

## Working Group 3.32 “Properties of Liquids“

### Newtonian calibration liquids for viscosity

are liquids traceable to the National Standard of Viscosity<sup>1</sup>. They are used to calibrate or to verify viscosity measuring equipment according to device-specific methods. Viscosity measuring devices<sup>2</sup> calibrated or verified by means of these calibration liquids are accepted as traceable to the National Standard of Viscosity according to DIN EN ISO/IEC 17 025.

Liquids used as calibration liquids meet special requirements, concerning e. g. longterm stability and flow behaviour. With respect to dissolved gases the liquids are in equilibrium with the atmosphere.

The relative uncertainty of the viscosity for calibration liquids provided by the Physikalisch-Technische Bundesanstalt is from 0.2% up to 1.0% of their value. These calibration liquids are mainly used to calibrate or verify high-accuracy viscometers, e. g. capillary or falling-ball viscometers, used as the internal standard of an enterprise to calibrate or verify its own viscosity measuring devices or to carry out high precision measurements.

Newtonian calibration liquids for viscosity will be supplied by calibration laboratories accredited by Deutsche Akkreditierungsstelle GmbH (DAkkS) (at the moment in Germany exclusively by the calibration laboratory D-K-15186-01, Zentrum für Messen und Kalibrieren GmbH<sup>3</sup>).

Meanwhile, the measurement uncertainty stated in the calibration certificates of this calibration laboratory differs only insignificantly from that of the PTB. In addition, the supply program with respect to viscosity and temperature ranges is comparable to that of the PTB. Its calibration certificates document the traceability of the national standards (realised by PTB) for the realisation of the units in accordance with the International System of Units (SI).

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<sup>1</sup> The National Standard of Viscosity is kept at the Physikalisch-Technische Bundesanstalt in accordance with the „Gesetz über Einheiten im Messwesen“

<sup>2</sup> For measurements of non-Newtonian liquids additional calibrations are necessary, in the case of rotational viscometers e. g. the calibration of angular velocity and torque measurement systems.

<sup>3</sup> Zentrum für Messen und Kalibrieren GmbH, P-D ChemiePark Bitterfeld-Wolfen, Areal A Filmstraße 7, 06766 Wolfen, Tel.: 03494 6973-0, Fax: 03494 6973-34, E-Mail: [info@zmk-wolfen.de](mailto:info@zmk-wolfen.de), Internet: <http://www.zmk-wolfen.de>

Therefore, PTB restricts the provision of Newtonian calibration liquids for viscosity for industrial demands to special cases. PTB remains responsible for highest level calibrations.

Corresponding to the measurement ranges of commonly used viscometers, a great assortment of Newtonian calibration liquids for viscosity is provided by PTB in the viscosity range of 1.2 mm<sup>2</sup>/s to 775 000 mm<sup>2</sup>/s. Their kinematic viscosity is determined using viscometers of the national standard of viscosity, which is based on the kinematic viscosity of water at 20°C of  $\nu = 1.0034$  mm<sup>2</sup>/s (internationally agreed value in accordance with ISO/TR 3666-1998, and subject to ITS 90). The dynamic viscosity is calculated by means of the density determined with calibration standards of the liquid density which are traceable to the National Standard of the density unit.

For each Newtonian viscosity standard specimen a calibration certificate of the Physikalisch-Technische Bundesanstalt is provided. It states the value of the kinematic and dynamic viscosity and the viscosity temperature coefficient at the measuring temperature which is usually 20°C. On request, these values can be determined at other temperatures in the range of 20°C to 100°C, mainly at 23, 25, 40, and 100°C. The viscosity values stated in the certificate are valid for a period of 6 month provided that the bottle containing the calibration liquid is kept unopened in the dark at room temperature.

The calibration liquids are delivered in quantities of 100 ml, 250 ml and 500 ml, and can be obtained from:

**Physikalisch-Technische Bundesanstalt**  
**Working Group 3.32 "Properties of Liquids"**  
**Postfach 33 45**  
**38023 Braunschweig**  
**Germany**

**Phone: +49 531 592-3141 (Dr. Jürgen Rauch)**

**Fax: +49 531 592-693320**

**E-Mail: [kundeninfo332@PTB.DE](mailto:kundeninfo332@PTB.DE)**

The fee is calculated according to the average working time necessary for the determination of the viscosity and density of the standard specimen, its preparation and delivery, all of which depends on the viscosity and the quantity ordered. The fee is charged in accordance with the » Regulations Governing the Charges for Services Supplied by the Physikalisch-Technische Bundesanstalt«

(<http://www.ptb.de/cms/en/fachabteilungen/abt/z14/information-on-ptb-fees.html>)

and is subject to change. For the first liquid we charge a delivery fee of 15 € when shipped inside Germany, 37.50 € when shipped inside EU, elsewhere 60 €. For each additional liquid this amount increases by 7.50 €.

If requested by the customer, the delivery can be effected carriage forward with the parcel service suggested by the customer. n-Nonan will only be shipped carriage forward with the parcel service suggested by the customer.

Calibration liquid	Charge in € for			Charge in € for each additional temperature
	100 ml	250 ml	500 ml	
up to 20000A	1110,-	1295,-	1480,-	185,-
up tp 50000A	1480,-	1665,-	1850,-	370,-

Table 1a: Calibration values for the dynamic viscosity of the liquids provided by PTB

Calibration liquid	Dynamic viscosity in mPa s at					Uncertainty (%)
	20 °C	23 °C	25 °C	40 °C	100 °C	
2A	1.5	1.4	1.3	1.0	-	0.2
4A	2.9	2.7	2.6	1.9	-	0.2
10A	9.6	8.7	8.1	5.2	-	0.2
20A	20	17	16	9.1	2.2	0.2
50B	57	48	43	22	3.8	0.25
100A <sup>1</sup>	87	75	68	35	6.3	0.25
EF168 (alternative)	102	87	78	39	6,1	0,25
500A	380	320	280	130	15	0.28
1000A	1100	890	780	330	32	0.28
2000A	1700	1400	1200	490	44	0.28
5000A	3800	3100	2700	1000	78	0.35
10000A	7900	6000	5000	1500	59	0.38
20000A	19000	14000	12000	3800	150	0.45
50000A	45000	37000	32000	13000	1100	0.5
100000A	95000	68000	57000	15000	390	0.7
200000A	230000	170000	140000	38000	950	0.8
500000B	700000	520000	430000	120000	2700	1.0

<sup>1</sup> Currently not available. As an alternative calibration liquid within the same range of viscosity, we can offer you the calibration liquid EF168.

Table 1b: Calibration values for the kinematic viscosity of the liquids provided by PTB

Calibration liquid	Kinematic viscosity in mm <sup>2</sup> /s at					Uncertainty (%)
	20 °C	23 °C	25 °C	40 °C	100 °C	
2A	1.9	1.8	1.7	1.4	-	0.2
4A	3.7	3.5	3.3	2.5	-	0.2
10A	12	11	10	6.5	-	0.2
20A	23	20	19	11	2.7	0.2
50B	66	56	50	25	4.7	0.25
100A <sup>1</sup>	106	91	83	44	8.1	0.25
EF 168 (alternative)	122	104	94	48	7,9	0,25
500A	450	380	340	150	19	0.28
1000A	1300	1100	930	390	40	0.28
2000A	2000	1600	1400	590	55	0.28
5000A	4500	3600	3200	1200	97	0.35
10000A	9000	6900	5700	1700	71	0.38
20000A	21000	16000	14000	4300	180	0.45
50000A	53000	44000	38000	15000	1300	0.5
100000A	106000	76000	64000	17000	460	0.7
200000A	250000	190000	160000	42000	1100	0.8
500000B	780000	580000	480000	130000	3200	1.0

<sup>1</sup> Currently not available. As an alternative calibration liquid within the same range of viscosity, we can offer you the calibration liquid EF168.