

Tuning Fork Density Meter

DME Series

Operation Manual

CAUTION

Be sure to read this Operation Manual first so that you use the equipment safely. To ensure to use this equipment properly, fully understand the contents of this manual.
Keep this manual in a safe and accessible place for future reference.



Shinko Denshi Co., Ltd.

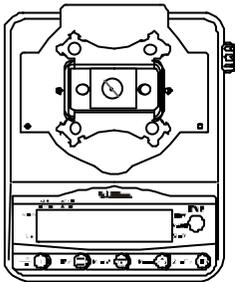
Introduction

Thank you for your purchasing our DME equipment. Be aware not to drop the equipment or accessories when unpacking. Check that all the articles have been received against the list below.

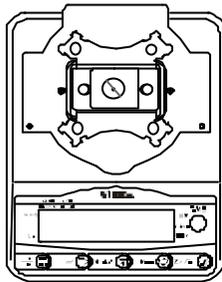
Articles in the package

(1) Main Body

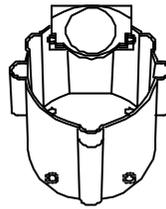
DME-220HE



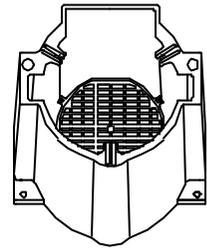
DME-220E



(2) Liquid Tank



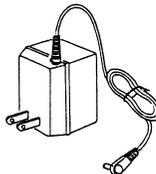
(3) Housing



(4) Fixing nut (x 2)



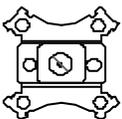
(5) AC Adapter



(6) Operation Manual



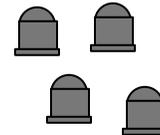
(7) Pan Base



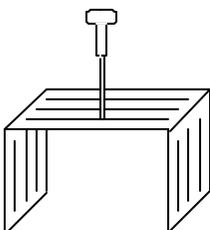
(8) Measurement dish



(9) Pan Guide for measurement dish fixing (x 4)



(10) Clamp



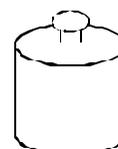
(11) Thermometer



(12) Tweezers



(13) 200g weight for span adjustment
(only available with the DME-220E equipment)



Contents

1 Usage Precaution	2	8 Measuring Density of a Liquid	
2 Assembling the Density Meter	5	8.1 Tools used for measuring Density of a liquid	16
3 Name of Sections		8.2 Procedure for measuring Density of a liquid	16
3.1 The main equipment	7	8.3 Measuring Density of a liquid using	
3.2 Display symbol used	8	saved glass weight data	18
4 Awareness of Items to Note during		8.4 Displaying weight in air and Density value	
Density Measurement	9	of saved glass weight data (sample for	
5 Setting Functions	10	measuring Density of a liquid)	19
6 Before Measuring Density (Correction		9 Using the Equipment as Electronic	
Coefficient Input)		Weight Balance	20
6.1 List of correction coefficients	12	10 Span Adjustment	21
6.2 Inputting a correction coefficient	13	11 Output	22
7 Measuring Density of a Solid		12 Troubleshooting	23
7.1 Procedure for measuring Density of a solid	14	13 Specification	25
7.2 Measuring floating sample on water	15		

1 Usage Precaution

This chapter describes what you must do to prevent injury to people when using or maintaining the equipment and to minimize the damage to articles.

Incorrect usage can cause injury to people or damage to the equipment. Below are a list of PRECAUTIONS and RECOMMENDATIONS that must be followed .

CAUTION

You must follow this instruction for safe usage. Incorrect usage can cause injury or damage over large area and can affect people, buildings and assets. Sometimes it may result in serious injury.

RECOMMENDED

describes what you should do in order to maintain the quality and reliability of the equipment.

Symbols instructions are shown using two symbols.



A "Mandatory" symbol indicates an operation or task that you must do.

An example)

Mandatory



Level surface check



A "Forbidden" symbol indicates an operation or task that you must not do.

An example)

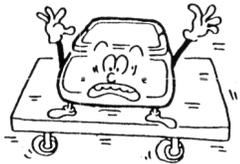
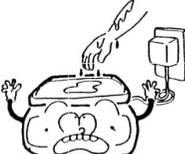
Forbidden



Usage Forbidden

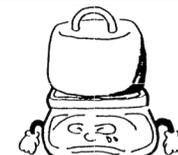
CAUTION

 Degradation Forbidden		Do not degrade or modify the equipment. <ul style="list-style-type: none">• Degradation or modification causes failure or overheating.• Contact the Sales or Service Department in our company if you have any problem.
 Usage of non- specified parts Forbidden		Only use AC power (rated value) should be used. Only use the dedicated AC adapter. <ul style="list-style-type: none">• Using another type of power supply or adapter may cause overheating or failure.
 Movement Forbidden		With articles on the equipment do not move it. <ul style="list-style-type: none">• You may be injured if the article falls from the measurement dish. Movement Forbidden

 Usage Forbidden		<p>Do not use the equipment on unstable surfaces or where the equipment is likely to be subjected to vibration.</p> <ul style="list-style-type: none"> • The article to be measured may fall from the measurement dish. • The equipment cannot provide a correct measurement under these circumstances.
 Pull Forbidden		<p>Do not leave the cord of the AC adapter in a position where it can be tripped over or pulled.</p> <ul style="list-style-type: none"> • You may get injured or damage the equipment by pulling it.
 Wet Hands Forbidden		<p>Do not touch AC adapter or the equipment with wet hands.</p> <ul style="list-style-type: none"> • You may get an electric shock.
 Water Forbidden		<p>Do not use the equipment where water can get on it.</p> <ul style="list-style-type: none"> • You may get an electric shock or short out the equipment. • The equipment may corrode and lead to failure.
 Unstable Area Forbidden		<p>Do not use the equipment where the foot adjusters are unstable.</p> <ul style="list-style-type: none"> • The equipment can wobble and cannot provide a correct measurement.
 Dusty Area Forbidden		<p>Do not use the equipment where it is dusty.</p> <ul style="list-style-type: none"> • It may cause fire or an explosion. • It can lead to failure as short or open circuit.

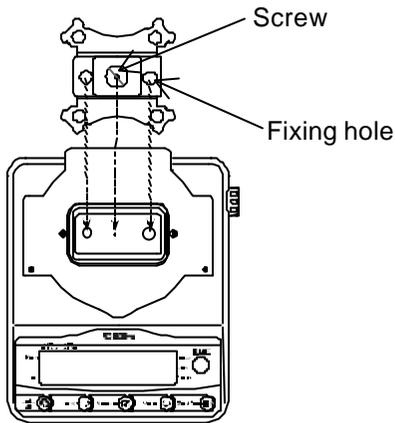
RECOMMENDED

 Equipment Calibration		<p>Be sure to calibrate the equipment after maintenance or change of usage area.</p> <ul style="list-style-type: none"> • Error may occur in the measurement value and the equipment may not provide a correct measurement.
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 Impact Forbidden		<p>Do not impact the equipment.</p> <ul style="list-style-type: none"> Impact causes damage or failure. Place articles to be measured on the equipment carefully.
 Usage Forbidden		<p>Do not use the equipment where the ambient temperature and humidity fluctuate.</p> <ul style="list-style-type: none"> The equipment may not be able to provide a correct measurement. Ambient temperature and humidity should be in the range of 10 to 30C ° ,80%RH max.
 Do Not Overload		<p>Do not leave the equipment when it shows 「E」, an overload error.</p> <ul style="list-style-type: none"> This may cause damage or failure. Remove the article from the equipment immediately.
 Usage Forbidden		<p>Do not use the equipment in direct sunlight.</p> <ul style="list-style-type: none"> The display may not be easy to see. Temperature inside the equipment rises. The equipment may not be able to provide a correct measurement.
 Remove Adapter		<p>Remove the AC adapter from the socket if you do not use the equipment for long periods.</p> <ul style="list-style-type: none"> It is recommended to save energy and prevent degradation.
 Usage Forbidden		<p>Do not use volatile solutions.</p> <ul style="list-style-type: none"> It may distort or damage the equipment. Wipe with dry cloth or cloth containing a little neutral detergent when the equipment gets dirty.
 Usage Forbidden		<p>Do not use the equipment where air from an air conditioner blows directly on it.</p> <ul style="list-style-type: none"> The affect on ambient temperature change may cause an incorrect measurement.
 Usage Forbidden		<p>Do not use the equipment where the floor is springy or cushioned.</p> <ul style="list-style-type: none"> The equipment may incline and give an incorrect measurement.
 Make Sure it is Level		<p>Do not use the equipment on an inclined surface.</p> <ul style="list-style-type: none"> Errors may occur and the equipment may provide an incorrect measurement.

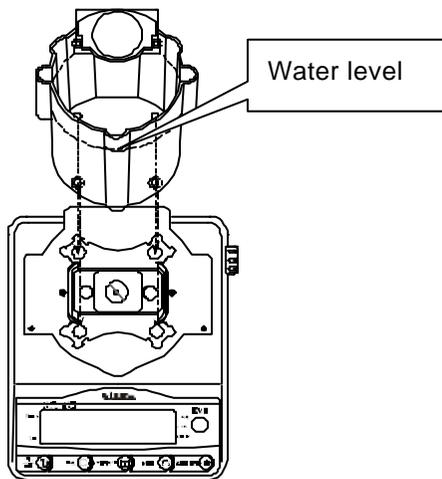
2 Assembling the Density Meter

Fix the Pan Base to the equipment.



Align the fixing hole in the pan base with the plug on the equipment, then screw tight the central screw to attach.

Pour water into the Liquid Tank and place it on the Pan Base.

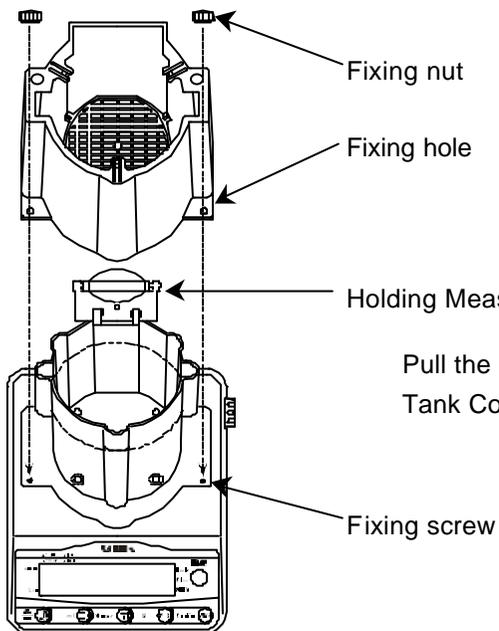


Fill to the water level. You can avoid bubbles attaching to the sample for measurement if you add a few drops of surface-active agent such as washing-up liquid at this time.

Align fixing holes at the 4 corners in the Pan Base and with 4 lugs on the bottom of the Liquid Tank. Place the Liquid Tank on the Pan Base.

Install the Liquid Tank cover on the equipment.

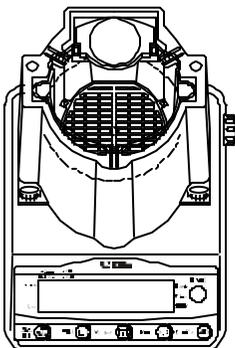
Locate both holes in the Housing with the fixing screws on the main equipment. Secure with fixing nuts.



Pull the Dish up and away from you and place the Liquid Tank Cover on.

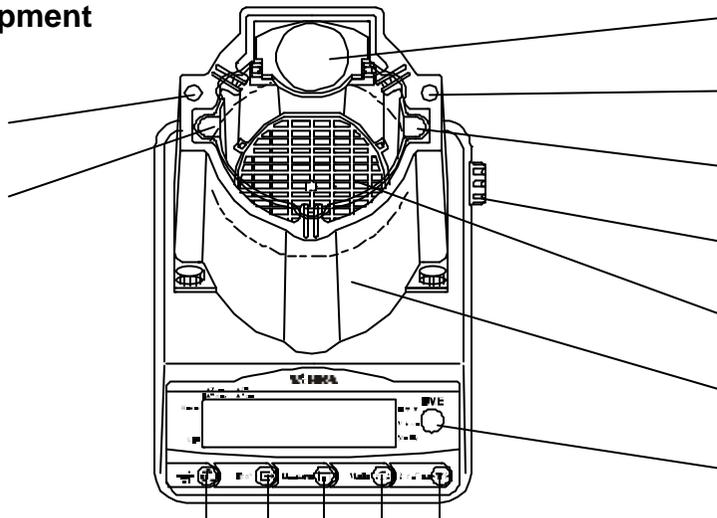
Completion

The assembly is complete after pulling the folding measurement dish down towards you.



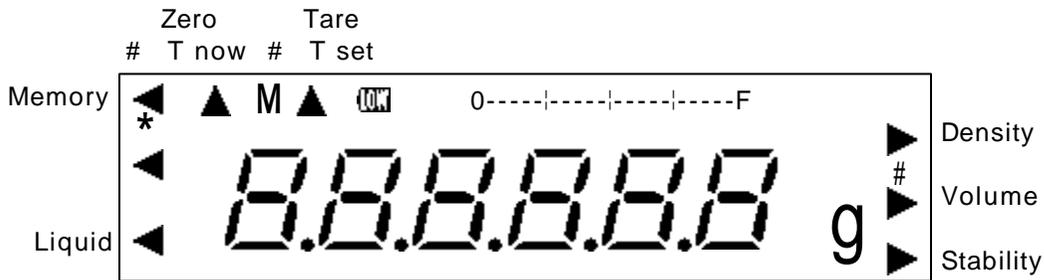
3 Name of Sections

3.1 The main equipment



Number	Name	Function
	Holding measurement dish	To place a sample on it when the weight in air is measured. You can enlarge the dish area if you pull it down toward you.
	Thermometer storage hole	To store the thermometer. This is also used as the fixing hole to hold the option hanger when the Density of a liquid is measured.
	Tweezers compartment	Hole to store the tweezers in when measuring in water.
	Calibration button (only available in the DME-220HE equipment)	To use for span adjustment on the equipment.
	Water dish	To place a sample in when it is measured in water.
	Housing	The water dish with fixing holes for mounting on it. The whole housing section protects the sample from air turbulence.
	Level	To adjust the equipment level. To adjust, turn the adjuster.
	On/Off key	• To switch the power supply On/Off on the main equipment.
	Print key	• Output operation • Clearing 『◀』 when the weight is displayed during 『Memory ▶』 or 『Liquid ▶』 lights up.
	Measure key	• Starting weight data reading. • Reading can be cancelled by pressing the key during reading.
	Mode key	• Switching over alternately from Density to volume display when solid Density is shown. • Changing input digit during correction coefficient input. • Calling function by [Continuous Pressing]. • Calling span adjustment by [Additional Continuous Pressing].
	Zero/Tare key	• Zero point adjustment and tare operation. • Changing the value when inputting correction coefficient. • Calling correction coefficient input mode by [Continuous Pressing].

3.2 Display symbols used



Display symbols	Description
g	Weight display unit - grams
#	Correction coefficient input mode
M	Flashes when reading weight data.
0-- - - --F	Bar graph showing proportion of the sample weight placed on the measurement dish, compared to weight capacity of the equipment.
*	During energizing. It will only light up when the power supply is Off.
	Only when battery option is installed. It will light up when the battery is low.
-	Minus display
▶ Density	Density value display. Inputting the Density of a substance when the indicator "#" lights up.
▶ Volume	Volume value display
▶ Stability	Stability lights up when it is stable and the weight is shown.
Memory ◀	Lights up once the data of the sample weight in air is saved.
◀ (left of center on the display)	Confirming and changing the sample Density together with "#" mode.
Liquid ◀	Lights up when measuring the Density of a liquid or showing the liquid Density value.
(left top on the display)	"#" lights UP: during actual water temperature input "#" lights OFF: when indicating zero point while weight is shown
(right top on the display)	"#" lights UP: during the standard water temperature input "#" lights OFF: during tare when the weight is shown

4 Awareness of Items to Note during Density Measurement

This Density meter is normally used as an electronic balance. Follow the instructions in Chapter "1 Usage Precaution" (p2 to p4). Follow the description below for awareness of items to note in the unique Density meter as well as in Chapter 1.

Do not spill water out of the Liquid Tank or add water to the Liquid Tank after setting the value to 0 on the display.

The Density meter measures the total weight including the Liquid Tank. The total weight will change if the amount of water inside the Liquid Tank changes after setting the zero point. The equipment cannot provide a correct measurement value. Be aware not to drop the water attached on the tweezers out of the Liquid Tank or the water on your hands when you immerse a sample in the Water Dish.

Water will evaporate and reduce the weight if you leave the water standing for long periods. Set the display to 0 and measure it.

Measurement does not take a long time so normal evaporation will not affect the measurement value.

Use the heaviest sample possible to minimize the variation in measurement value.

The Density value is calculated from the weight in air and the weight in water. Change the sample to a larger size and measure it again when the variation in measurement is large. Refer to the list below and use a sample with an acceptable weight.

[Sample List] Required weight of a sample against Density.

Density of sample	0.8	1.2	1.6	2.0	2.6	3.0	7.0
Required weight [g]	2.5	5.5	10	15	20	35	100

The required weights should be values within $\pm 0.5\%$ of the required weight listed.

Completely remove bubbles attached to the measurement sample after immersing the sample in water.

The equipment cannot provide the correct measurement value if bubbles are attached to the sample. The volume of bubbles causes errors. You can avoid bubbles attaching to the sample by adding a few drops of surface-active agent to the water such as washing-up liquid.

Do not use any aggressive liquid as it may damage the Liquid Tank which is made from polyethylene or the Water Dish which is made from an ABS resin.

Be aware not to spill any liquid inside the equipment as it may damage or corrode the equipment.

5 Setting Functions

5.1 Procedure for setting functions

Press and hold the **Mode** key.

Release the key after you see 『 F U N C 』.

The functions appear.

Change setting value with the **Zero/Tare** key. Move to the following items using the **Mode** key.

After you complete the setting, return to weight display by pressing the **Measure** key.

5.2 List of functions

This  symbol indicates it is already set when shipped and this  symbol indicates the function is only available in the DME-220HE equipment.

Item	Setting	Description
Measurement mode	0	Solid Density measurement mode
	1	Liquid Density measurement mode
Use of sample value for liquid Density measurement*1	0	Not in use
	1	In use
Substance to be used	0	Water
	1	Liquid except for water
	2	The previous measured liquid Density measurement (Appearing only in the DME-220HE equipment)
Response speed	1	Fast
	2	
	3	Slow
Measurement condition	1	Easy (when turbulence is low)
	2	
	3	Difficult (when turbulence is high)
Specification of minimum value display	0	Unit of 0.01
	1	Unit of 0.001
Flashing digit with error on the display	0	No Flashing
	1	Flashing
Auto zero	0	Disabled
	1	Enabled
Bar graph display	0	Disabled
	1	Enabled
Buzzer output	0	Disabled
	1	Comes on every time of continuous
Auto power Off	0	Disabled
	1	Enabled

Item	Setting	Description	
Output control ¹	R. o.c.	0	Stops output
		1	Constant and continuous output
		2	Continuous output during stable status (Stops during an unstable status)
		3	One output per one press of the [Print] key
		4	One automatic output when the scale judges stability after a sample is loaded
		5	One output in stable status. Stops output in unstable status
		6	Continuous output in unstable status. Stops once the output goes stable.
Baud rate	b. b.L.	1	1200bps
		2	2400bps
		3	4800bps
Output data selection ²	C. o.d.	0	Only Density value
		1	Header and Density value
		2	Outputting Density value, weight, actual water temperature and standard water temperature and each header (Notice) <ul style="list-style-type: none"> • Density of the inputted substance is outputted by inputting [2NEd 1] instead of actual water temperature. • Density of a liquid in the previous Density measurement is outputted in [2NEd 2]
Auto output ³	d. R.o.	0	Stops output
		1	An automatic output after Density measurement

- 1 The setting 『R. o.c.』 can be applied to the operation prior to the Density measurement only. (Before the weight measurement in air). The fixing format is outputted by pressing the **[Print]** key when the Density or the volume is displayed.
- 2 It shows the content of the output data by pressing the **[Print]** key when Density or the volume is displayed. See Chapter "11 Output".
- 3 The setting 『C. o.d.』 are outputted in the auto output function.

6 Before Measuring Density (Inputting Correction Coefficient)

Input correction coefficients required for Density calculation prior to Density measurement. Coefficient to be inputted differs depending on the setting 『PRESET』 (substance to be used) as described in Chapter "5 Setting functions". The inputted correction coefficient is saved even after the power supply is switched Off.

6.1 List of correction coefficients

Correction coefficient in each substance to be used

Setting	Substance to be used	Description of correction coefficient to input
DME d	0	Water ¹
	1	A liquid except for water
	2 ²	The liquid in the previous Density measurement

: PRESET WHEN SHIPPED

1 Density $t/t_1C^\circ:t$ = Actual water temperature (water temperature in the Liquid Tank), t_1 =standard water temperature. 4C°

Set the standard water temperature (t_1) at 4C° (Density $t/4C^\circ$) where Density of water is highest (=1.000) for normal use.

Change the standard water temperature (t_1) only when water temperature other than for 4C° is used as the standard.

2 The Density measurement of a liquid is available only in the DME-220HE equipment. Use this function for a liquid medium other than water. First, perform the Density of a liquid measurement procedure to measure the medium that you wish to use. After measuring the Density of this medium, change the correction coefficient setting to 『DME d 2』. This operation automatically sets the Density of the medium to be used. The equipment saves the measured value of Density of a liquid and updates the value every time a measurement is conducted. Therefore the Density of the liquid measured last is shown.

Correction coefficient

Correction coefficient	Setting range of correction coefficient		Preset value when
	DME-220HE	DME-220E	
Actual water temperature	0.0 ~ 99.9		15.0
Standard water temperature	0.0 ~ 99.9		4.0
Substance Density (manual input)	0.001 ~ 9.999		1.000

Measurement value to be displayed (DME-220HE only)

Measurement value to be displayed	Remarks
Weight of sample for measuring Density of a liquid	Displayed in the Density of a liquid measurement mode 『15G 1』.
Density value of sample for measuring Density of a liquid	
Measurement value of Density of a liquid	Displayed in the Density of a liquid measurement mode 『DME d 2』

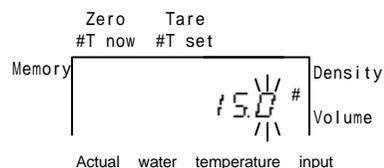
6.2 Inputting a correction coefficient

The correction coefficient input mode does not operate when the $\text{Memory} \blacktriangleleft$ lights up. Clear $\text{Memory} \blacktriangleleft$ by pressing the **Print** key when the light is on. The \# lights up. The \# or $\text{\blacktriangleleft}$ in each correction coefficient lights up at the right hand side of the screen when correction coefficient input mode is on.

An example) when substance is water, 2.7E d. 0

Actual water temperature input

Press and hold the **Zero/Tare** key. Release the key after moving to the value input screen of the actual water temperature. The \# indicator lights up either in the \# symbol or "T now" when inputting actual water temperature. The digit on at right flashes first.



You can input value at the flashing digit location.

Input value. The operation of the input key is as follows.

Zero/Tare key: Changes the value in the order of 0 1 2...9 0.

Mode key: moves the flashing digit to the left. It moves the flashing light to the extreme right digit again after reaching the extreme left position.

Save the setting value after inputting or cancel it.

Measure key: saves the setting value and moves to the standard water temperature input.

Mode key: does not save the setting value and moves to the standard water temperature input.

Standard water temperature input

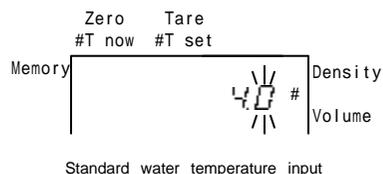
The \# indicator lights up either in the \# symbol or "T set" when inputting standard water temperature.

Input values same as in the procedures to in actual water temperature input.

Save the setting value after inputting or cancel it.

Measure key: saves the setting value and moves to the weight display.

Print key: does not save the setting value and moves to the weight display.



Symbols display on the screen during correction coefficient input

Direct input of substance Density	Confirmation or change or measurement value of Density of a liquid
2.7E d. 1	2.7E d. 2
\# and $\text{\blacktriangleleft}$ Density lights up.	\# and $\text{\blacktriangleleft}$ Liquid lights up.
<div style="border: 1px solid black; padding: 2px; display: inline-block;"> \blacktriangleleft Density \# Volume </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> Memory Liquid \blacktriangleleft \# Density Volume Stability </div>

Note

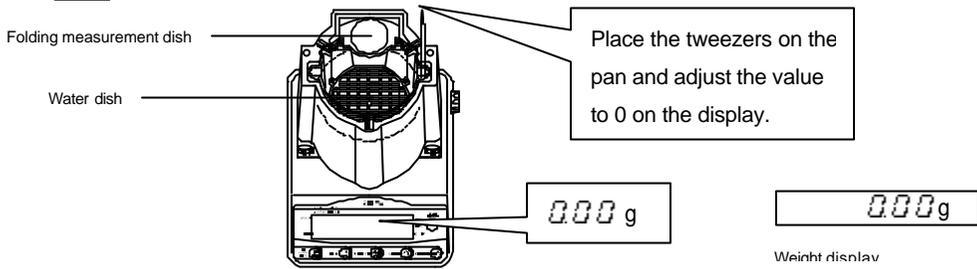
If the digit in the tenth place is a zero, this "0" is not displayed.

7 Measuring Density of a Solid

7.1 Procedure for measuring Density of a solid

Be sure to input the required correction coefficient for measurement before starting measurement of Density.

Make sure that the weight display mode is set and the tweezers are inserted in the tweezers storage hole compartment. Then, press the **Zero/Tare** key. If **Memory** is displayed, press the **Print** key to clear the indication.



Place a sample on the folding measurement dish. Press the **Measure** key after **Stability** lights up. The letter **M** in the upper left hand corner of the screen flashes and the equipment measures the weight of the sample in air.

When the weight of the sample in air is completed, the indicator **Memory** lights up and the weight display appears.

- If there is high interference or a minus value is displayed, bring up **STOP** to interrupt the measurement. In this case, retry the procedure from step 1 to perform the measurement again.

Place the sample in the water dish using the tweezers. At this time remove any bubbles attached to the sample completely. Ensure all are removed. Be aware not to drop any water from the tweezers outside the tank.

After making sure that there are no bubbles on the sample, return the tweezers to the water tank cover and press the **Measure** key. The letter **M** flashes in the upper left hand corner of the screen.

- If there is high interference or a minus value is displayed, bring up **STOP** to interrupt the measurement. In this case, retry the procedure from step 3 to perform the measurement again.

When the weight measurement in water is completed, the measured Density is shown. By pressing the **Mode** key, the Density and volume appear alternately.

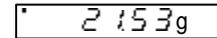
By pressing the **Measure** key, the weight display appears again.

By pressing the **Measure** key when the letter **M** is flashing, **STOP** appears and reading weight data is cancelled.

By pressing the **Print** key when **Memory** is displayed, the indicator is cleared and the display returns to the previous status of Density measurement.



Weight display

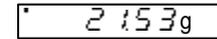


Press the **Measure** key after the display is stable.

Measure

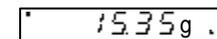


Reading weight



Saving weight

Change and replace samples in the water dish

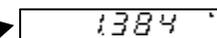


Press the **Measure** key after the display is stable.

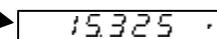
Measure



Reading data in water

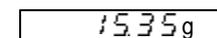


Density



Volume display

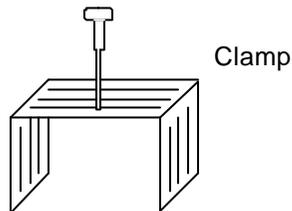
Measure



Weight display

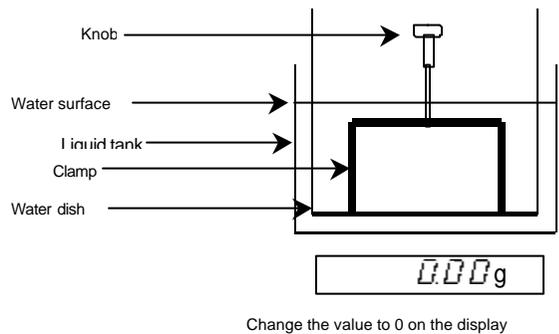
7.2 Measuring floating samples on water

Use the supplied clamp for measuring a sample that will float on water.

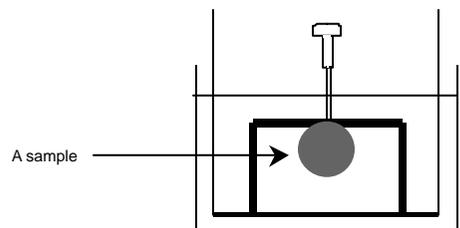


Dip the whole clamp under water in the water dish, after completing procedure in Section "7.1 Procedure for measuring Density of a solid".

Change the value to 0 on the display by pressing the **Zero/Tare** key.



Place the sample under the clamp using the tweezers. This procedure prevents the sample from floating on the water surface.



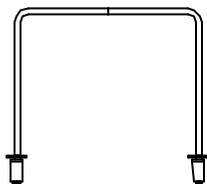
Measure the sample by following the procedure in Section "7.1 Procedure for measuring Density of a solid".

Add more weight on the clamp to stop floating if the clamp and sample together still float.

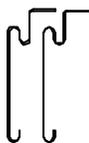
8 Measuring Density of a Liquid

Density measurement of a liquid is only available in the DME-220HE equipment. The optional parts set for Density measurement of a liquid is required for measurement.

8.1 Tools used for measuring Density of a liquid



Hanger x 1

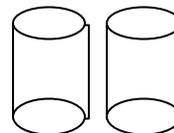


Hook hanger x 2



Glass weight x 1

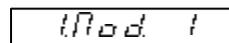
(Sample of Density measurement of a liquid)



Beaker (50cc) x 2

8.2 Procedure for measuring Density of a liquid

Set the function to the mode of Density measurement of a liquid 『Mod 1』.

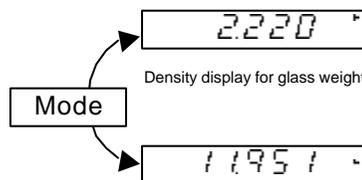


Mode of liquid Density measurement

Conduct the same operation as in procedures to in Chapter "7 Measuring Density of a solid".

Operation as in the procedures to in Chapter "7 Measuring Density of a Solid"

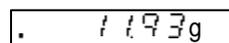
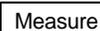
When the Density measurement of the glass weight is completed, press the **Measure** key to return to the weight display. The indicator 『Liquid』 *1 lights up.



Density display for glass weight

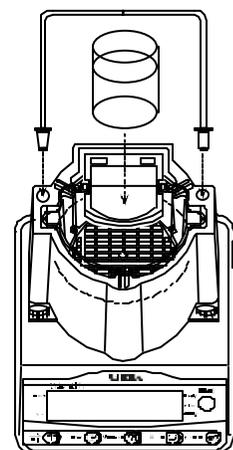
Volume display for glass weight

Remove the glass weight from the water. Remove any water attached to the glass weight.

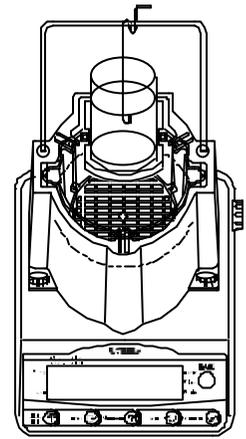


Return to weight display

Place the beaker containing the liquid to be measured on the folding measurement dish. Place the hanger in thermometer storage hole.



After placing the hanger and beaker, hang only the hook hanger as shown as in the picture on the left. Change the value to 0 on the display by pressing the **Zero/Tare** key.



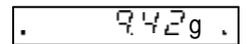
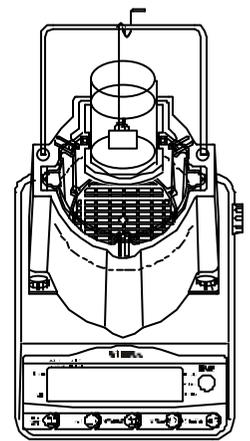
Change the value to 0 on the display

Hang the glass weight on the hook hanger and hang them from the hanger point.
Be aware that the glass weight does not contact the beaker wall.

Press the **Measure** key. The equipment reads the weight of the glass sample in liquid and shows the measured liquid Density *2.

- If there is high interference or a minus value is displayed, bring up **STOP** to interrupt measurement. In this case, retry the procedure from step 4 to perform the measurement again.

By pressing the **Measure** key again, the weight is displayed. Start with operation for the following procedure.

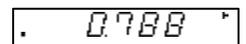


Immerse the glass weight in the liquid

Measure

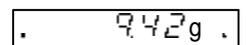


Reading weight in the liquid



Liquid Density display

Measure



- 1 Clears **LIQ** by pressing the **Print** key when weight is displayed while the indicator **LIQ** lights up. Then the display returns to the previous status of Density measurement of a solid.
- 2 By pressing **Zero/Tare** key while Density of a liquid is displayed, you can return to the weight display (procedure) just before the Density is measured. You can measure liquid Density continuously. Remove any liquid attached to the glass weight then dry and measure it.

8.3. Measuring Density of a liquid using saved glass weight data

When you measure the Density of a liquid as in procedure Section "8.2 Procedure for measuring Density of a liquid (hereinafter referred to as "Section 8.2)", the glass weight data (Density and weight) is automatically saved.

You can continuously measure the Density of a liquid using the saved glass weight data for Density of a liquid.

For the first use of the glass weight data, measure Density of a liquid once by following the procedure in Section 8.2 to save the glass weight data in the equipment.

Set to the mode of Density measurement of a liquid

by pressing $\left[\text{MODE} \right]$.

Set the following item $\left[\text{115G} \right]$ to $\left[\text{1} \right]$.

$115G \ 1$

Using sample data

$. \ 000g$

Set the liquid for measuring and change the value to 0 on the display

$. \ 9.42g$

Immerse the glass sample in the liquid

$\Rightarrow \Leftarrow$

Reading weight in a liquid

$. \ 0.788 \ ^{\circ}$

Density of a liquid display

Measure

$. \ 9.42g$

Weight display

The indicator $\left[\text{Liquid} \ \blacktriangleleft \right] *1$ is displayed in the weight display mode. This is the same procedure as in procedure in Section 8.2.

Conduct the same operation as in procedures to in Section 8.2.

You return to procedure by moving from the liquid Density display to the weight display.

Notice

- 1 If you need to measure the Density of a liquid for a consecutive number of times, thoroughly wash the liquid deposited on the glass weight, dry the weight, and then perform the next measurement.
- 2 During setting $\left[\text{115G} \ 1 \right]$, pressing the $\left[\text{Print} \right]$ key is invalid while the indicator $\left[\text{Liquid} \ \blacktriangleleft \right]$ lights up when the weight is displayed.
- 3 The saved sample data is updated after every Density measurement of a solid following the procedure in Section "8.1. The value in the previous measurement is saved".

8.4 Displaying weight in air and Density value of saved glass weight data (sample for measuring Density of a liquid)

The weight in air and Density value of a liquid sample is only shown when the indicator "Liquid" lights up.

It is advisable to confirm the weight in air and Density value before measuring the Density of a liquid for a consecutive number of times using the saved glass weight data or when a sample other than the supplied glass weight is used as a sample for measuring Density of a liquid.

If you use a specific Density of a liquid measurement sample whose weight/Density you have already measured (other than the supplied glass weight), enter the weight/Density data of this sample directly to perform consecutive Density of a liquid measurements.

1. Displaying the weight of Density of a liquid measurement sample in air

Press and hold the **Zero/Tare** key. Release the key after moving to the confirmation (Input) mode of the weight of a sample in air. The indicators **Memory**, **#**, **#** and **g** light up when confirming sample weight.

The digit on right flashes first. You can change the value. You can input the value at the flashing digit location. If you do not wish to change a value, press the **Mode** key to return to the sample Density display screen.

Input value. The operation of the input key is as follows.

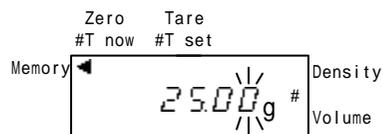
Zero/Tare key: Changes the value in the order of 0 1 2...9 0.

Mode key: moves the flashing digit to the left. It moves the flashing indicator to the extreme right digit after reaching the extreme left position.

Save the setting value after inputting or cancel it.

Measure key: saves the setting value and moves to the following item [sample Density confirmation (modification)].

Print key: does not save the setting value and moves to the following item [sample Density confirmation (modification)].



Screen for confirming the weight in air

2. Sample Density confirmation (modification)

The indicator "←" (left center on the display) and "#" light up when confirming Density of a sample.

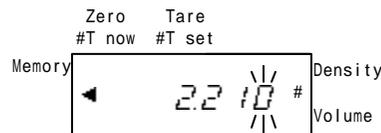
If you do not wish to change a value, press the **Mode** key to return to the weight display screen.

Conduct the operation same as in procedures to when displaying the weight of a sample in air.

Save the setting value after inputting.

Measure key: saves the setting value and returns to the weight display.

Print key: does not save the setting value and returns to the weight display.



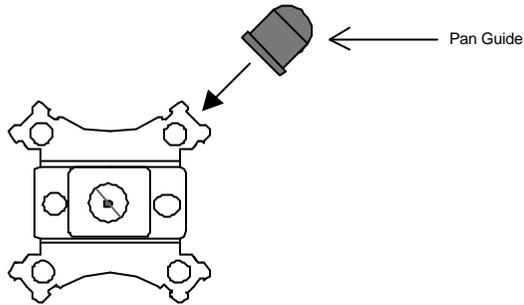
Screen for confirming the Density

9 Using the Equipment as Electronic Weight Balance

The DME series can be used not only as Density equipment but also as an electronic weight balance of 600g capacity with a 0.01g minimum display capability.

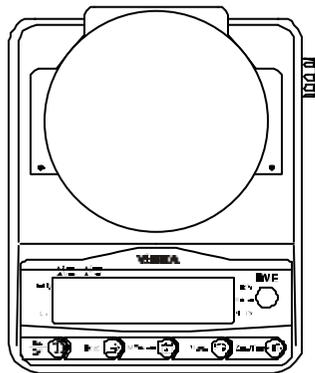
Assembling the balance

Attach the supplied Pan Guide to the 4 corners on the Pan Base.



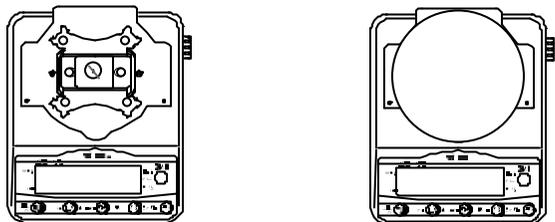
Install the Pan Base on the equipment as in procedure in Chapter "2. Assembling the Density Meter".

Assembly is complete after placing the supplied measurement dish on the Pan Base.



10 Span Adjustment

Remove the tank cover and tank. Adjust the span only on the Pan Base. (Note, however, that when this Density meter is being used as an electronic weight balance, you can adjust the span in the condition where the measurement dish is placed on the Density meter equipment.) Adjust the span by keeping the balanced level.



Adjust the span in either condition.

DME-220HE		DME-220E	
Operation	Display indication	Operation	Display indication
Press and hold the Mode key.	<i>Func</i> <i>SRCAL</i>	Press and hold the Mode key.	<i>Func</i> <i>CR L</i>
	<i>"CR 0"</i> flashing <i>CR L on</i>	Press and hold the [Switch] key. Press the Mode key while pressing the Zero/Tare key then release them at the same time.	
Turn the calibration button to the direction [Calibration] until it stops.			<i>"on 0"</i> flashing <i>on F.S</i>
	<i>"CR L on"</i> flashing	Place the weight on.	
Return the calibration button to the position [In use] . (Turn it until it stops with a "Click" sound).	<i>CR L OFF</i>		<i>"on F.S"</i> flashing
	<i>End</i>		<i>End</i>
	Weight display		Weight display

Press any key except the **On/Off** key if you want to cancel span adjustment. You return to the weight display after 『*STOP*』 appears.

Note

If there is an effect of wind or vibration during the span adjustment, the operation will not advance to the next phase after the indicator flashes in each phase. In this case, stop the span adjustment and retry the operation when the conditions are stable.

11 Output

By pressing the Print key when the Density or volume is shown, data is outputted in the fixed format. You can choose the data to output in the function setting.

Statistical calculation data of Density values of a solid and a liquid are available in the printer.

Example of printer output (CSP-16) ([\bar{C}] or [\bar{C}]] in the function setting)

(1) Outputting Density of a solid

Substance : water	Substance: except water ¹														
<table border="1" style="width: 100%;"> <tr> <td style="padding: 2px;">DENSITY_SOLID *****</td> <td style="padding: 2px;">Density of a solid No unit for Density</td> </tr> <tr> <td style="padding: 2px;">SAMPLE WEIGHT ***. ** g</td> <td style="padding: 2px;">Weight (g)</td> </tr> <tr> <td style="padding: 2px;">TEMPERATURE_NOW **.* C</td> <td style="padding: 2px;">Actual temperature ¹ Unit : (Only "C" is shown on the actual display)</td> </tr> <tr> <td style="padding: 2px;">TEMPERATURE_SET **.* C</td> <td style="padding: 2px;">The standard water temperature</td> </tr> <tr> <td style="padding: 2px;">VOLUME/cm3 *****</td> <td style="padding: 2px;">Volume (cm³) Blank</td> </tr> </table>	DENSITY_SOLID *****	Density of a solid No unit for Density	SAMPLE WEIGHT ***. ** g	Weight (g)	TEMPERATURE_NOW **.* C	Actual temperature ¹ Unit : (Only "C" is shown on the actual display)	TEMPERATURE_SET **.* C	The standard water temperature	VOLUME/cm3 *****	Volume (cm ³) Blank	<table border="1" style="width: 100%;"> <tr> <td style="padding: 2px;">DENSITY_MED.LIQ * . ***</td> <td style="padding: 2px;">Density of the substance</td> </tr> <tr> <td style="padding: 2px;"> </td> <td style="padding: 2px;"> </td> </tr> </table>	DENSITY_MED.LIQ * . ***	Density of the substance		
DENSITY_SOLID *****	Density of a solid No unit for Density														
SAMPLE WEIGHT ***. ** g	Weight (g)														
TEMPERATURE_NOW **.* C	Actual temperature ¹ Unit : (Only "C" is shown on the actual display)														
TEMPERATURE_SET **.* C	The standard water temperature														
VOLUME/cm3 *****	Volume (cm ³) Blank														
DENSITY_MED.LIQ * . ***	Density of the substance														

(2) Outputting Density of a liquid ²(Output of Density of a liquid is only available in the DME-220HE equipment)

DENSITY_LIQUID * . ***	Density of a liquid Blank
---------------------------	----------------------------------

- 1 The actual water temperature described in Section "(1) Outputting Density of a solid" in the Section "11. Examples of printer output", indicates the Density of the inputted substance when the setting substance is other than water. Printing is the same when using the measured liquid Density.
- 2 Only specific value is outputted in [\bar{C}] or [\bar{C}]. Printing with [\bar{C}] ~ [\bar{C}] is same as in the examples of printing (2) in any setting.

Note

Printer does not provide statistical calculation by printing the Density of a solid when the Density mode of a liquid is set. The examples of printing in (1) and (2) described above are by using the CSP-16 printer. It may differ if you use another printer.

- When you use CSP-16, set the printer DIP switch No. 3 to ON (print control from Density meter side) and DIP switch No. 7 to OFF (manual print OFF).
- See the operation manual supplied with each printer for detailed information about using it.

12 Troubleshooting

Symptom	Problem cause	Measurement
The equipment does not save weight after pressing the Measure key or show the Density value.	<ul style="list-style-type: none"> • Measurement started when the display shows - or 0. 	Change the value in the display to 0 and then place a sample on the equipment.
After flashing a "M" the equipment shows 『SEOP』.	<ul style="list-style-type: none"> • The unit cancels the measurement automatically after a large vibration affect. • The table surface where the unit is on is wobbly. • The measurement dish or tare or sample to be measured is in contact with something. • Measurement was started in the condition where the weight display was showing a minus value. 	<p>Make sure to confirm that 『▶ Stability』 lights up before start of the measurement.</p> <p>Move the equipment to where the affect of vibration is less. Be sure to set the display to zero and then place a sample on the equipment.</p> <p>If 『SEOP』 lights up, perform the current measurement again.</p>
Variation in measurement value is obtained in the same sample measurement.	<ul style="list-style-type: none"> • The size of the measuring sample is too small. • Bubbles were on the sample when it was immersed in water. • When placing a sample in the Water Dish, water on the tweezers or hands that is subsequently lost will change the water value amount. 	<p>Change to a larger sample and measure it again.</p> <p>Refer to the list of the required weights against Density of a sample in Chapter "4 Awareness of Items to Note during Density Measurement". (p9)</p> <p>Check there are no bubbles on the sample and start measurement again. You can avoid this by adding a few drops of surface-active agent such as washing-up liquid to the water. There is no affect to variation.</p> <p>The equipment measures the total weight of the Liquid Tank so do not allow a change in water value to happen after setting 0 on the display.</p>

Symptom	Problem cause	Measurement
The weight display indicated a reduced value after leaving it idle for long periods.	<ul style="list-style-type: none"> The weight changed to a lower value as the water in the Liquid Tank evaporated. 	Change the value to 0 on the display with the Zero/Tare key and then measure it.
Measurement takes a short time. There is no affect to the measurement value.	<ul style="list-style-type: none"> There is an affect of wind or vibration. The table surface where the unit is on is wobbly. The measurement dish or tare or sample to be measured is in contact with something. The mechanism section is damaged. 	Move the equipment to where the affect of vibration is less. Check around the measurement dish. Contact the Service Department or the shop where you purchased the equipment.
Error occurs in weight display.	<ul style="list-style-type: none"> The measurement dish or tare or sample to be measured is in contact with something. The span came off after continuous usage. The mechanism section is damaged. 	Check around the measurement dish. Adjust the span on the equipment. Contact the Service Department or the shop where you purchased the equipment.
The equipment shows 『 □ - ERR 』 before reaching the weight capacity of the equipment.	<ul style="list-style-type: none"> The weight including tare exceeded the weight capacity of the equipment. (Measurement range = container weight + article weight) The mechanism section is damage. 	Check the total weight. Change the container. Contact the Service Department or the shop where you purchased the equipment.
『 △ - ERR 』 appears.	<ul style="list-style-type: none"> The Pan Base came off. An obstacle is between the Pan Base and the equipment. 	Check around the measurement dish. Remove the pan base and check there is no obstacle between the Pan Base and the equipment.
『 ◇ - ERR 』 appears.	<ul style="list-style-type: none"> Static or noise affected. The electrical section in the equipment failed. 	Contact the Service Department or the shop where you purchased the equipment.
『 ! - ERR 』 appears (Only available in the DME-220E equipment).	<ul style="list-style-type: none"> The span was adjusted with too light a weight. 	Adjust the span using the supplied 200g weight.
『 ? - ERR 』 appears (Only available in the DME-220E equipment).	<ul style="list-style-type: none"> Wind or vibration affected the span during adjustment. 	Adjust the span again so that it is not affected by wind or vibration. Contact the Service Department or the shop where you purchased the equipment.
『 3 - ERR 』 appears (Only available in the DME-220HE equipment).	<ul style="list-style-type: none"> The span was adjusted when sample was on the measurement dish. 	Confirm there is nothing on the measurement dish and adjust the span again.
『 4 - ERR 』 appears (Only available in the DME-220HE equipment).	<ul style="list-style-type: none"> During span adjustment, it is affected by wind or vibration. The mechanism section failed. 	Adjust the span again where there is no wind or vibration. Contact the Service Department or the shop where you purchased it.

13 Specification

1 Basic specifications

	DME-220HE	DME-220E
Maximum measurement range during Density measurement	220g	
Weighing capacity as a balance	600g	
Weight minimum display	0.01g	
Weight measurement method	Tuning fork vibration	
Density measurement method	Complies with JIS Z 8807	
Density minimum value display	0.001/0.01	0.01
Volume minimum value display	0.001/0.01cm ³	0.01cm ³
Span adjustment	By integrated calibration	By an external weight
Output	Printer output (Disabled when battery is installed)	
Operating range (temperature humidity)	10 ~ 35 , less than 80%Rh	

* You can measure liquid heavier than 220g depending on the volume of water to be put in the tank.

2 Standard supplied accessories

DME-220HE	DME-220E
Operation manual	
AC adapter (AC120V DC9V/400mA, or AC230V DC9V/200mA)	
Measurement dish	
Tweezers	
Thermometer	
	200g weight for span adjustment

3 Option

DME-220HE	DME-220E
Battery (No output available in the installation)	
RS232C (No printer output available in the installation)	
Parts set for Density of a liquid measurement	