

Automatic Potentiometric Titrator

Karl Fischer Moisture Titrator

► **Density/Specific Gravity Meter**

Refractometer

Thermal Measurement Instrument

Process & Environment

Density/Specific Gravity Meter

DA-650/-645/-640 (With viscosity correction)

DA-650B/-645B/-640B (Without viscosity correction)

Quickest measurement in 20 seconds

Minimum sample of 1.0 mL

Viscosity correction for high-viscosity samples^{*1}

Touchscreen operation

Comes with Density Standard Liquid

Equipped with sampling^{*2} & dry pump

Completely ready for use

Customizable display & sound

Easy operation & maintenance-free

ASTM	D 1250
	D 1475
	D 4052
	D 4806
	D 5002
	D 5798
	D 5931

ISO	12185
ISO	15212
Pharmacopoeia	



KEM

KYOTO ELECTRONICS
MANUFACTURING CO., LTD.

Density/Specific Gravity Meter

Uniqueness

1 Accuracy of One of the Highest in the World

Density: $\pm 2 \times 10^{-5} \text{g/cm}^3$
(Repeatability: $\text{SD } 5 \times 10^{-6} \text{g/cm}^3$)
Temp.: $\pm 0.02^\circ\text{C}$
(DA-650/-650B)

2 Quick Measurement

20 seconds
(According to KEM standard measurement conditions)

3 Small Sample Size

Minimum 1.0mL
(Manual sampling by syringe)

4 Viscosity Correction for High-viscosity Samples*¹

Up to 30,000 mPa·s
(Manual sampling by syringe: 30,000 mPa·s,
Auto sampling by pump: 2,000 mPa·s)

5 Comes with Density Standard Liquid

KEM is the only manufacturer of Density/Specific Gravity Meters that also produces standard liquids. KEM's original Density Standard Liquid guarantees high quality and reliability.

*¹ DA-650B/-645B/-640B is not equipped with viscosity correction function.





Features

Hassle-free and safe measurement

Sampling^{*2} & dry pump makes comprehensive measurement procedure simple and prevents a sample from contacting the skin.

Easy check of measurement cell

High-intensity LED and cell window ensures high visibility inside measurement cell.

No air bubble, no contamination

New flat-type joint ensures almost no air bubble and no contamination. It contributes to easy cleaning and cost reduction.

Repeated measurement

Air bubble could be a major factor of variation in measurement results. The same sample is measured repeatedly to check air bubble.

Calibration at one temperature

One-point calibration enables measurement at different temps. from one temp. at which calibration is carried out.

Easy data transfer








USB flash drive and LAN enables data to be transferred to PC.

Connection to barometer (Option / NON-CE)

Barometer enables calibration of DA-6XX with accurate air density depending on actual environment.

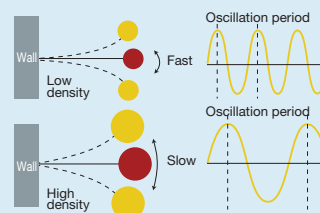
^{*2} Each model is also available without sampling pump.

Application

	Crude Oil, Petrochemical Products, Biofuels		
	ASTM D 1250, D 1475, D 4052, D 4806, D 5002, D 5798, D 5931 ISO 12185, 15212	Density, SG	Market price and tax amount are subject to Density or SG of oil products such as crude oil, fuels (heavy oil, light oil, kerosene and gasoline) and lubricants.
	Chemical Products		
		Concentration	Various chemical products are measured for quality control purposes during production process and/or before shipment. Organic and inorganic substances are controlled by purity or by Concentration.
	Beverage		
		Brix, Density	Samples in this category include milk, dairy products, soft drinks, carbonated drinks, fruit juice, soy milk, etc. Density or Brix is measured for quality control purposes during production process and/or before shipment.
	Alcoholic Drinks		
		Alcohol Concentration	Samples in this category include beer, wine, whisky, Japanese sake and other liquors. Pricing is subject to Alcohol Concentration or extract, and taxation subject to alcohol degree.
	Food		
		Brix, Concentration	Samples in this category include raw materials such as honey, syrup, concentrated extract, saline water, isomerized sugar, etc. Soy sauce, Worcestershire sauce or barbeque sauce is checked for taste control by measuring Brix or Concentration of target substance.
	Fat and Oil		
		Density, SG	Quality of vegetable oil and animal oil are controlled by measuring Density or SG.
	Fragrance, Pharmaceutical		
		Density	Samples in this category are precious and expensive. Even with a limited amount of sample, successful measurement can be done easily and conveniently.
	Electronic Parts, Semiconductors		
		Density	Quality control is required by measuring Density of surface processing fluids like etching or acid cleaning.
	Electric		
		Concentration, Density	Concentration of flux or Density of plating fluid is checked for quality control purposes in the manufacturing process.

Measurement Principle

Just imagine the model where a weight is attached to a bar at the end and a bar is fixed on a wall as shown in the right figures. And when you hit the weight by a finger, the weight starts vibrating. Now you will find that the heavier the weight becomes, the slower it vibrates, and vice versa. This is because the weight will vibrate on the oscillation period specific to a substance in proportion to the mass of weight. This means that one can determine the density of a substance by measuring its oscillation period since density becomes proportional to the mass when the volume is constant, i.e. a fixed tube.



FAQs

1 What is sample amount required?

Minimum 1mL is required.

2 How long does it take to measure one sample?

Minimum 20 seconds is required. (It may vary depending on samples, ambient conditions etc.)

3 How often is calibration required?

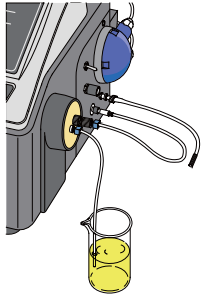
Factor calibration must be made before any measurement is attempted right after the unit is turned on. If the unit is left turned on, calibration must be made once every three days. The necessity of calibration can be confirmed by comparing the measured results of calibration with air and water. If the result is the same as before, it means that calibration is not necessary.

4 What solutions are recommended to clean and dry the measuring cell?

Sample	Rinse Solution 1 (To Clean)	Rinse Solution 2 (To Dry)
Petrochemical Product / Organic Substance	Toluene	Acetone
Soft Drink / Alcohol	Pure Water	Acetone or Ethanol
Protein Substance	Hypochlorous Acid	Pure Water or Ethanol

Quick Reference (Peristaltic Pump Suction Type)

1

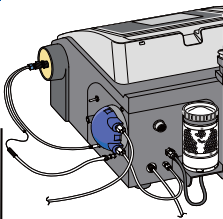


Clean the cell

- Adjust sample/drain lever to "Drain."
- Wipe off tip of sampling tube.
- Press "PUMP" and clean the cell with rinse solution 2 for about 10 sec.
- Press "PUMP" to stop pump operation.

2

Sampling Tube

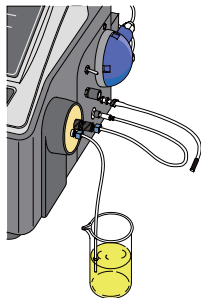


Put in. Drying Tube

Dry the cell

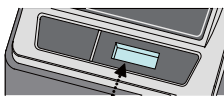
- Wipe off sampling tube and put it in drying tube.
- Press "PURGE" twice. (Auto Off)

3



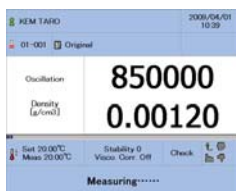
Sampling

- Adjust sample/drain lever to "Sample."
- Adjust controller to slowest.
- Press "PUMP" to start sampling.
- Adjust controller to optimal speed.
- Check through cell window to make sure there is no air bubble in the cell.
- Press "PUMP" to stop pump operation.



Check air bubbles.

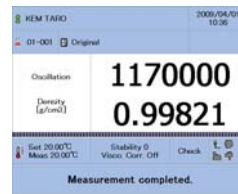
4



Start measurement

- Press "START".

5



Measurement ends

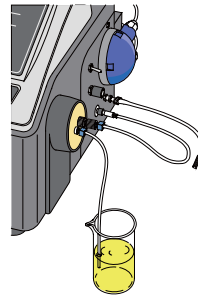
- Once oscillation frequency becomes stable, measurement comes to an end and result (density of sample) will be shown.

6

Drain sample

- Adjust sample/drain lever to "Drain."
- Remove sampling tube from sample.
- Press "PUMP" to drain sample.

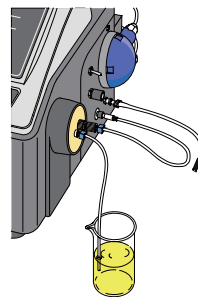
7



Clean the cell (Rinse 1)

- Adjust sample/drain lever to "Drain."
- Wipe off tip of sampling tube.
- Press "PUMP" and clean the cell with rinse solution 1 for about 10 sec.
- Press "PUMP" to stop pump operation.

8

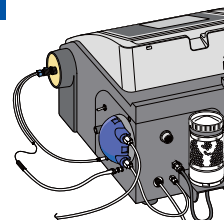


Clean the cell (Rinse 2)

- Adjust sample/drain lever to "Drain."
- Wipe off tip of sampling tube.
- Press "PUMP" and clean the cell with rinse solution 2 for about 10 sec.
- Press "PUMP" to stop pump operation.

9

Sampling Tube



Put in. Drying Tube

Dry the cell

- Wipe off sampling tube and put it in drying tube.
- Press "PURGE" twice. (Auto Off)

Options



Sampler

Auto Clean and Sampling Unit DCU-551N/H



- Measurement of 1 sample in 20mL vial
- Viscosity up to 50,000mPa·s
- Heating temp. of R.T ~ 80°C (DCU-551H)
- Connection kit required;
12-02763 (DCU-551N)
12-02764 (DCU-551H)

Multiple Sample Changer CHD-502N/H/C



- Measurement of 30 samples in 20mL vial
- Viscosity up to 50,000mPa·s
- Heating temp. of R.T ~ 80°C (CHD-502H)
- Thermostat water circulator to be locally prepared (CHD-502C)
- Connection kit required;
12-02763 (CHD-502N/C)
12-02764 (CHD--502H)



Printer

Thermal Printer with Connection Cable 12-02618-0X

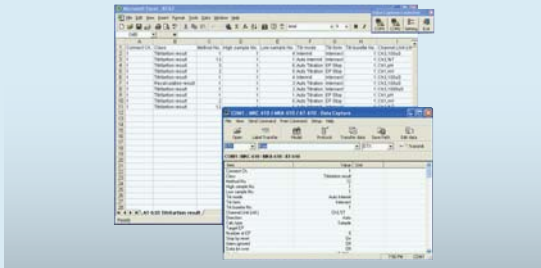


Dot Matrix Printer with Connection Cable 12-02028-0X



Software

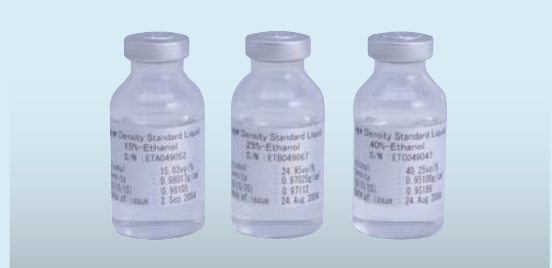
Data Capture Software SOFT-CAP



- Data transfer to PC in CSV format
- Connection cable required;
64-00625 & 12-02012



Density Standard Liquid



3-place Density Meter

Density / Specific Gravity Meter DA-100



- Measurement Range: 0 ~ 3g/cm³
- Measurement Temp.: 15 ~ 40°C (59 ~ 104°F)
- Accuracy of Density: ±0.001g/cm³



Portable Density Meter

Portable Density / Specific Gravity Meter DA-130N



- Measurement Range: 0 ~ 2g/cm³
- Entry of Temp. Compensation Coefficient: Manual
- Accuracy of Density: ±0.001g/cm³



JCSS-accredited Density Standard Liquid

Part name	Part number	g/cm ³ at 20°C	mL/bottle	Remarks
Pure Water	12-02708-01	0.998**	10	2 bottles/ set
Isooctane* ¹	12-03288-01	0.691**	10	Pure Water & Isooctane 1 bottle each
Dichlorotoluene	12-03289-01	1.249**	10	Pure Water & Dichlorotoluene 1 bottle each
Bromobenzene* ¹	12-03290-01	1.494**	10	Pure Water & Bromobenzene 1 bottle each

Shelf life: 6 months from calibration date (Bromobenzene) / 12 months from calibration date (Others)

*¹ These items are categorized as hazard items to be exported. They requires special packing & transportation charge.



Density Standard Liquid

Part name	Part number	g/cm ³ at 15°C	mL/bottle	Remarks
5% ethanol	12-03536-30	0.991**	20	3 bottles / set
10% ethanol	12-03536-31	0.985**	20	3 bottles / set
15% ethanol	12-03536-32	0.980**	20	3 bottles / set
20% ethanol	12-03536-33	0.975**	20	3 bottles / set

Shelf life: 6 months from calibration date



Recommend Consumables and Parts

Part name	Part number	Qty	Remarks
Filter	20-05665	1 pc	
Silica Gel (500g)	61-00249	1 pc	
Syringe 2mL x 2	66-00088	1 set	
Thermal Roll Paper P-58-30 (10 rolls)	69-00522-01	1 set	For Thermal Printer
Thermal Roll Paper STH-215 (10 rolls)	69-00522-11	1 set	For Thermal Printer
Printing Roll RP5860 4rolls Set	12-04260	1 set	For Dot Matrix Printer
Ribbon Cartridge IR-91B Black (5pcs/set)	12-04261	1 set	For Dot Matrix Printer



Standard Parts

Part name	Part number	Qty	Remarks
Main Unit	DA-650/DA-645/DA-640 or DA-650B/DA-645B/DA-640B	1 unit	
Tube Holder	12-00051-00	1 pc	
Desiccant Container	12-01148-02	1 pc	
Tube 2x3 L=2000 PFA (Single Ended with Union)	12-01997-01	1 pc	For Peristaltic Pump Suction Type, Solenoid valve exhaust
Tube 3.4x4.7 L=350 PVC (Double Ended with Union)	12-01998	1 pc	For drying
Tube 2x3 L=330 PFA (Flare Single Ended with Union)	12-01999	1 pc	For cell drain outlet
Tube 2x3 L=250 PFA (Flare Single Ended with Union)	12-02000	1 pc	For sampling
Tube 3.4x4.7 L=400 PVC (Double Ended with Union)	12-02699	1 pc	For purge
Lure Adapter	20-05764	1 pc	Adapter for syringe
Tube 2x3 L=2m PFA	20-08325-02	1 pc	For Peristaltic Pump Suction Type, Pump drain
Waste Liquid Bottle (500mL)	12-04403-01* ¹	1 pc	For Air Pump Suction Type
Bottle for Mist Trap (250mL)	12-04403-02* ¹	1 pc	For Air Pump Suction Type, Bottle
Tube 2x3 L=500 PFA (Double Ended with Union)	12-05210* ¹	1 pc	For Air Pump Suction Type
Cup with Magnetφ100x80	66-00164* ¹	1 pc	For Air Pump Suction Type
Cup with Magnetφ78x60	66-00164-02* ¹	1 pc	For Air Pump Suction Type
Tube 2x3 L=1m PFA	20-08325-01* ¹	1 pc	For Air Pump Suction Type, Exhaust
Bottle Holder	20-09301* ¹	1 pc	For Air Pump Suction Type
DA-600 Series Operation Manual (CD - ROM)	12-02845	1 pc	Incl. Operation Manual, Function Description, CE Declaration of conformity, etc.
DA-600 Series Quick Manual	59-00053-01	1 copy	
Silica Gel (500g)	61-00249	1 pc	
AC Adapter Type1 with Power Cord	12-02833-0X	1 pc	
Syringe 2mL x 2	66-00088	1 set	
Touch Pen	69-00444	1 pc	
Pure Water	-	1 set	Density standard liquid (2 bottles / set)
Inspection Certificate / Warranty	-	1 copy	

*¹ They are not supplied with DA-6XX with Peristaltic Pump Suction Type or without sampling pump.

Model Name		DA-650	DA-650B	DA-645	DA-645B	DA-640	DA-640B
Measurement Method		Resonant frequency oscillation					
Measurement Range		0 ~ 3 g/cm ³					
Temperature Range		0 ~ 96°C (32 ~ 204.8°F)					
Accuracy ¹	Density	±2x10 ⁻⁵ g/cm ³ (0.00002 g/cm ³)		±5x10 ⁻⁵ g/cm ³ (0.00005 g/cm ³)		±1x10 ⁻⁴ g/cm ³ (0.0001 g/cm ³)	
	(Calibration with air and water required.)						
Repeatability ²	Temp	±0.02 °C (±0.04 °F)		±0.03 °C (±0.05 °F)		±0.05 °C (±0.09 °F)	
	Density	SD 5x10 ⁻⁶ g/cm ³		SD 1x10 ⁻⁵ g/cm ³		SD 5x10 ⁻⁵ g/cm ³	
Minimum Sample Required		1) Approx. 1 mL (Syringe)		2) Approx. 2 mL (Pump)			
Measurement Time		1) 1 to 4 mins (Manual)		2) 2 to 10 mins (Auto)			
Display		1) 5.7-inch colour TFT LCD; 640 x 480 2) Shows density, specific gravity, oscillation frequency, temperature, concentration and other messages.					
Resolution	Density & Specific Gravity	0.000001		0.00001		0.0001	
	Temperature	0.001		0.01		0.01	
Viscosity Correction		Yes	No	Yes	No	Yes	No
Sampling		1) Manual by syringe 2) Auto by sampling pump ³					
Method		Saves up to 100 different methods in built-in memory.					
Stability		Four modes of stability according to measurement accuracy and time					
Density Auto Correction		1) Saves conversion table or formula at your desired temperatures according to your samples. 2) Temperature conversion table preprogrammed according to ASTM standard for petroleum, petroleum products and lubricating oils					
Auto Conversion		1) Between concentration and density 2) Between temperature and density					
Statistics		1) Auto or manual calculation of mean value, SD and coefficient 2) Recalculation, data deletion					
Interfaces		1) LAN : x 1; Personal computer (PC) 2) USB 1.1 : x 2; USB flash drive, keyboard, barcode reader, Epson inkjet printer ⁴ 3) RS-232C : x 2; Dot Matrix Printer, Auto Clean and Sampling Unit, Multiple Sample Changer					
Options		1) Printer : Thermal Printer, Dot Matrix Printer 2) Sampling Unit, Changer : DCU-551N/H, CHD-502N/H/C 3) Software : SOFT-CAP (Data Acquisition Software)					
Data I/O		1) USB flash drive as data storage medium 2) Application Notes provided in USB flash drive					
Wetted Materials		PTFE, borosilicate glass, SUS304					
Ambient Conditions		1) Temperature : 5 ~ 35 °C (41 ~ 95 °F) 2) Humidity : 85%RH or below (No condensation allowed.)					
Power Supply		AC 100 ~ 240V; 50/60Hz (Comes with AC adapter.)					
Power Consumption		40W (max. 120W, min. 20W)					
Dimensions		320 (W) x 365 (D) x 250 (H) mm (12.6 (W) x 14.4 (D) x 9.8 (H) inches)					
Weight		18 kg (39.7 lbs)					
Export Packing in Double Carton Box		G/W 21 kg (46.3 lbs); 540 (W) 480 (D) 460 (H) mm (21.3 (W) 18.9 (D) 18.1 (H) inches) (May vary in some cases.)					

*1, *2: According to KEM standard measurement conditions.

*3: There are two choices for sampling pump; Air Pump Suction Type or Peristaltic Pump Suction Type.
Each model is also available without sampling pump.

*4: Enquire for applicable models.

KEM KYOTO ELECTRONICS
MANUFACTURING CO., LTD.
<http://www.kyoto-kem.com>

Overseas Division : 2-7-1, Ichigaya-sadohara-cho, Shinjuku-ku
TOKYO, 162-0842, JAPAN
Fax : +81-3-3268-5592 Phone : +81-3-5227-3156

Distributed by