated speed ratio and adjustment constants. The kinematic viscosity is obtained by dividing the measured dynamic viscosity by the measured density.

23581\_ed1fig1.EPS

Formatted: Font: 11 pt, Bold, Font color: Auto Formatted: Font: 11 pt, Bold, Font color: Auto Formatted: Font: Bold

Formatted: HeaderCentered, Left

Formatted: Adjust space between Latin and Asian text, Adjust space between Asian text and numbers

<b>Commented [eXtyles7]:</b> ISO 12185: current stage is 50.20
cm + 4.9 cm + 5.6 cm + 6.3 cm + 7 cm
Not at 0.7 cm + 1.4 cm + 2.1 cm + 2.8 cm + 3.5 cm + 4.2
Adjust space between Asian text and numbers, Tab stops:
Formatted: Adjust space between Latin and Asian text,

commented [extyles/]. 150 12105. current stage is

Formatted: Default Paragraph Font Formatted: Default Paragraph Font

Formatted: Default Paragraph Font

Formatted: Default Paragraph Font

Formatted: Adjust space between Latin and Asian text, Adjust space between Asian text and numbers

#### Formatted: Font: Bold

Formatted: p2, Adjust space between Latin and Asian text, Adjust space between Asian text and numbers, Tab stops: Not at 0.71 cm

Formatted: p3, Adjust space between Latin and Asian text, Adjust space between Asian text and numbers, Tab stops: Not at 0.71 cm + 0.99 cm + 1.27 cm

**Formatted:** Adjust space between Latin and Asian text, Adjust space between Asian text and numbers

Formatted: FooterPageRomanNumber, Left

3

© ISO 2023 – All rights reserved

© ISO 2024 - All rights reserved



JSO/FDIS 23581: <del>2023(E2024(en))</del>	1	Formatted: Font: 11 pt, Bold, Font color: Auto
	L	Formatted: Font: 11 pt, Bold, Font color: Auto
		Formatted: Font: Bold
	\	Formatted: HeaderCentered
Key 1 outer rotor (constant speed) 3 sample fluid		<b>Formatted:</b> Adjust space between Latin and Asian text, Adjust space between Asian text and numbers, Tab stops:
2     inner rotor (measured speed)     3     sample initial		Not at 0.7 cm + 1.4 cm + 2.1 cm + 2.8 cm + 3.5 cm + 4.2 cm + 4.9 cm + 5.6 cm + 6.3 cm + 7 cm
Figure 1 — Viscosity cell	$\langle \rangle \rangle$	Formatted Table
rigure i viscosity cen	$\langle \rangle$	Formatted: Adjust space between Latin and Asian text,
6.1.2 Density measurement	$\backslash \backslash$	Adjust space between Asian text and numbers, Tab stops: Not at 0.7 cm + 1.4 cm + 2.1 cm + 2.8 cm + 3.5 cm + 4.2 cm + 4.9 cm + 5.6 cm + 6.3 cm + 7 cm
The Stabinger type viscometer has an integrated density measurement based on the oscillating U-tube principle. The sample-filled U-tube is oscillated and the instrument calculates the density from the measured	$\backslash \backslash $	<b>Formatted:</b> None, Adjust space between Latin and Asian text, Adjust space between Asian text and numbers
natural frequency of the filled tube using adjustment factors. The viscosity-dependent error of this procedure is corrected using the measured viscosity value.		Formatted: p3, Adjust space between Latin and Asian text, Adjust space between Asian text and numbers, Tab stops: Not at 0.71 cm + 0.99 cm + 1.27 cm
6.1.3 <u>6.1.3</u> Temperature control		<b>Formatted:</b> Adjust space between Latin and Asian text, Adjust space between Asian text and numbers
The Stabinger type viscometer has an integrated temperature control which keeps the viscosity and density measurement at the same temperature.	$\backslash \rangle$	<b>Formatted:</b> p3, Adjust space between Latin and Asian text, Adjust space between Asian text and numbers, Tab
Using Peltier elements, a highly conductive measuring cell block which surrounds the measuring cells is set to the target temperature with a stability of ±0,005 °C over the whole temperature range at the position of the viscosity cell.		stops: Not at 0.71 cm + 0.99 cm + 1.27 cm <b>Formatted:</b> Adjust space between Latin and Asian text, Adjust space between Asian text and numbers
The measurement uncertainty of the temperature calibration ( $k = 2$ ; 95 % confidence level) shall be within ±0,03 °C over the range from 15 °C to 100 °C and within ±0,05 °C outside this range.		35db936/iso-fdis-23581
		Formatted: Font: Bold
6.2 <u>Syringes</u> Commercially available syringes with a Luer tip of at least 5 ml in volume shall be used. The user shall ensure	<i>—</i>	Formatted: p2, Adjust space between Latin and Asian text, Adjust space between Asian text and numbers, Tab stops: Not at 0.71 cm
full chemical compatibility of the syringe construction materials with all sample and cleaning liquids by consulting the manufacturer's documentation.		Formatted: Adjust space between Latin and Asian text, Adjust space between Asian text and numbers
<b>6.3 6.3</b> Flow-through or pressure adapter.		Formatted: Font: Bold
A flow-through or a pressure adapter may be used as an alternative to a syringe for introduction of the test- specimen into the measuring cells. Such adapters apply either pressure or suction to the test specimen,		Formatted: p2, Adjust space between Latin and Asian text, Adjust space between Asian text and numbers, Tab stops: Not at 0.71 cm
therefore, care shall be taken to avoid the formation of bubbles. The user shall ensure full chemical compatibility of the flow-through or pressure adapter construction materials with all sample and cleaning		<b>Formatted:</b> Adjust space between Latin and Asian text, Adjust space between Asian text and numbers
liquids by consulting the manufacturer's documentation.	/	Formatted: Font: Bold
6.4 6.4 Hot filling adapter.	/	<b>Formatted:</b> p2, Adjust space between Latin and Asian text, Adjust space between Asian text and numbers, Tab stops: Not at 0.71 cm
		Formatted: FooterPageRomanNumber
4 © ISO 2023 – All rights reserved		
© ISO 2024 – All rights reserved		
4	/	
-		