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# AbbeMat Refractometers: Overview Application Methods

The AbbeMat refractometers are used in all industries to measure a wide range of samples, from pharmaceuticals, chemicals, petroleum products, flavors and fragrances to beverages and food. In close cooperation with customers, Anton Paar continuously collects and develops new methods and applications based on refractive index measurements. Below please find the latest list of methods being installed on the AbbeMat refractometers.

Method	Substance	Standard Unit	Measuring Range	Temperature [°C]	Accuracy		Availability						Application Report
					AbbeMat 200/300/350/450 3200/3100/3000	AbbeMat 500/550/650	AbbeMat 200/300/500	AbbeMat 350/550	AbbeMat 450/650	AbbeMat 3000	AbbeMat 3100	AbbeMat 3200	
<b>Acids</b>													
Acetic Acid 0.0 - 67.0 % <sup>a)</sup>	Acetic acid content in aqueous solution	g/100 g	0.0 - 67.0	20	0.27	0.05	s	s	a	-	a	a	<a href="#">link</a>
Acetic Acid 67.0 - 85.0 % <sup>a)</sup>	Acetic acid content in aqueous solution	g/100 g	67.0 - 85.0	20	0.88	0.28	s	s	a	-	a	a	<a href="#">link</a>
Acetic Acid 86.0 - 99.8 % <sup>a)</sup>	Acetic acid content in aqueous solution	g/100 g	86.0 - 99.8	20	1.80	0.66	s	s	a	-	a	a	<a href="#">link</a>
Citric Acid 0.0 - 30.0 % <sup>d)</sup>	Citric acid content in aqueous solution	g/100 g	0.0 - 30.0	20	0.1	0.05	a	a	a	-	a	a	<a href="#">link</a>
Formic Acid 0 - 68 % <sup>d)</sup>	Formic acid content in aqueous solution	g/100 g	0.0 - 68.0	20	0.4	0.16	a	a	a	-	a	a	<a href="#">link</a>
Hydrochloric Acid <sup>a)</sup>	Hydrochloric acid content in aqueous solution	g/100 g	0.0 - 37.0	20	0.048	0.009	a	a	a	-	-	-	<a href="#">link</a>
Lactic Acid 0 - 80 % <sup>d)</sup>	Lactic acid content in aqueous solution	g/100 g	0.0 - 80.0	20	0.15	0.07	a	a	a	-	a	a	
Nitric Acid 0 - 50 % <sup>a)</sup>	Nitric acid content in aqueous solution	g/100 g	0.0 - 50.0	20	0.12	0.02	a	a	a	-	-	-	<a href="#">link</a>
Nitric Acid 50 - 68.1 % <sup>a)</sup>	Nitric acid content in aqueous solution	g/100 g	50.0 - 68.1	20	50-68.1%: 1.15 50-61%: 0.28 61-65%: 0.80 65-68.1%: 1.15	50-68.1%: 0.25 50-61%: 0.06 61-65%: 0.15 65-68.1%: 0.25	a	a	a	-	-	-	<a href="#">link</a>
Oxalic Acid 0 - 8 % <sup>d)</sup>	Oxalic acid content in aqueous solution	g/100 g	0.0 - 8.0	20	0.13	0.054	a	a	a	-	a	a	
Phosphoric Acid 0.0 - 40.0 % <sup>d)</sup>	Phosphoric acid content in aqueous solution	g/100 g	0.0 - 40.0	20	0.16	0.07	a	a	a	-	a	a	
Sulfuric Acid 0.0 - 84.5 % <sup>a)</sup>	Sulfuric acid content in aqueous solution	g/100 g	0.0 - 84.5	20	0.142	0.028	s	s	a	-	a	a	<a href="#">link</a>
Sulfuric Acid 87.0 - 98.0 % <sup>a)</sup>	Sulfuric acid content in aqueous solution	g/100 g	87.0 - 98.0	20	0.29	0.06	s	s	a	-	a	a	<a href="#">link</a>

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## Abbemat Refractometers: Overview Application Methods

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Method	Substance	Standard Unit	Measuring Range	Temperature [°C]	Accuracy		Availability						Application Report
					Abbemat 200/300/350/450 3200/3100/3000	Abbemat 500/550/650	Abbemat 200/300/500	Abbemat 350/550	Abbemat 450/650	Abbemat 3000	Abbemat 3100	Abbemat 3200	
Tartaric Acid 0.0 - 58.0 % <sup>d)</sup>	Tartaric acid content in aqueous solution	g/100 g	0.0 - 56.0	20	0.08	0.02	a	a	a	-	a	a	
Trichloroacetic Acid 0.0 - 48.0 % <sup>d)</sup>	Trichloroacetic acid content in aqueous solution	g/100 g	0.0 - 48.0	20	0.18	0.11	a	a	a	-	a	a	

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# AbbeMat Refractometers: Overview Application Methods

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Method	Substance	Standard Unit	Measuring Range	Temperature [°C]	Accuracy		Availability						Application Report
					AbbeMat 200/300/350/450 3200/3100/3000	AbbeMat 500/550/650	AbbeMat 200/300/500	AbbeMat 350/550	AbbeMat 450/650	AbbeMat 3000	AbbeMat 3100	AbbeMat 3200	
<b>Alcohols</b>													
1-Propanol <sup>d)</sup>	1-propanol content in aqueous solution	g/100 g	0.0 - 100.0	20	0.94	0.42	a	a	a	-	a	a	
Ethanol 0.0 - 54.0 % <sup>d)</sup>	Ethanol content in aqueous solution	g/100 g	0.0 - 54.0	20	0.41	0.08	a	a	a	-	a	a	
Ethanol 54.0 - 80.0 % <sup>d)</sup>	Ethanol content in aqueous solution	g/100 g	54.0 - 80.0	20	2.23	0.47	a	a	a	-	a	a	
Ethanol 84.0 - 100.0 % <sup>d)</sup>	Ethanol content in aqueous solution	g/100 g	84.0 - 100.0	20	1.12	0.23	a	a	a	-	a	a	
Ethanol in Sanitizer (WHO recipe)	Ethanol content in hand sanitizer (WHO recipe)	ml/100 ml	0.0 - 85.0	20	2.23	0.47	a	a	a	-	a	a	
Glycerol <sup>a)</sup>	Glycerol content in aqueous solution	g/100 g	0.0 - 99.8	20	0.085	0.017	s	s	a	-	a	a	
Glycerol 0.0 - 10.0 % <sup>a)</sup>	Glycerol content in aqueous solution	g/100 g	0.0 - 10.0	25	0.09	0.02	s	s	a	-	a	a	
Isopropyl Alcohol 0.0 - 70.0 % <sup>a)</sup>	Isopropyl alcohol content in aqueous solution	g/100 g	0.0 - 70.0	20	0.59	0.42	s	s	a	-	a	a	<a href="#">link</a>
Isopropyl Alcohol 60.0 - 80.0 % <sup>a)</sup>	Isopropyl alcohol content in aqueous solution	g/100 g	60.0 - 80.0	20	0.72	0.36	s	s	a	-	a	a	<a href="#">link</a>
Isopropyl Alcohol 80.0 - 92.0 % <sup>a)</sup>	Isopropyl alcohol content in aqueous solution	g/100 g	80.0 - 92.0	20	2.5	0.8	s	s	a	-	a	a	<a href="#">link</a>
Isopropyl Alcohol 95.0 - 99.5 % <sup>a)</sup>	Isopropyl alcohol content in aqueous solution	g/100 g	95.0 - 99.5	20	2.0	0.52	s	s	a	-	a	a	<a href="#">link</a>
Isopropyl Alcohol in Sanitizer (WHO recipe)	Isopropyl alcohol content in hand sanitizer (WHO recipe)	ml/100 ml	65.0-83.0	20	0.72	0.36	a	a	a		a	a	<a href="#">link</a>
Methanol 0.0 - 44.0 % <sup>d)</sup>	Methanol content in aqueous solution	g/100 g	0.0 - 44.0	20	1.36	0.56	a	a	a	-	a	a	
Methanol 60.0 - 100.0 % <sup>d)</sup>	Methanol content in aqueous solution	g/100 g	60.0 - 100.0	20	1.06	0.29	-	a	a	-	a	a	

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Method	Substance	Standard Unit	Measuring Range	Temperature [°C]	Accuracy		Availability						Application Report
					Abbemat 200/300/350/450 3200/3100/3000	Abbemat 500/550/650	Abbemat 200/300/500	Abbemat 350/550	Abbemat 450/650	Abbemat 3000	Abbemat 3100	Abbemat 3200	

Antifreeze													
Antifreeze Ethylene Glycol (Freezing Point)	Freezing point of ethylene glycol	°C	-50.0 - 0.0	20	0.15	0.03	s	s	s	-	a	a	
Antifreeze Ethylene Glycol [°F] (Freezing Point)	Freezing point of ethylene glycol	°F	-58.0 - 32.0	20	0.06	0.27	a	a	a		a	a	
Antifreeze Ethylene Glycol [g/100 g]	Ethylene glycol content	g/100 g	0.0 - 60.0	20	0.11	0.02	a	a	a	-	a	a	
Antifreeze Ethylene Glycol [mL/100 mL]	Percentage by volume of ethylene glycol	mL/100 mL	0.0 - 57.81	20	0.11	0.02	a	a	a	-	a	a	
Antifreeze Propylene Glycol (Freezing Point)	Freezing point of propylene glycol	°C	-51.0 - 0.0	20	0.22	0.04	s	s	s	-	a	a	
Antifreeze Propylene Glycol [g/100 g]	Propylene glycol content	g/100 g	0.0 - 60.0	20	0.10	0.02	a	a	a	-	a	a	
Antifreeze Propylene Glycol [mL/100 mL]	Percentage by volume of propylene glycol	mL/100 mL	0.0 - 50.0	20	0.12	0.024	a	a	a	-	a	a	
Fuel System Icing Inhibitors (ASTM D5006)	Percentage by volume of fuel system icing inhibitors is calculated according to ASTM D5006, diethylene glycol monomethyl ether (DiEGME) in aviation fuels	g/100 mL	0.01 - 0.25	20	0.0014	0.0003	s	s	s	-	a	a	<a href="#">link</a>

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Method	Substance	Standard Unit	Measuring Range	Temperature [°C]	Accuracy		Availability						Application Report
					Abbemat 200/300/350/450 3200/3100/3000	Abbemat 500/550/650	Abbemat 200/300/500	Abbemat 350/550	Abbemat 450/650	Abbemat 3000	Abbemat 3100	Abbemat 3200	

### Bases

Ammonium Hydroxide <sup>d)</sup>	Ammonium hydroxide content in aqueous solution	g/100 g	0.0 - 30.0	20	0.23	0.06	s	s	a	-	a	a	
Potassium Hydroxide <sup>a)</sup>	Potassium hydroxide content in aqueous solution	g/100 g	0.0 - 50.0	20	0.057	0.011	a	a	a	a	a	a	
Sodium Hydroxide 0.0 - 50.0 % <sup>d)</sup>	Sodium hydroxide content in aqueous solution	g/100 g	0.0 - 25.0 25.0 - 50.0	20	0-25%: 0.047 25-50%: 0.091	0-25%: 0.009 25-50%: 0.018	s	s	a	-	a	a	<a href="#">link</a>

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# AbbeMat Refractometers: Overview Application Methods

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Method	Substance	Standard Unit	Measuring Range	Temperature [°C]	Accuracy		Availability						Application Report
					AbbeMat 200/300/350/450 3200/3100/3000	AbbeMat 500/550/650	AbbeMat 200/300/500	AbbeMat 350/550	AbbeMat 450/650	AbbeMat 3000	AbbeMat 3100	AbbeMat 3200	

## Beverage

Brix (ICUMSA 2000) <sup>b)</sup>	Dry substance content in confectionaries, plant juices, syrups, marmalades, jams and sucrose content of high purity sucrose solutions	g/100 g	0.0 - 100.0	TC*	0.05	0.015	s	s	s	s	s	s	<a href="#">link</a>
Brix (%) <sup>b)</sup>	Dry substance content in confectionaries, plant juices, syrups, marmalades, jams and sucrose content of high purity sucrose solutions	g/100 g	0.0 - 100.0	TC*	0.05	0.015	s	s	s	a	a	a	<a href="#">link</a>
Brix (°Brix) <sup>b)</sup>	Dry substance content in confectionaries, plant juices, syrups, marmalades, jams and sucrose content of high purity sucrose solutions	g/100 g	0.0 - 100.0	TC*	0.05	0.015	a	a	a	a	a	a	<a href="#">link</a>
Corn Syrup, AC, 28 DE	Dry matter composed of 28 dextrose equivalents (DE) in acid converted (AC) corn syrup	g/100 g	0.0 - 90.0	20	0.03	0.01	s	s	s	-	a	a	<a href="#">link</a>
Corn Syrup, AC, 28 DE, 0.4 % Ash, TC*	Dry matter in acid converted (AC) corn syrup containing 28 dextrose equivalents (DE) and 0.4 % Ash (dry basis), temp. controlled (TC*) from 20 °C to 60 °C	g/100 g	0.0 - 70.0	TC*	0.24	0.10	a	a	a	a	a	a	<a href="#">link</a>
Corn Syrup, AC, 42 DE, 0.4 % Ash, TC*	Dry matter in acid converted (AC) corn syrup containing 42 dextrose equivalents (DE) and 0.4 % Ash (dry basis), temp. controlled (TC*) from 20 °C to 60 °C	g/100 g	0.0 - 84.0	TC*	0.23	0.14	a	a	a	a	a	a	<a href="#">link</a>

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Method	Substance	Standard Unit	Measuring Range	Temperature [°C]	Accuracy		Availability						Application Report
					AbbeMAT 200/300/350/450 3200/3100/3000	AbbeMAT 500/550/650	AbbeMAT 200/300/500	AbbeMAT 350/550	AbbeMAT 450/650	AbbeMAT 3000	AbbeMAT 3100	AbbeMAT 3200	
Corn Syrup, AC, 55 DE, 0.4 % Ash, TC*	Dry matter in acid converted (AC) corn syrup containing 55 dextrose equivalents (DE) and 0.4 % Ash (dry basis), temp. controlled (TC*) from 20 °C to 60 °C	g/100 g	0.0 - 84.0	TC*	0.24	0.14	a	a	a	a	a	a	<a href="#">link</a>
Corn Syrup, DC, 32 DE, 0.4 % Ash, TC*	Dry matter in acid converted (AC) corn syrup containing 32 dextrose equivalents (DE) and 0.4 % Ash (dry basis), temp. controlled (TC*) from 20 °C to 60 °C	g/100 g	0.0 - 84.0	TC*	0.22	0.15	a	a	a	a	a	a	<a href="#">link</a>
Corn Syrup, DC, 63 DE, 0.4 % Ash, TC*	Dry matter in acid converted (AC) corn syrup containing 63 dextrose equivalents (DE) and 0.4 % Ash (dry basis), temp. controlled (TC*) from 20 °C to 60 °C	g/100 g	0.0 - 84.0	TC*	0.24	0.14	a	a	a	a	a	a	<a href="#">link</a>
Corn Syrup, DC, 70 DE, 0.4 % Ash, TC*	Dry matter in acid converted (AC) corn syrup containing 70 dextrose equivalents (DE) and 0.4 % Ash (dry basis), temp. controlled (TC*) from 20 °C to 60 °C	g/100 g	0.0 - 84.0	TC*	0.25	0.14	a	a	a	a	a	a	<a href="#">link</a>
Corn Syrup, DC, 95 DE, 0.4 % Ash, TC*	Dry matter in acid converted (AC) corn syrup containing 95 dextrose equivalents (DE) and 0.4 % Ash (dry basis), temp. controlled (TC*) from 20 °C to 60 °C	g/100 g	0.0 - 74.0	TC*	0.26	0.10	a	a	a	a	a	a	<a href="#">link</a>
HFCS, 42 % Fructose, 0.05 % Ash, TC*	Dry matter in high fructose corn syrup (HFCS) containing 42 % fructose, with 0.05 % Ash (dry basis), temp. controlled (TC*) from 20 °C to 60 °C	g/100 g	0.0 - 84.0	TC*	0.83	0.44	a	a	a	a	a	a	<a href="#">link</a>
HFCS, 55 % Fructose, 0.05 % Ash, TC*	Dry matter in high fructose corn syrup (HFCS) containing 55 % fructose, with 0.05 % Ash (dry basis), temp. controlled (TC*) from 20 °C to 60 °C	g/100 g	0.0 - 84.0	TC*	0.41	0.17	a	a	a	a	a	a	<a href="#">link</a>

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					AbbeMAT 200/300/350/450 3200/3100/3000	AbbeMAT 500/550/650	AbbeMAT 200/300/500	AbbeMAT 350/550	AbbeMAT 450/650	AbbeMAT 3000	AbbeMAT 3100	AbbeMAT 3200	
HFCS, 90 % Fructose, 0.05 % Ash, TC*	Dry matter in high fructose corn syrup (HFCS) containing 90 % fructose, with 0.05 % Ash (dry basis), temp. controlled (TC*) from 20 °C to 60 °C	g/100 g	0.0 - 84.0	TC*	0.15	0.14	a	a	a	a	a	a	<a href="#">link</a>
HMCS, DC, 42 DE, 0.4 % Ash, TC*	Dry matter in dual converted (DC) high maltose corn syrup (HMCS) containing 42 dextrose equivalents (DE) and 0.4 % Ash (dry basis), temp. controlled (TC*) from 20 °C to 60 °C	g/100 g	0.0 - 84.0	TC*	0.23	0.14	a	a	a	a	a	a	<a href="#">link</a>
HMCS, DC, 50 DE, 0.4 % Ash, TC*	Dry matter in dual converted (DC) high maltose corn syrup (HMCS) containing 50 dextrose equivalents (DE) and 0.4 % Ash (dry basis), temp. controlled (TC*) from 20 °C to 60 °C	g/100 g	0.0 - 84.0	TC*	0.23	0.14	a	a	a	a	a	a	<a href="#">link</a>
Must Weight (°Babo) <sup>e)</sup>	Must weight in grape must (°Babo scale)	°Babo	0.3 - 37.8	20	0.06	0.012	a	s	a	-	a	a	
Must Weight (°Baumé) <sup>e)</sup>	Must weight in grape must (°Baumé scale)	°Baumé	0.56 - 39.54	20	0.089	0.023	a	s	a	-	a	a	
Must Weight (°KMW, °KI) <sup>e)</sup>	Must weight in grape must (Austria)	°KMW	0.340 - 37.716	20	0.06	0.012	s	s	s	-	a	a	
Must Weight (°Oe, CH) <sup>e)</sup>	Must weight in grape must (Switzerland)	°Oe	1.413 - 201.479	20	0.108	0.054	s	s	s	-	a	a	
Must Weight (°Oe, GER) <sup>e)</sup>	Must weight in grape must (Germany)	°Oe	0.92 - 201.68	20	0.268	0.053	s	s	s	-	a	a	
Must Weight (°Plato)	Must weight in beer or wine	°Plato	0.0 - 88.4	20	0.073	0.015	a	s	a	-	a	a	
Zeiss (14.45)	Quick estimate of alcohol by %vol in wine, cider and beer in combination with a hydrometer	Z	14.4 -140.00	20	0.87	0.17	s	s	s	-	a	a	



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Zeiss (15.00)	Quick estimate of alcohol by %vol in wine, cider and beer in combination with a hydrometer	Z	15.00-140.00	20	0.87	0.17	s	s	s	-	a	a	

### Food

Butter Iodine Number	Iodine number of butter	g/100 g	10.98 - 70.40	40	0.57	0.11	s	s	s	-	-	a	
Butyro Fat (AOAC 921.08, TC)	Butyro value in compliance with international standards and the ancient butter refractometer	-	0.0 - 79.5	TC*	0.18	0.035	s	s	s	a	a	a	<a href="#">link</a>
Butyro Oil (AOAC 921.08, TC)	Butyro value in compliance with international standards and the ancient butter refractometer	-	0.0 - 79.5	TC*	0.18	0.035	s	s	s	a	a	a	<a href="#">link</a>
Cacao Fat (AOAC 921.78, TC)	The cacao fat value in compliance with international standards and the ancient butter refractometer	-	0.0 - 79.5	TC*	0.18	0.035	s	s	s	a	a	a	<a href="#">link</a>
Castor Oil (ASTM) Iodine Number	Iodine number (g 1/2/100 g oil) of castor oil in compliance with ASTM D960-52 (1952)	IN	82.0 - 88.0	30	0.2	0.04	a	a	a	-	-	a	
Castor Oil Iodine Number	Iodine number (g 1/2/100 g oil) of castor oil	IN	4.7 - 84.6	60	0.68	0.14	a	a	a	-	-	a	
Coconut Oil Iodine Number	Iodine number (g 1/2/100 g oil) of edible coconut oil	IN	6.3 - 10.6	40	0.22	0.04	a	a	a	-	-	a	
Cottonseed Oil (Indian) Iodine Number	Iodine number (g 1/2/100 g oil) of Indian cottonseed oil	IN	0.0 - 100.0	60	1.0	0.2	a	a	a	-	-	a	
Cottonseed Oil Iodine Number	Iodine number (g 1/2/100 g oil) of cottonseed oil	IN	100.0 - 123.0	40	0.29	0.06	a	a	a	-	-	a	
Fat Content in Chocolate	Fat content determination in chocolate can be determined after fat extraction	% (v/v)	0.0 - 100.0	20	0.2	0.04	-	a	a	-	-	-	<a href="#">link</a>

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Flaxseed Oil Iodine Number	Iodine number (g 1/2/100 g oil) of crude flaxseed oil	IN	134.4 - 206.5	20 - 30	0.86	0.17	a	a	a	a	a	a	
Honey Moisture Content	Water content in honey	g/100 g	0.0 - 46.0	20	0.04	0.008	s	s	s	-	a	a	<a href="#">link</a>
Iodine Numbers acc. to JAS <sup>f)</sup>	Iodine Number (g 1/2/100 g) of safflower oil (also high oleic), grape oil, soybean oil, sunflower oil (also high oleic), corn oil, cottonseed oil, sesame oil, rice oil, olive oil, palm oil, and coconut oil	IN	7.0 - 148.0	25	0.8	0.16	a	a	a	-	a	a	
Linseed Oil Iodine Number	Iodine number (g 1/2/100 g oil) of linseed oil	IN	3.0 - 173.0	60	0.89	0.18	a	a	a	-	-	a	
Moisture Content	Water content in sugar solutions	g/100 g	0.0 - 100.0	20	0.05	0.015	a	s	a	a	a	a	
Olive Oil (Pomace) Iodine Number at 40 C°	Iodine number (g 1/2/100 g oil) of olive oil (Pomace) at 40 °C	IN	75.0 - 92.0	40	0.61	0.12	a	a	a	-	-	a	
Olive Oil (Pomace) Iodine Number at 20 C°	Iodine number (g 1/2/100 g oil) of olive oil (Pomace) at 20 °C	IN	75.0 - 92.0	20	0.63	0.13	a	a	a	-	a	a	
Olive Oil (Refined) Iodine Number at 40 C°	Iodine number (g 1/2/100 g oil) of olive oil (Refined) at 40 °C	IN	75.0 - 94.0	40	0.61	0.13	a	a	a	-	-	a	
Olive Oil (Refined) Iodine Number at 20 C°	Iodine number (g 1/2/100 g oil) of olive oil (Refined) at 20 °C	IN	75.0 - 94.0	20	0.68	0.14	a	a	a	-	a	a	
Olive Oil (Virgin) Iodine Number at 40 C°	Iodine number (g 1/2/100 g oil) of olive oil (Virgin) at 40 °C	IN	75.0 - 94.0	40	0.61	0.13	a	a	a	-	-	a	
Olive Oil (Virgin) Iodine Number at 20 C°	Iodine number (g 1/2/100 g oil) of olive oil (Virgin) at 20 °C	IN	75.0 - 94.0	20	0.68	0.14	a	a	a	-	a	a	
Palm Kernel Oil Iodine Number	Iodine number (g 1/2/100 g oil) of palm kernel oil at 40 °C	IN	14.1 - 21.0	40	0.17	0.04	a	a	a	-	-	a	
Palm Oil Iodine Number	Iodine number (g 1/2/100 g oil) of palm oil	IN	44 - 58	40	0.47	0.09	a	a	a	-	-	a	

s → standard  
a → available

## Abbemat Refractometers: Overview Application Methods

The Abbemat refractometers are used in all industries to measure a wide range of samples, from pharmaceuticals, chemicals, petroleum products, flavors and fragrances to beverages and food. In close cooperation with customers, Anton Paar continuously collects and develops new methods and applications based on refractive index measurements. Below please find the latest list of methods being installed on the Abbemat refractometers.

Method	Substance	Standard Unit	Measuring Range	Temperature [°C]	Accuracy		Availability						Application Report
					Abbemat 200/300/350/450 3200/3100/3000	Abbemat 500/550/650	Abbemat 200/300/500	Abbemat 350/550	Abbemat 450/650	Abbemat 3000	Abbemat 3100	Abbemat 3200	
Palm Olein Iodine Number	Iodine number (g l <sub>2</sub> /100 g oil) of palm olein	IN	54 - 62	40	0.13	0.027	a	a	a	-	-	a	
Scale of the Milk Fat Refractometer	Refractive index of milk samples converted into the scale of the milk fat refractometer	-	0.0 - 100.0	20	0.14	0.03	s	s	s	-	a	a	
Soybean Oil Iodine Number	Iodine number(g l <sub>2</sub> /100 g oil) of soybean oil	IN	100 - 150	TC*	0.87	0.17	a	a	a	a	a	a	
Sunflower Oil (high oleic) Iodine Number	Iodine number (g l <sub>2</sub> /100 g oil) of crude, sunflower seed oil with high oleic acid content	IN	78.0 - 90.0	25	0.3	0.06	a	a	a	-	a	a	
Sunflower Oil (mid oleic) Iodine Number	Iodine number (g l <sub>2</sub> /100 g oil) of crude, sunflower seed oil with mid oleic acid content	IN	94.0 - 122.0	25	0.28	0.06	a	a	a	-	a	a	
Sunflower Oil (tradit.) Iodine Number	Iodine number (g l <sub>2</sub> /100 g oil) of crude, traditional sunflower seed oil	IN	100.0 - 140.0	40	0.25	0.05	a	a	a	-	-	a	

s → standard  
a → available

## AbbeMat Refractometers: Overview Application Methods

The AbbeMat refractometers are used in all industries to measure a wide range of samples, from pharmaceuticals, chemicals, petroleum products, flavors and fragrances to beverages and food. In close cooperation with customers, Anton Paar continuously collects and develops new methods and applications based on refractive index measurements. Below please find the latest list of methods being installed on the AbbeMat refractometers.

Method	Substance	Standard Unit	Measuring Range	Temperature [°C]	Accuracy		Availability						Application Report
					AbbeMat 200/300/350/450 3200/3100/3000	AbbeMat 500/550/650	AbbeMat 200/300/500	AbbeMat 350/550	AbbeMat 450/650	AbbeMat 3000	AbbeMat 3100	AbbeMat 3200	

### Inorganic Chemicals

Ammonium Chloride 0 - 24 % <sup>d)</sup>	Ammonium chloride content in aqueous solution	g/100 g	0.0 - 24.0	20	0.076	0.03	a	a	a	-	a	a	
Ammonium Sulfate 0 - 40 % <sup>d)</sup>	Ammonium sulfate content in aqueous solution	g/100 g	0.0 - 40.0	20	0.11	0.06	a	a	a	-	a	a	
Barium Chloride 0 - 26 % <sup>d)</sup>	Barium chloride content in aqueous solution	g/100 g	0.0 - 26.0	20	0.09	0.04	a	a	a	-	a	a	
Caesium Chloride 0 - 64 % <sup>d)</sup>	Caesium chloride content in aqueous solution	g/100 g	0.0 - 64.0	20	0.19	0.08	a	a	a	-	a	a	
Calcium Chloride 0 - 40 % <sup>d)</sup>	Calcium chloride content in aqueous solution	g/100 g	0.0 - 40.0	20	0.06	0.03	a	a	a	-	a	a	
Copper Sulfate 0.0 - 18.0 % <sup>d)</sup>	Copper sulfate content in aqueous solution	g/100 g	0.0 - 18.0	20	0.07	0.03	a	a	a	-	a	a	
Ferric Chloride 0 - 14 % <sup>d)</sup>	Ferric chloride content in aqueous solution	g/100 g	0.0 - 14.0	20	0.05	0.02	a	a	a	-	a	a	
Hydrogen Peroxide	Hydrogen peroxide content in aqueous solution	g/100 g	0.0 - 100.0	25	0.33	0.22	a	a	a	-	a	a	
Lithium Chloride 0 - 30 % <sup>d)</sup>	Lithium chloride content in aqueous solution	g/100 g	0.0 - 30.0	20	0.07	0.03	a	a	a	-	a	a	
Magnesium Chloride 0 - 30 % <sup>d)</sup>	Magnesium chloride content in aqueous solution	g/100 g	0.0 - 30.0	20	0.06	0.03	a	a	a	-	a	a	
Magnesium Sulfate 0 - 26 % <sup>d)</sup>	Magnesium sulfate content in aqueous solution	g/100 g	0.0 - 26.0	20	0.07	0.03	a	a	a	-	a	a	

s → standard  
a → available

## Abbemat Refractometers: Overview Application Methods

The Abbemat refractometers are used in all industries to measure a wide range of samples, from pharmaceuticals, chemicals, petroleum products, flavors and fragrances to beverages and food. In close cooperation with customers, Anton Paar continuously collects and develops new methods and applications based on refractive index measurements. Below please find the latest list of methods being installed on the Abbemat refractometers.

Method	Substance	Standard Unit	Measuring Range	Temperature [°C]	Accuracy		Availability						Application Report
					Abbemat 200/300/350/450 3200/3100/3000	Abbemat 500/550/650	Abbemat 200/300/500	Abbemat 350/550	Abbemat 450/650	Abbemat 3000	Abbemat 3100	Abbemat 3200	
Manganese(II) Sulfate 0.0 - 20.0 % <sup>d)</sup>	Manganese(II) sulfate content in aqueous solution	g/100 g	0.0 - 20.0	20	0.08	0.03	a	a	a	-	a	a	
Potassium Bicarbonate 0 - 24 % <sup>d)</sup>	Potassium bicarbonate content in aqueous solution	g/100 g	0.0 - 24.0	20	0.15	0.08	a	a	a	-	a	a	
Potassium Bromide 0 - 40 % <sup>d)</sup>	Potassium bromide content in aqueous solution	g/100 g	0.0 - 40.0	20	0.12	0.05	a	a	a	-	a	a	
Potassium Carbonate 0 - 50 % <sup>d)</sup>	Potassium carbonate content in aqueous solution	g/100 g	0.0 - 50.0	20	0.08	0.03	a	a	a	-	a	a	
Potassium Chloride 0 - 24 % <sup>d)</sup>	Potassium chloride content in aqueous solution	g/100 g	0.0 - 24.0	20	0.11	0.05	a	a	a	-	a	a	
Potassium Dihydrogen Phosphate 0 - 10 % <sup>d)</sup>	Potassium dihydrogen phosphate content in aqueous solution	g/100 g	0.0 - 10.0	20	0.12	0.05	a	a	a	-	a	a	
Potassium Hydrogen Phosphate 0 - 8 % <sup>d)</sup>	Potassium hydrogen phosphate content in aqueous solution	g/100 g	0.0 - 8.0	20	0.95	0.43	a	a	a	-	a	a	
Potassium Iodide 0 - 40 % <sup>d)</sup>	Potassium iodide content in aqueous solution	g/100 g	0.0 - 40.0	20	0.11	0.048	a	a	a	-	a	a	
Potassium Nitrate 0 - 24 % <sup>d)</sup>	Potassium nitrate content in aqueous solution	g/100 g	0.0 - 24.0	20	0.15	0.07	a	a	a	-	a	a	
Potassium Sulfate 0 - 10 % <sup>d)</sup>	Potassium sulfate content in aqueous solution	g/100 g	0.0 - 10.0	20	0.12	0.046	a	a	a	-	a	a	
Salinity, NaCl	Sodium chloride content in aqueous solution	g/100 g	0.0 - 30.0	20	0.058	0.012	s	s	s	-	a	a	
Silver Nitrate 0 - 40 % <sup>d)</sup>	Silver nitrate content in aqueous solution	g/100 g	0.0 - 40.0	20	0.19	0.12	a	a	a	-	a	a	
Sodium Bicarbonate 0.0 - 6.0 % <sup>d)</sup>	Sodium bicarbonate content in aqueous solution	g/100 g	0.0 - 6.0	20	0.10	0.04	a	a	a	-	a	a	
Sodium Bromide 0 - 40 % <sup>d)</sup>	Sodium bromide content in aqueous solution	g/100 g	0.0 - 40.0	20	0.10	0.04	a	a	a	-	a	a	
Sodium Carbonate 0.0 - 15.0 % <sup>d)</sup>	Sodium carbonate content in aqueous solution	g/100 g	0.0 - 15.0	20	0.05	0.03	a	a	a	-	a	a	

s → standard  
a → available

## Abbemat Refractometers: Overview Application Methods

The Abbemat refractometers are used in all industries to measure a wide range of samples, from pharmaceuticals, chemicals, petroleum products, flavors and fragrances to beverages and food. In close cooperation with customers, Anton Paar continuously collects and develops new methods and applications based on refractive index measurements. Below please find the latest list of methods being installed on the Abbemat refractometers.

Method	Substance	Standard Unit	Measuring Range	Temperature [°C]	Accuracy		Availability						Application Report
					Abbemat 200/300/350/450 3200/3100/3000	Abbemat 500/550/650	Abbemat 200/300/500	Abbemat 350/550	Abbemat 450/650	Abbemat 3000	Abbemat 3100	Abbemat 3200	
Sodium Chloride 0.0 - 26.0 % <sup>d)</sup>	Sodium chloride content in aqueous solution	g/100 g	0.0 - 30.0	20	0.08	0.04	s	s	a	-	a	a	
Sodium Dihydrogen Phosphate 0.0 - 40.0 % <sup>d)</sup>	Sodium dihydrogen phosphate content in aqueous solution	g/100 g	0.0 - 40.0	20	0.11	0.05	a	a	a	-	a	a	
Sodium Hydrogen Phosphate 0.0 - 5.5 % <sup>d)</sup>	Sodium hydrogen phosphate content in aqueous solution	g/100 g	0.0 - 5.5	20	0.07	0.03	a	a	a	-	a	a	
Sodium Nitrate 0.0 - 40.0 % <sup>d)</sup>	Sodium nitrate content in aqueous solution	g/100 g	0.0 - 40.0	20	0.10	0.05	a	a	a	-	a	a	
Sodium Phosphate 0.0 - 8.0 % <sup>d)</sup>	Sodium phosphate content in aqueous solution	g/100 g	0.0 - 8.0	20	0.06	0.02	a	a	a	-	a	a	
Sodium Sulfate 0.0 - 22.0 % <sup>d)</sup>	Sodium sulfate content in aqueous solution	g/100 g	0.0 - 22.0	20	0.14	0.07	a	a	a	-	a	a	
Sodium Thiosulfate 0.0 - 40.0 % <sup>d)</sup>	Sodium thiosulfate content in aqueous solution	g/100 g	0.0 - 40.0	20	0.07	0.03	a	a	a	-	a	a	
Strontium Chloride 0 - 36 % <sup>d)</sup>	Strontium chloride content in aqueous solution	g/100 g	0.0 - 36.0	20	0.08	0.03	a	a	a	-	a	a	
Zinc Sulfate 0.0 - 16.0 % <sup>d)</sup>	Zinc sulfate content in aqueous solution	g/100 g	0.0 - 16.0	20	0.08	0.04	a	a	a	-	a	a	

s → standard  
a → available

# AbbeMat Refractometers: Overview Application Methods

The AbbeMat refractometers are used in all industries to measure a wide range of samples, from pharmaceuticals, chemicals, petroleum products, flavors and fragrances to beverages and food. In close cooperation with customers, Anton Paar continuously collects and develops new methods and applications based on refractive index measurements. Below please find the latest list of methods being installed on the AbbeMat refractometers.

Method	Substance	Standard Unit	Measuring Range	Temperature [°C]	Accuracy		Availability						Application Report
					AbbeMat 200/300/350/450 3200/3100/3000	AbbeMat 500/550/650	AbbeMat 200/300/500	AbbeMat 350/550	AbbeMat 450/650	AbbeMat 3000	AbbeMat 3100	AbbeMat 3200	

## Medical/Pharma

Clonidine HCl (10 mg/mL) and NaCl (9 mg/mL)	Percentage of 10 mg/mL clonidine HCl and 9 mg/mL sodium chloride ( $\pm$ 100 %) in an aqueous solution	%	95.0 - 105.0	20	6.5	1.6	a	a	a	-	a	a	
EDTA Sodium 0.0 - 6.0 % <sup>d)</sup>	EDTA content in aqueous solution	g/100 g	0.0 - 6.0 %	20	0.08	0.04	a	a	a	-	a	a	
Human Serum/Plasma Specific Gravity <sup>c)</sup>	Specific gravity of human blood serum / plasma	-	1.0000 - 1.0420	20	0.0004	0.0001	s	s	s	-	a	a	
Human Serum/Plasma Total Protein Concentration <sup>c)</sup>	Total protein concentration in human blood serum /plasma	g/100 mL	0.0 - 14.1	20	0.07	0.02	s	s	s	-	a	a	
Human Serum Plasma Total Solids [g/100 mL] <sup>c)</sup>	Concentration of total dissolved solids in human blood serum / plasma	g/100 mL	0.0 - 15.6	20	0.07	0.01	a	s	a	-	a	a	
Human Serum/Plasma Total Solids <sup>c)</sup>	Content of total dissolved solids in human blood serum /plasma	g/100 g	0.0 - 15.0	20	0.07	0.01	s	s	s	-	a	a	
Human Serum/Plasma Water Concentration <sup>c)</sup>	Water concentration in human blood serum/plasma	g/100 mL	99.8 - 88.4	20	0.05	0.01	s	s	s	-	a	a	
Human Urine Specific Gravity <sup>c)</sup>	Specific gravity of human urine	-	1.000 - 1.039	20	0.0004	0.0002	s	s	s	-	a	a	<a href="#">link</a>
Human Urine Total Solids [g/100 mL] <sup>c)</sup>	Total solids concentration of human urine	g/100 mL	0.0 - 10.3	20	0.08	0.03	s	s	a	-	a	a	<a href="#">link</a>
Human Urine Total Solids <sup>c)</sup>	Total solids content of human urine	g/100 g	0.0 - 9.9	20	0.07	0.01	a	s	s	-	a	a	<a href="#">link</a>

s → standard  
a → available

## Abbemat Refractometers: Overview Application Methods

The Abbemat refractometers are used in all industries to measure a wide range of samples, from pharmaceuticals, chemicals, petroleum products, flavors and fragrances to beverages and food. In close cooperation with customers, Anton Paar continuously collects and develops new methods and applications based on refractive index measurements. Below please find the latest list of methods being installed on the Abbemat refractometers.

Method	Substance	Standard Unit	Measuring Range	Temperature [°C]	Accuracy		Availability						Application Report
					Abbemat 200/300/350/450 3200/3100/3000	Abbemat 500/550/650	Abbemat 200/300/500	Abbemat 350/550	Abbemat 450/650	Abbemat 3000	Abbemat 3100	Abbemat 3200	
Human Urine Water Concentration <sup>c)</sup>	Water concentration of human urine	g/L	935.0 - 996.0	20	0.8	0.4	a	s	a	-	a	a	<a href="#">link</a>
Lugol's Iodine Solution	Percentage of 50 mg/mL iodine and 100 mg/mL potassium iodide ( $\pm 100\%$ ) in an aqueous solution	%	95.0 - 105.0	20	-	0.16	-	a	-	-	-	-	
Magnesium Chloride (101.6 mg/mL)	Percentage of magnesium chloride (101.6 mg/mL $\pm 100\%$ ) in an aqueous solution	%	95.0 - 105.0	20	0.88	0.18	a	a	a	-	a	a	
Sodium Benzoate (100 mg/mL)	Percentage of sodium benzoate (100.0 mg/mL $\pm 100\%$ ) in an aqueous solution	%	95.0 - 105.0	20	0.48	0.11	a	a	a	-	a	a	
Sodium Chloride (292.2 mg/mL)	Percentage of sodium chloride (292.2 mg/mL $\pm 100\%$ ) in an aqueous solution	%	95.0 - 105.0	20	0.29	0.07	a	a	a	-	a	a	
Tolazoline HCl (10 mg/mL) and NaCl (5.6 mg/mL)	Percentage of 10 mg/mL Tolazoline HCl and 5.6 mg/mL NaCl ( $\pm 100\%$ ) in an aqueous solution	%	95.0 - 105.0	20	4.7	1.0	a	a	a	-	a	a	
Tris(hydroxymethyl) Methylamine 0.0 - 40.0 % <sup>d)</sup>	Tris(hydroxymethyl) methylamine content in aqueous solution	g/100 g	0.0 - 40.0	20	0.1	0.04	a	a	a	-	a	a	



s → standard  
a → available

## AbbeMat Refractometers: Overview Application Methods

The AbbeMat refractometers are used in all industries to measure a wide range of samples, from pharmaceuticals, chemicals, petroleum products, flavors and fragrances to beverages and food. In close cooperation with customers, Anton Paar continuously collects and develops new methods and applications based on refractive index measurements. Below please find the latest list of methods being installed on the AbbeMat refractometers.

Method	Substance	Standard Unit	Measuring Range	Temperature [°C]	Accuracy		Availability						Application Report
					AbbeMat 200/300/350/450 3200/3100/3000	AbbeMat 500/550/650	AbbeMat 200/300/500	AbbeMat 350/550	AbbeMat 450/650	AbbeMat 3000	AbbeMat 3100	AbbeMat 3200	

### Organic Chemicals

Acetone 0.0 - 10.0 % <sup>d)</sup>	Acetone content in aqueous solution	g/100 g	0.0 - 10.0	20	0.20	0.09	a	a	a	-	a	a	
Sodium Acetate 0.0 - 30.0 % <sup>d)</sup>	Sodium acetate content in aqueous solution	g/100 g	0.0 - 30.0	20	0.10	0.04	a	a	a	-	a	a	
Sodium Citrate 0.0 - 36.0 % <sup>d)</sup>	Sodium citrate content in aqueous solution	g/100 g	0.0 - 36.0	20	0.11	0.06	a	a	a	-	a	a	
Urea 0.0 - 60 %	Urea content in aqueous solution	g/100 g	0.0 - 60.0	20	0.17	0.11	a	a	a	-	a	a	
Urea 0.0 - 60 %, TC	Urea content in aqueous solution	g/100 g	0.0 - 60.0	TC*	2.8	0.56	a	a	a	a	a	a	

s → standard  
a → available

## AbbeMat Refractometers: Overview Application Methods

The AbbeMat refractometers are used in all industries to measure a wide range of samples, from pharmaceuticals, chemicals, petroleum products, flavors and fragrances to beverages and food. In close cooperation with customers, Anton Paar continuously collects and develops new methods and applications based on refractive index measurements. Below please find the latest list of methods being installed on the AbbeMat refractometers.

Method	Substance	Standard Unit	Measuring Range	Temperature [°C]	Accuracy		Availability						Application Report
					AbbeMat 200/300/350/450 3200/3100/3000	AbbeMat 500/550/650	AbbeMat 200/300/500	AbbeMat 350/550	AbbeMat 450/650	AbbeMat 3000	AbbeMat 3100	AbbeMat 3200	

### Others

NOx red. Agent AUS 32 (DEF)	AdBlue®, 32.5 % aqueous urea solution (AUS 32) DIN 70070, diesel exhaust fluid (DEF)	g/100 g	30.0 - 35.0	20	-	0.013	-	s <sup>1)</sup>	a <sup>2)</sup>	-	-	-	<a href="#">link</a>
Refractive Index	Liquids and solids	n <sub>D</sub>	1.26 - 1.72	TC*	0.0001	0.00002	s	s	s	s	s	s	

s → standard  
a → available

## AbbeMat Refractometers: Overview Application Methods

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Method	Substance	Standard Unit	Measuring Range	Temperature [°C]	Accuracy		Availability						Application Report
					AbbeMat 200/300/350/450 3200/3100/3000	AbbeMat 500/550/650	AbbeMat 200/300/500	AbbeMat 350/550	AbbeMat 450/650	AbbeMat 3000	AbbeMat 3100	AbbeMat 3200	

Sugar													
Brix (ICUMSA 2000) <sup>b)</sup>	Dry substance content in confectionaries, plant juices, syrups, marmalades, jams and sucrose content of high purity sucrose solutions	g/100 g	0.0 - 100.0	TC*	0.05	0.015	s	s	s	s	s	s	<a href="#">link</a>
Brix (%) <sup>b)</sup>	Dry substance content in confectionaries, plant juices, syrups, marmalades, jams and sucrose content of high purity sucrose solutions	g/100 g	0.0 - 100.0	TC*	0.05	0.015	s	s	s	a	a	a	<a href="#">link</a>
Brix (°Brix) <sup>b)</sup>	Dry substance content in confectionaries, plant juices, syrups, marmalades, jams and sucrose content of high purity sucrose solutions	g/100 g	0.0 - 100.0	TC*	0.05	0.015	a	a	a	a	a	a	<a href="#">link</a>
Fructose (ICUMSA 2000) <sup>b)</sup>	Fructose content of high purity fructose solutions	g/100 g	0.0 - 100.0	TC*	0.05	0.015	s	s	s	s	s	s	
Glucose (ICUMSA 2000) <sup>b)</sup>	Glucose content of high purity glucose solutions	g/100 g	0.0 - 100.0	TC*	0.05	0.015	s	s	s	s	s	s	
Invert Sugar (ICUMSA 2000) <sup>b)</sup>	Content of high purity invert sugar solutions	g/100 g	0.0 - 100.0	TC*	0.05	0.015	s	s	s	s	s	s	
Lactose 0 - 17 % <sup>d)</sup>	Lactose content in aqueous solution	g/100 g	0.0 - 17.0	20	0.069	0.014	s	s	a	-	s	s	
Maltose 0 - 60 % <sup>d)</sup>	Maltose content in aqueous solution	g/100 g	0.0 - 60.0	20	0.07	0.01	a	a	a	-	a	a	

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a → available

## Abbemat Refractometers: Overview Application Methods

The Abbemat refractometers are used in all industries to measure a wide range of samples, from pharmaceuticals, chemicals, petroleum products, flavors and fragrances to beverages and food. In close cooperation with customers, Anton Paar continuously collects and develops new methods and applications based on refractive index measurements. Below please find the latest list of methods being installed on the Abbemat refractometers.

Method	Substance	Standard Unit	Measuring Range	Temperature [°C]	Accuracy		Availability						Application Report
					Abbemat 200/300/350/450 3200/3100/3000	Abbemat 500/550/650	Abbemat 200/300/500	Abbemat 350/550	Abbemat 450/650	Abbemat 3000	Abbemat 3100	Abbemat 3200	
Sucrose/Saccharose (ICUMSA 2000) <sup>b)</sup>	Sucrose/saccharose content of high purity sucrose/saccharose solutions	g/100 g	0.0 - 100.0	TC*	0.05	0.015	s	s	s	s	s	s	

\*TC = temperature corrected  
a) Anton Paar method  
b) ICUMSA methods  
c) Original data published by Wolf in 1966 "Aqueous Solutions And Body Fluids"  
d) Original data published in CRC Handbook of Chemistry and Physics  
e) Original data published by Tanner/Brunner in 1979 "Getränke Analytik"  
f) JAS = Japanese Agriculture Standard  
1) only ISO 22241-2 compliant with Abbemat 550  
2) only ISO 22241-2 compliant with Abbemat 650