

**Aggregate Analyzer
with a Thermostat
DIK-2012
Instruction Manual**

Be sure to read this manual before using the equipment.
Keep this manual handy so that you can refer to it whenever necessary.

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Introduction

Thank you for purchasing the DIK-2012 Aggregate Analyzer with a thermostat. Please read this instruction manual thoroughly in order to use this equipment correctly and obtain full performance from it. After reading this manual, keep it handy for future reference.

Notes on This Manual

- Read and understand this manual thoroughly before using the product.
- Keep this manual handy so that you can refer to it whenever necessary.
- Observe the correct, intended usage of this product and the operation method specified in this manual.
- Observe the safety instructions described in this manual.
- The contents of this manual may change without prior notice in order to improve the performance and functions of the product.
- If this manual is lost, contact your local dealer or the store from which the product was purchased.
- This manual has been written with the utmost care, but if you find any unclear items, errors or omissions, please contact your local dealer.



Safety Precautions

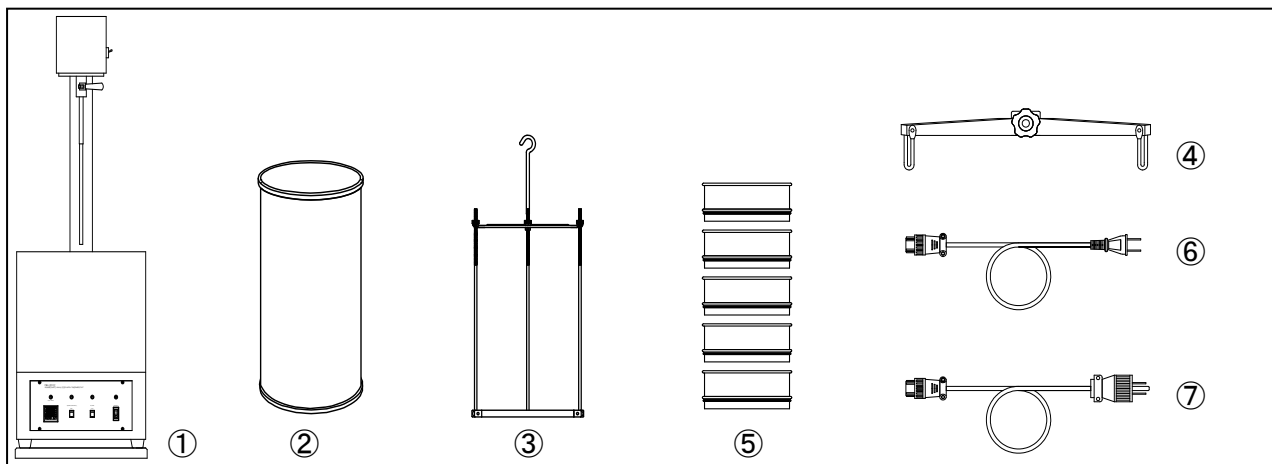
Follow the instruction below

- Before using this product, always check each component for damage or other problems. Never use the product if there is any problem.
- Be sure to insert the power plug all the way into the wall socket (100 VAC, 15 A or more). Do not connect other electric appliances to the same socket.
- Be careful not to damage the power cable by stepping on it.
- Install the product on a safe and level place. Otherwise, it could tip over.
- This product is not waterproof or drip-proof. Keep it away from water. Otherwise, the electric circuits could fail.
- Never modify this product.

Inspection on receiving

After unpacking, make sure that everything shown in the figure below is included in the package.

Construction



Model No.	Description	Qty	
DIK-2012	Aggregate Analyzer with a thermostat	1 set	
	Contents		
	Main unit (analyzing water tank stand, two power cables)	1 set	①⑥⑦
2000-05	Analyzing water tank	4	②
2000-07	Hanger	4	③
	Hanging frame	1	④
DIK-2410-11	Mesh sieve for soil, 150 mm (Dia) x 45 mm (H), 2.0-mm mesh	4	⑤
DIK-2410-12	Mesh sieve for soil, 150 mm (Dia) x 45 mm (H), 1.0-mm mesh	4	⑤
DIK-2410-13	Mesh sieve for soil, 150 mm (Dia) x 45 mm (H), 500-μm mesh	4	⑤
DIK-2410-14	Mesh sieve for soil, 150 mm (Dia) x 45 mm (H), 250-μm mesh	4	⑤
DIK-2410-15	Mesh sieve for soil, 150 mm (Dia) x 45 mm (H), 106-μm mesh	4	⑤
	Options		
DIK-2001-51	Mesh sieve for soil, 150 mm (Dia) x 45 mm (H), 8.0-mm mesh	1	
DIK-2001-52	Scale (electronic balance), weighing up to 200 g in 0.01 g units	1	

Note: The mesh size can be changed to suit the purpose of analysis. For further information on mesh sizes, please contact the marketing department.

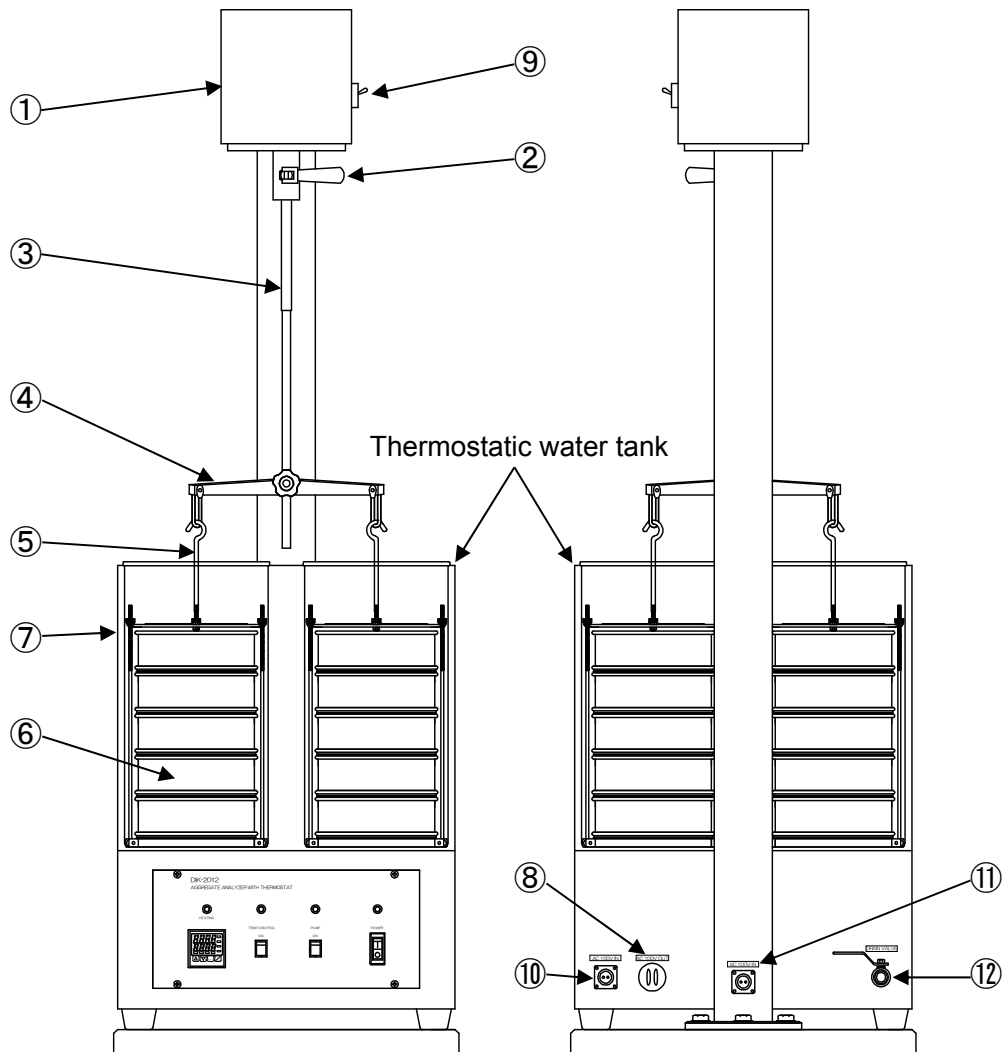
Note

In addition to the product, the following items are required for the aggregate analysis test:
 Container (beaker or the like), Evaporating dish, Wash bottle, Desiccator, Hydrogen peroxide water 6%, Solution of 0.4N sodium hexametaphosphate, Distilled water, Stirrer

Specifications

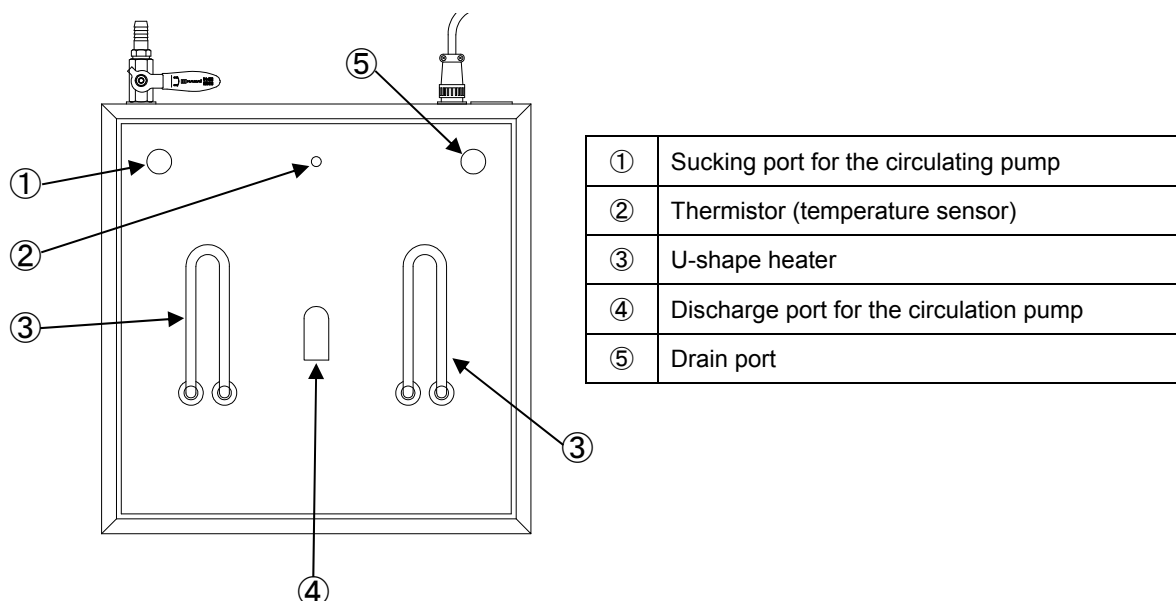
Main unit		Hanger	
Dimensions	450 (W) × 620 (D) × 1320 mm (H) (without projections)	Dimensions	170 (Dia.) × 420 mm (H) (without projections)
Weight	Approx. 80 kg	Weight	Approx. 346 g
Movement	Upward/Downward 38 mm	Hanging frame	
Movement count	Upward/Downward Approx. 30	Dimensions	Approx. 215 (W) × 215 (D) × 30 (H) mm (without a projection)
Power source	AC100 V, 11 A	Weight	Approx. 440 g
Temperature setting	Water: Max. 50°C	Analyzing water tank	
Heater	Two 500-W heaters	Dimensions	185 mm (I.D.) × 360 mm (H)
Tank dimensions	435 (W) × 435 (D) 360 mm (H)	Weight	Approx. 2 kg
Tank material	Stainless steel	Material	Stainless steel
Motor	100 V, 15 W	Mesh sieve for soil	
Accessories - Analyzing water tank stand - Two power cables		Dimensions	150 mm (I.D.) × 45 mm (H)
		Material	Stainless steel
		Mesh	2.0 mm, 1.0 mm, 500 μm, 250 μm, 106 μm

Names of components

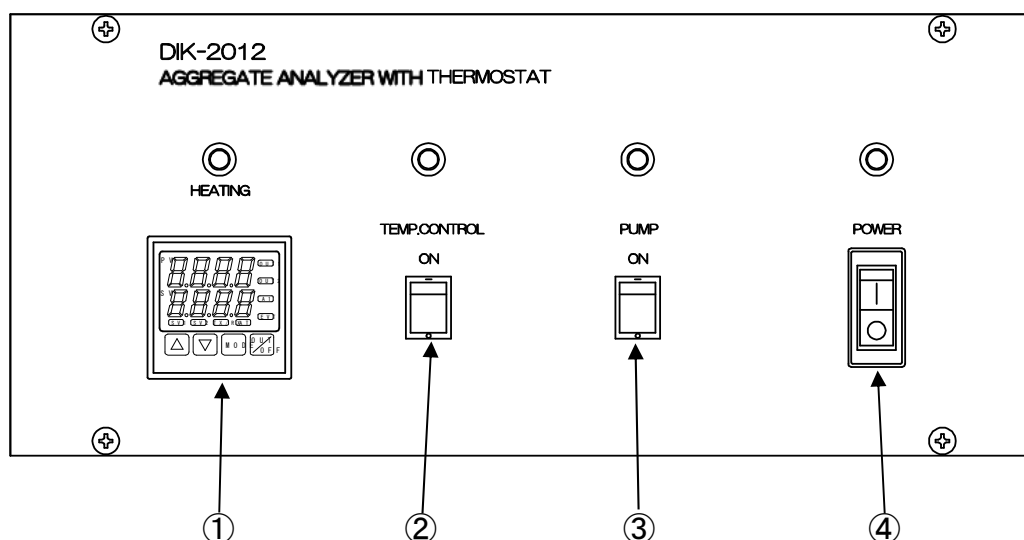


①	Main unit cover Protects the motor and the controlling unit.	⑦	Analyzing water tank Used to perform wet-sieving
②	Slide bar locking handle Used to lock or unlock the slide bar. Lock the slide bar during transportation or while setting the analyzing water tank.	⑧	Connector for output power For 100 VAC output power.
③	Slide bar Holds the hanging frame	⑨	Power switch Used to start or stop sieving.
④	Hanging frame Holds the hanger	⑩	Connector for input power (No. 1) For externally supplied 100 VAC input power.
⑤	Hanger Holds the mesh sieve for soil.	⑪	Connector for input power (No. 2) Used to connect to the output power connector.
⑥	Mesh sieve for soil Five-stage mesh sieve for sieving soil	⑫	Drain valve Drains water from the thermostatic water tank.

Inside the thermostatic water tank (top view)



Controlling unit



①	Temperature regulator Sets the temperature of the water in the thermostatic water tank to 50°C or less.	③	Pump power switch Turns on the pump used to circulate the water in the thermostatic water tank.
②	Temperature regulator switch Turns on or off the temperature regulator.	④	Main power switch Turns on or off the unit.

Note: Turning on each switch causes the corresponding light above each switch to light up.

Chapter 1: Sample preparation

Note

This manual describes operation using the set of five sieves (2.0 mm, 1.0 mm, 500 μm , 250 μm , 106 μm). If a different number of sieves is used, the test should be performed after adjusting the sample amount accordingly.

Aggregate analysis test

When single soil particles coalesce, they form an aggregate. These single particles are also known as primary particles and the grouped particles as secondary particles. Binding materials such as colloidal organic matter, clay, activated iron, alumina, silicon and manganese play an important part in this aggregation process. When an air-dried aggregate is immersed in water, the binding force within the aggregate is lost and the aggregate breaks into fragments (slaking) due to the pore air pressure. The broken aggregate then breaks down further into smaller aggregates.

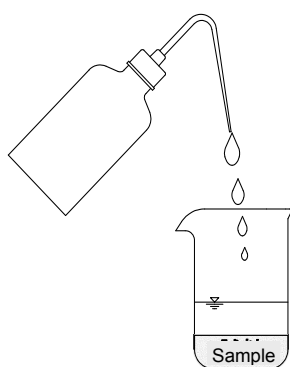
Despite this repeated breakage, some groups of aggregates are not broken down further and become stable against water; these are called "water-stable aggregate".

Each aggregate has an influence on the stability of the soil structure and void size or shape, as well as the water retention, permeability and ventilation of soil. If soil is composed of well-developed aggregate, it is called "aggregate structure soil". This type of soil creates favorable conditions for vegetation, and its appropriate permeability helps prevent erosion by decreasing surface runoff. Also, the stability of the aggregate structure suppresses settlement of an embankment.

Aggregate analysis refers to analyzing the particle sizes of water-stable aggregate. The test involves comparing the soil particle sizes of wet-sieved aggregate and broken single particles, both of which come from the same soil sample.

* What is "slaking"?

When water rapidly infiltrates an air-dried soil sample, air in the aggregate is compressed as the water is drawn into the soil by capillary force. This air bursts out when the aggregate is weakened by hydration, causing destruction of the aggregate. This is called slaking.

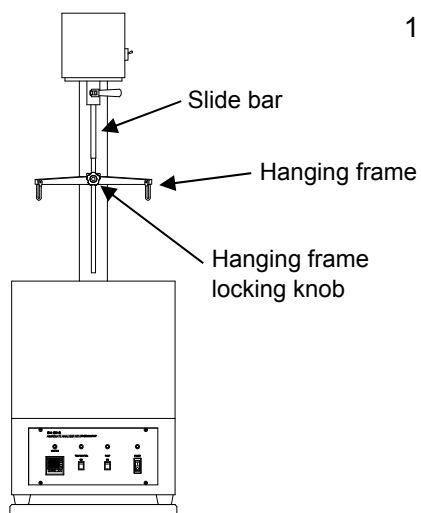


1. Collect samples while taking care not to destroy their natural structure, and then air-dry them in the shade.
2. When the soil moisture content becomes lower than the plastic limit*, break the sample by hand, pass it through the 8.0-mm sieve, then air-dry it.
3. From all air-dried samples, select a typical one and pass it through the 8.0-mm sieve.
4. Obtain approximately 50 grams of sample passed through the 8.0-mm sieve.
5. Determine the water content by using approximately 10 to 15 grams of sample.
6. Weigh the mass of the rest of the sample.
7. Place the sample in a container such as a beaker, pour distilled water until the sample is completely submerged, and then wait for 20 hours.

* What is the plastic limit?

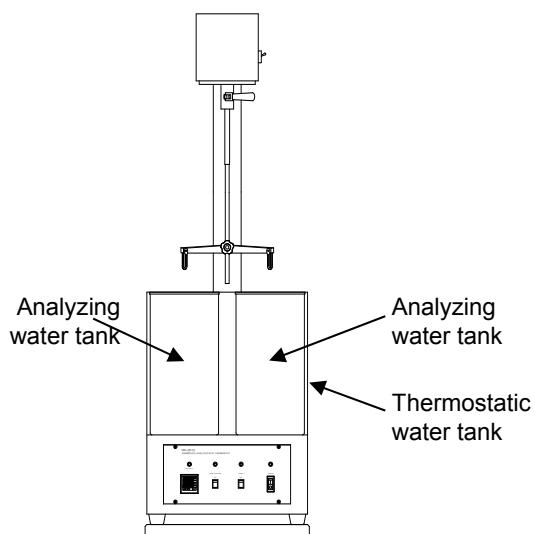
This is the water content indicating the limit between a plastic body and the semi-solid state of the soil. The Japanese Industrial Standards define the plastic limit as "the water content of soil where the soil just starts to break up when it has been rolled back and forth to form a string of 3 mm diameter".

Chapter 2: Assembly

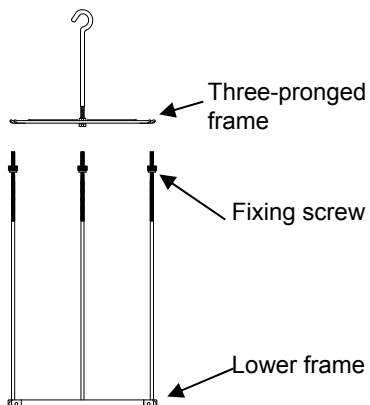


1. Pass the slide bar through the hanging frame and lock it with the hanging frame locking knob.

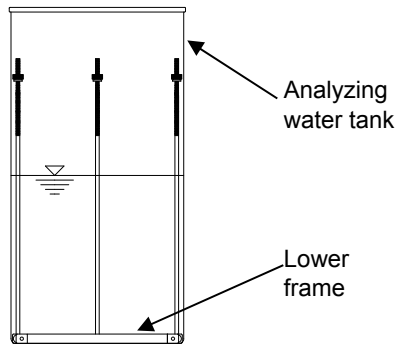
Note: Lock the knob as high on the slide bar as possible.



2. Place the analyzing water tank stand in the thermostatic water tank and place the analyzing water tank filled half full of water on top of the stand.

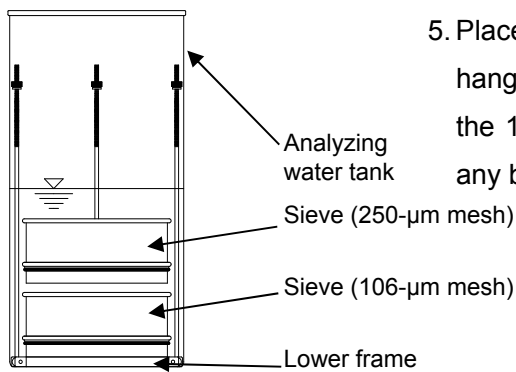


3. Loosen the fixing screw in the upper part of the hanger to remove the three-pronged frame.



4. Submerge the lower part of the hanger without the three-pronged frame.

Cross sectional view (inside the analyzing water tank)

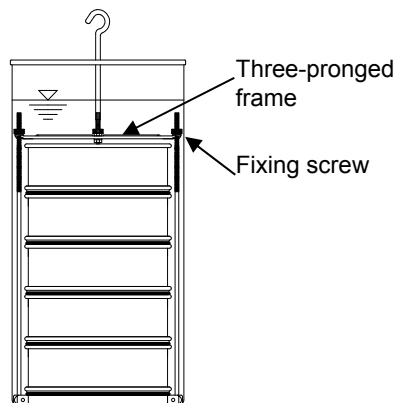


5. Place the 106-μm sieve on the lower frame of the hanger and then place the 2.0-mm sieve on top of the 106-μm sieve, while taking care not to leave any bubbles.

Cross sectional view (inside the analyzing water tank)

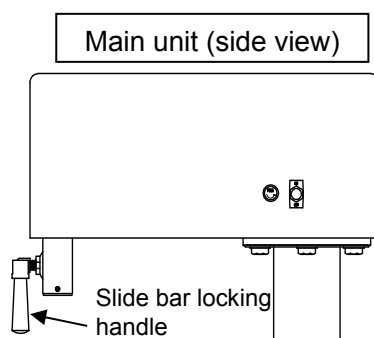
Notes:

- If any bubbles remain under the sieve, sieving may be affected. If the water becomes too low during sieve assembly, add water to the analyzing water tank.
- When placing the sieves, lay the smallest mesh size sieve at the bottom and the larger ones on top.

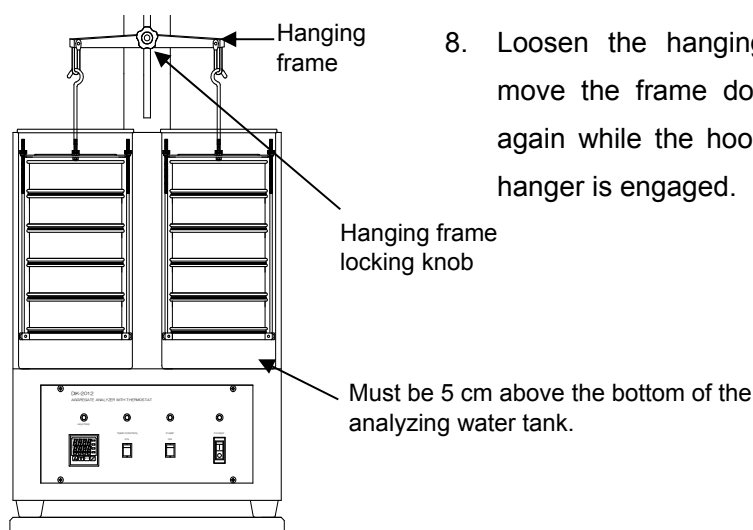


6. Attach the three-pronged frame with the fixing screw in the upper part of the hanger to lock the sieve. Assemble as many sets of sieves as necessary in a similar way.

Cross sectional view (inside the analyzing water tank)

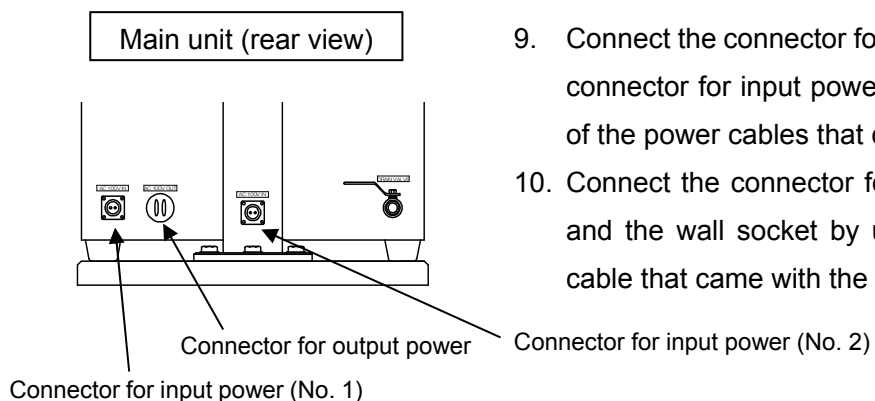


7. Turn the slide bar locking handle on the main unit cover counterclockwise to loosen it.

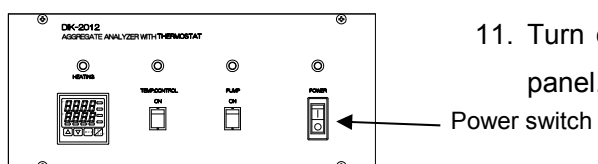


8. Loosen the hanging frame locking knob to move the frame downward, and then lock it again while the hook in the upper part of the hanger is engaged.

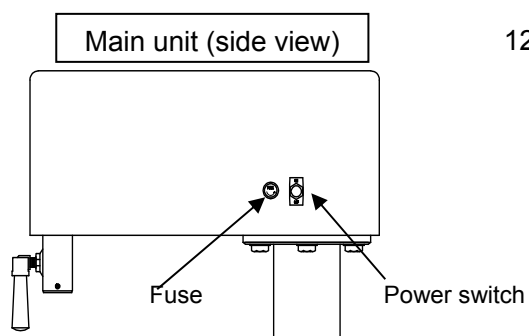
Note: Allowing for the upward and downward moving range of the sieves (38 cm), secure the frame so that the hanger is 5 cm above the bottom of the analyzing water tank.



9. Connect the connector for output power and the connector for input power (No. 2) by using one of the power cables that came with the product.
10. Connect the connector for input power (No. 1) and the wall socket by using the other power cable that came with the product.



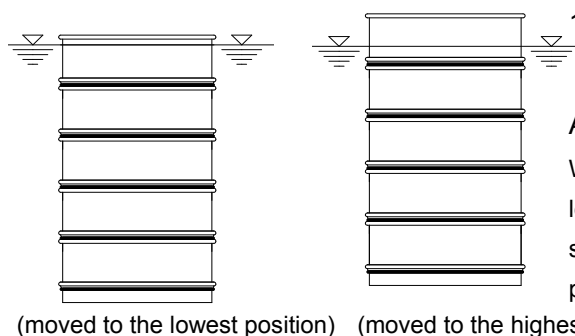
11. Turn on the main power switch on the control panel.



12. Turn on the power switch on the main unit cover and adjust the position of the analyzing water tank by moving the sieves up or down so that the sieves are not contacting the tank.

Note

Always loosen the slide bar locking handle before turning on the power switch. Otherwise, the motor shaft inside the main unit cover may be damaged.

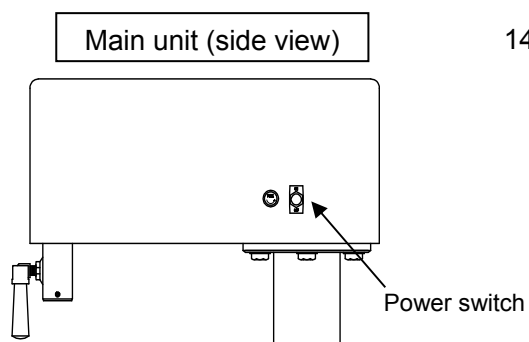


13. Adjust the water level in the analyzing water tank.

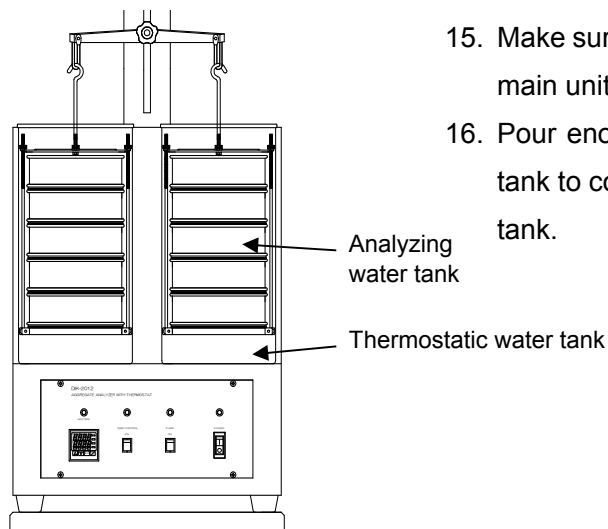
About the water level:

When the sieves are moved to the lowest position, the water level must be 5 mm lower than the top surface of the highest stage sieve. When the sieves are moved to the highest position, the sample must not protrude from the water.

(moved to the lowest position) (moved to the highest position)

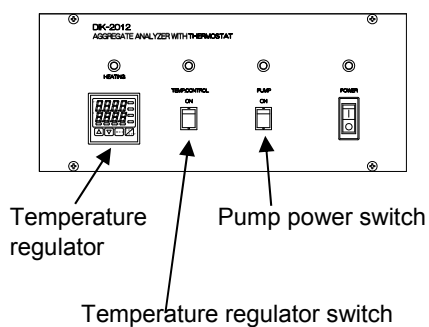


14. Turn off the power switch on the main unit cover.



15. Make sure that the drain valve on the rear of the main unit is closed.

16. Pour enough water into the thermostatic water tank to completely immerse the analyzing water tank.

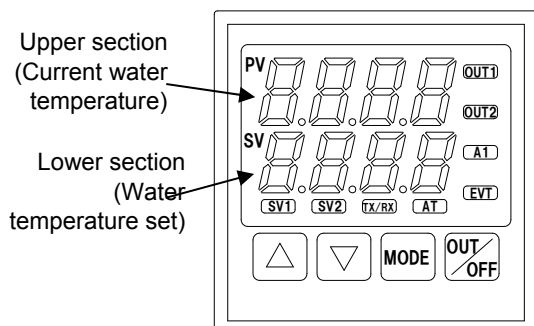


17. Turn on the pump switch on the control panel to circulate water inside the thermostatic water tank.

18. Turn on the temperature regulator switch to display the temperature regulator.

19. Set the temperature as described below and prepare for testing.

Setting the temperatures to the temperature regulator

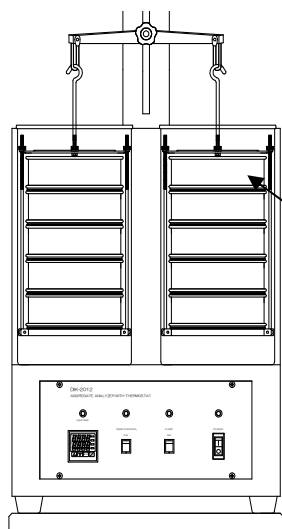


1. Press the MODE key to enter the setting mode.
2. Use the upper or lower arrow key to set the desired temperature.
3. Press the MODE key to fix the temperature setting.

Note

Never operate the temperature regulator if there is no water in the thermostatic water tank.

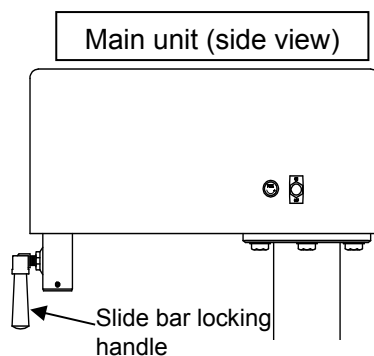
Chapter 3: Test



1. Carefully place the prepared sample, together with the distilled water in the container (beaker), onto the highest sieve and thinly spread out the sample.

Load it on top of the highest sieve.

Note: For preparing the sample, refer to "Chapter 1: Sample preparation".



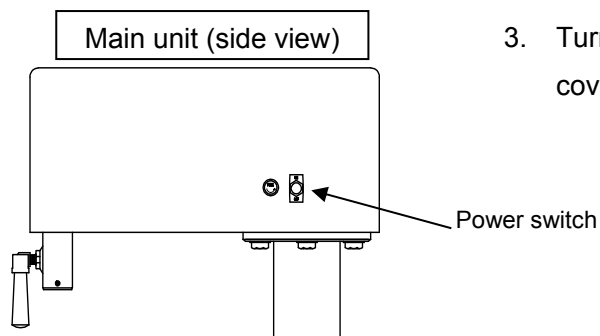
2. Turn the slide bar locking handle on the main unit cover counterclockwise to loosen it.

Note

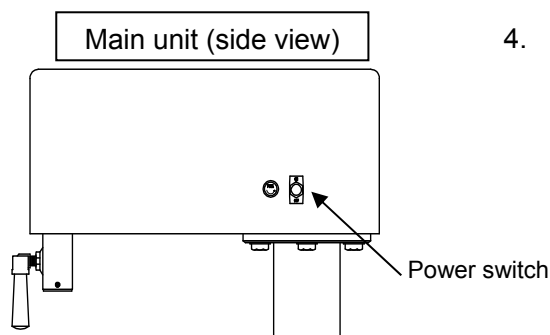
Always loosen the slide bar locking handle before turning on the power switch. Otherwise, the motor shaft inside the main unit cover may be damaged.

Note

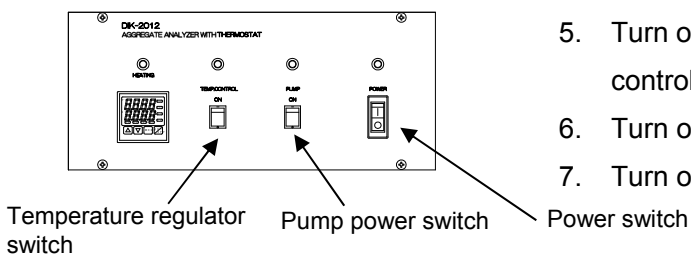
Please suspend the machine at more than 10 minutes interval after using it during 30 to 40 minutes continuously, in order to protect the motor from breakdown of overheating.



3. Turn on the power switch on the main unit cover and perform sieving for 30 to 40 minutes.



4. After approximately 30 or 40 minutes, turn off the power switch on the main unit cover to end sieving.



5. Turn off the temperature regulator switch on the control panel.
6. Turn off the pump power switch.
7. Turn off the main power switch.

8. Carefully collect any sample left on each sieve by spraying water with a wash bottle and place it in the evaporating dish.
9. The sample collected in the evaporating dish should be oven-dried at 110°C until it reaches a constant dry mass.
10. Place the sample in the desiccator and decrease the temperature to room temperature.
11. Weigh the mass of the sample in each evaporating dish.

12. To remove organic matter, combine samples on the five evaporating dishes into a container (beaker) and gently pour in approximately 50 ml of 6% hydrogen peroxide water.
13. In addition, as a dispersing agent, pour in 20 ml of 0.4N sodium hexametaphosphate.
14. Add approximately 400 ml of distilled water and allow the sample to disperse by stirring it in the stirrer at a high speed.
15. To continue testing, follow "Chapter 2: Assembly" and "Chapter 3: Test".

For further details on the test results, refer to pages 77 to 82 in "Practice of Soil Testing" by the Japanese Geotechnical Society.

Warranty Period

Our warranty is valid for one year from the delivery date, which is stamped on the shipment check list enclosed in the package of the product. However, we will not warrant the mesh sieve for soil or other consumable parts unless the user finds the defective parts upon opening the package. Be sure to read the Product Warranty contained at the end of this manual.

Our Contacts

Daiki Rika Kogyo Co., Ltd.

	Marketing Division, Head Office	West Japan Branch
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Telephone number	048-568-2500	077-510-8550
Facsimile number	048-568-2505	077-510-8555

Warranty Rules

If the user assembles and operates a product of Daiki Rika Kogyo Co., Ltd. ("Daiki") following the instructions given in the Instruction Manual enclosed in the product package but cannot make it operate properly, Daiki will repair the defective product free of charge or will replace it with an equivalent product free of charge provided that the user notifies Daiki within one year from the date of shipment, which is stamped on the shipment check list enclosed in the package of the product. Even for products and parts defined as Non Warranty items in the Instruction Manual, we will repair them free of charge or replace them with equivalent products/parts free of charge if the user finds any them to be defective while it is a new product or part. "Defective new product/part" herein means a product or part which the user finds is clearly defective or does not work when tried for the first time upon opening the package. The user can receive repair or replacement of the defective product or part only if the user notifies Daiki within one month from the date of shipment, which is the date stamped on the shipment check list enclosed in the package of the product. Daiki will not repair or replace defective new products/parts after one month has passed. Furthermore, the warranty offered by Daiki does not apply to products or parts which the user has purchased secondhand or purchased from an individual.

Daiki hereby makes no warranties that Daiki's product in the hands of the user is free from defects in workmanship or that there are no defective lots attributable to defective parts.

Scope of Warranty

- Daiki will repair the defective product or products/parts according to the rules set forth above. (Daiki may replace the defective product or product/part with their equivalents if the company finds a product or part to be beyond repair.)
- Daiki makes no warranties other than those set forth in the Warranty Rules above, regardless of the reasons for the claims made by the user.
- Regardless of the types of legal claims, the warranties offered by Daiki are limited to those that are set forth in the Warranty Rules presented above. That is, in no event will Daiki take any responsibility for any other damages which the user may suffer due to the use or improper operation of the product, including, but not limited to, loss of corporate profit, business interruption, or other monetary losses.
- Daiki takes no responsibility for a negative impact on other devices connected to the product or other equipment which may be affected by the use of the product.

No Warranty

Even within the Warranty Period, the user is required to pay for repair or replacement in any of the following events:

- The products/parts are defined in the Instruction Manual as "not applicable to warranty" or as consumable items.

- The user cannot present to Daiki the shipment check list that was enclosed in the product package.
- The shipment check list, which was enclosed in the product package, does not bear the stamp of shipment date, and the user cannot provide other evidence of the date of purchase.
- The user has modified any of the entries in the shipment check list without the approval of Daiki.
- Breakdown/damage was caused by improper handling of the product by the user, including, but not limited to, dropping the product or giving a shock to it when the user transported or moved it.
- Breakdown was caused by using the product other than as instructed in the Instruction Manual, incorrect assembling of parts, mistake, remodeling, improper installation, or breakdown attributable to connection parts such as a power supply outlet or CPU, or the product is damaged by any other external factor. Daiki will also request payment by the user for repair and replacement of peeled-off or damaged model number seals pasted on parts.
- Breakdown or damage was caused by a fire, environmental pollution, excessive voltage, earthquake, lightning, strong wind, flood, or other natural disasters.
- The product is used overseas. (Requests for repair from overseas cannot be accepted.)