

Operating Instructions

METTLER TOLEDO SOP50 Sample Operation Programmer, 5 steps

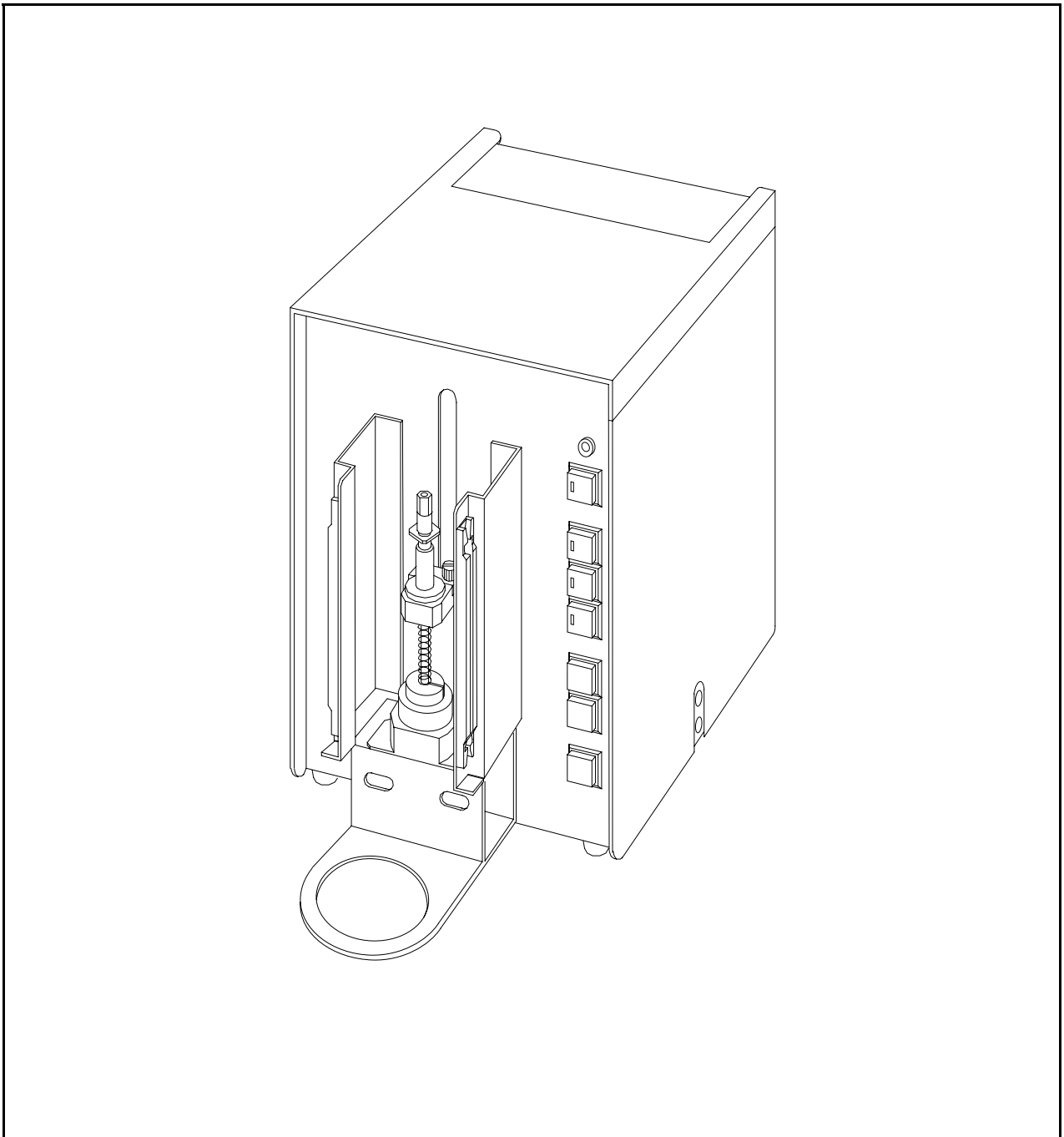



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1.General

1-1.Introduction

Thank you for purchasing this METTLER TOLEDO SOP50 Sample Operation Programmer. This device, when connected to a METTLER TOLEDO High Precision Density Meter DE40/DE50/DE51 with an automatic sampling unit (ASU-DE), can perform programmable sequences including sampling, draining, rinsing and drying. The SOP50 Sample Operation Programmer is designed for automated continuous measurements with assured precision.

Features of the instrument:

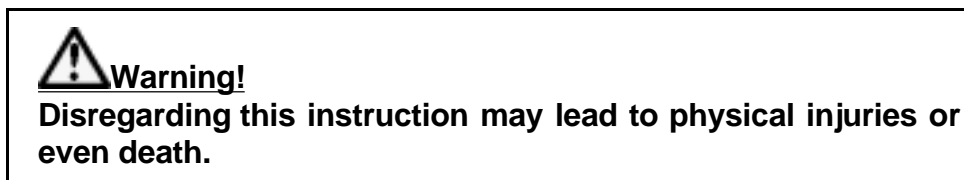
- When the desired sequence has been programmed in a method on the DE40/DE50/DE51, place the beaker filled with sample liquid on the beaker tray and press the [Meas.] key on the density meter. Sampling, draining, rinsing and drying will be performed automatically.
- The measuring cell of density meter can be automatically calibrated by placing the calibration liquid on the beaker tray and pressing the [Calib.] key.
- The [Rinse/Purge] key on the density meter prepares the measuring cell for sampling.
- Two different solvents can be used to clean the measuring cell.
- Cleaning of the measurement cell is very effective because it includes intermittent pulses of air with the solvent during the rinse cycle.

1-2.How to use this manual

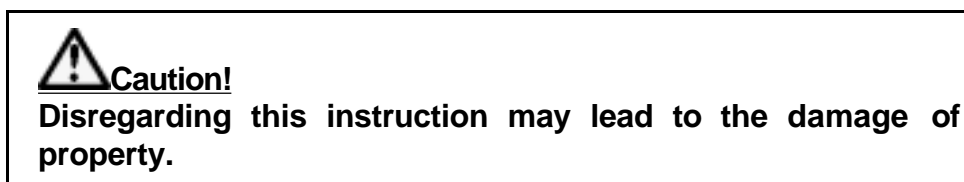
Keep this operation manual at hand when you use the equipment.

The following signs are the most important symbols and rules.

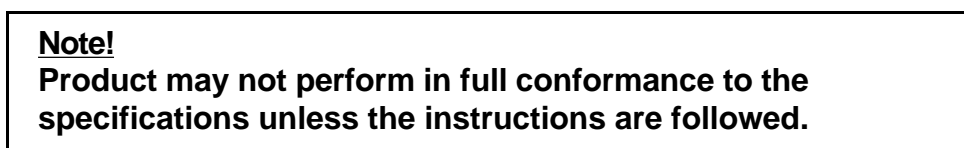
1. Danger leading to physical injuries or even death:



2. Danger leading to the damage of property:



3. Failure of performance:









- It is prohibited to copy part or all of this manual without authorization by copyright.
- Should you find any missing or unclear expressions in this manual, please contact your local dealers or our sales representative.
- We will not be liable for any losses or damages caused by the use of the instruments, either directly or indirectly.
- This manual is for the standard model. With respect to models with special specifications, please see the individual manuals.



1-3. Safety symbols



Always observe these signs and instructions.

You must observe cautionary messages and warnings in order to protect yourself as well as to prevent physical injury or property damage.

 Warning This symbol means "Danger of severe injury or possible death".	 This symbol means prohibition of an act.
 Caution This symbol means "Danger of injury or property damage".	 This symbol means mandatory.

 Warning
Do not use volatile chemicals or work with flammable gas.  Danger of explosion inside the instrument.

 Warning
Wear safety glasses, gloves or protective mask if necessary, and make sure the room is well ventilated.  Danger of injury to skin or eyes by splashing chemicals. Do not inhale toxic gas, danger of damage to respiratory system.

 Caution
Operate only as specified in the manual!  Danger of fire, electric shock or damage to the instrument.



Caution

Do not open housing case or overhaul the unit for repair except by an authorized service person.



Danger of fire, shock or malfunctioning of the unit.



Caution

Installation features

Avoid the following conditions, which may cause poor performance and reduce reliability of the system:

- Near or under vibration
- In direct sunlight
- In the atmosphere of corrosive gas
- Power source with fluctuating load or near a strong magnetic field
- Any ambient condition exceeding 5 to 35°C.
- High humidity (85% RH or more)

Power source

- * The power is supplied when connected to DE40, DE50 or DE51.
See the manual of your density meter for its power specification.

Storage

- * If the instrument is not to be used for a long time, clean and dry the measuring cell and place the instrument in the original box.
- * Do not store at extremely high/low temperature, high humidity or in a heavily dusty atmosphere.

Handling the unit

- * If a tube line should become derailed or clogged, press the [MANUAL] key of the SOP50 and check the trouble after the MANUAL lamp is lit.


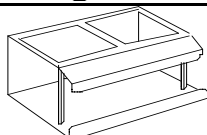

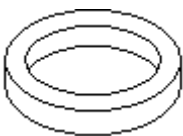





2.Preparatory steps

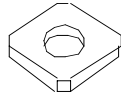

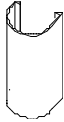


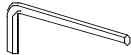
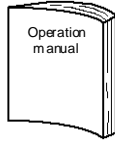

2-1.Check of supplied parts

In the packing box there is a SOP50 (main unit), supplied parts, manuals, and other items. Please check these items using the following parts list. There are also some optional items in the packing box. If there are any defective or missing parts, please contact your local dealer or a sales representative.

2-1-1.SOP50 and supplied parts




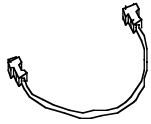
The following parts are supplied with the SOP50.

Part Name	Part Code	Qty	Sketch
Main unit	SOP50	1 unit	
Holder for rinse bottle		1 pc.	
Rinse bottle (1L)	51328127	2 pcs.	
Beaker adapter (47mm)		1 pc.	
Beaker adapter (37mm)		1 pc.	
Beaker adapter (30mm)		1 pc.	
Beaker tray		1 pc.	
Seal	51322203 (set of 5)	1 pc.	
Nozzle packing	51328131 (set of 10)	6 pcs.	

Part Name	Part Code	Qty	Sketch
Nozzle joint stopper		1 pc.	
Tube for drain/rinse: - tube for rinsing fluid - tube connector (set)	51328136 51322263	2 pcs.	
Cover		1 pc.	
Filter	51328137	2 pcs.	
Tube joint B	51322239	2 pcs.	
Hexagonal wrench		1 pc.	
Operation manual (English)		1 copy	
Warranty		1 copy	

2-1-2.Connection kit

The connection kit (51322055) is necessary in order to connect the SOP50 to your density meter. The kit consists of the following parts:

Part Name	Part Code	Qty	Sketch
Tube for control valve	51322005	1 pc.	
Connection tube A for Density/ Refractometer/ Sample Changer / SOP50	51322236	1 pc.	
Connection tube B for Density meter	51322233	1 pc.	
Connecting cable	51322048	1 pc.	

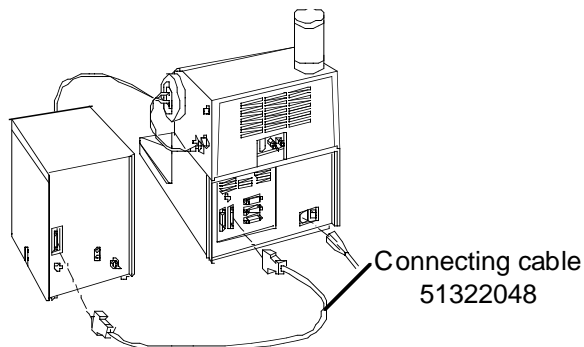
2-2. Installation and preparation

2-2-1. Checking the operating voltage

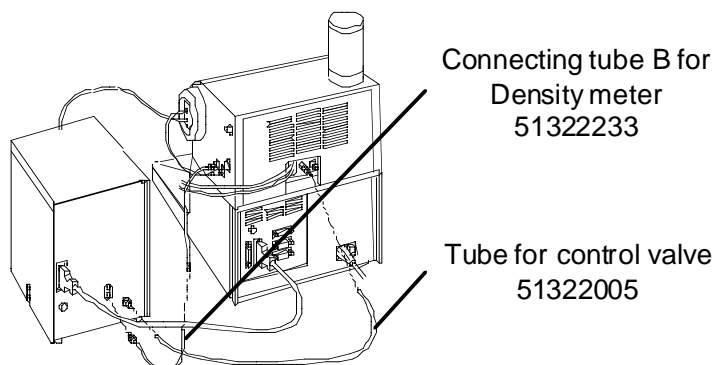
The power of this unit is supplied when a density meter DE40, DE50 or DE51 is connected. Refer to the operating manual of your density meter for power supply.

2-2-2. Connection to Density meter and of tube lines

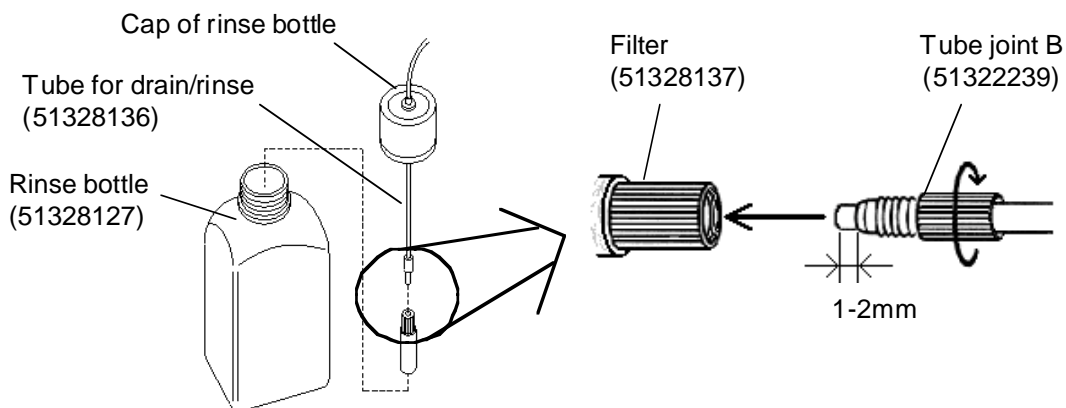
- (1) **Make sure that the power switch of the density meter is OFF.**
- (2) Connect SOP50 to Density meter by the connecting cable (51322048), and fix its connection securely by the screws.



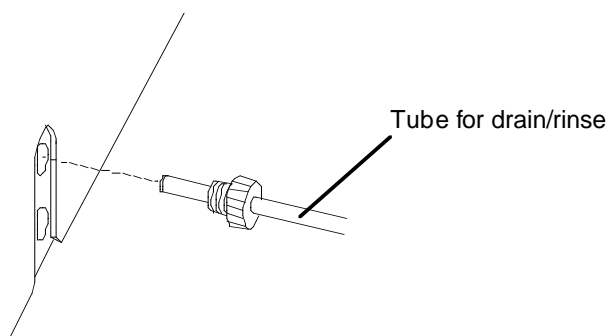
- (3) Attach connection tube B (51322233) for Density meter to the air inlet, and connect it to the drying tube of the Density meter.
- (4) Connect the air intake of the Density meter and SOP50 by means of the tube for control valve (51322005).



- (5) Insert the Tube for drain/rinse (51328136) through the cap of the rinse bottle, and squeeze it into Tube joint B (51322239) with its tip extended 1-2mm as shown. Then, attach Filter (51328137) to the joint.



- (6) Place the tube connectors (51322236) on the male tube for rinse/drain and connect them to the solvent inlets of SOP50.



- (7) Fill the rinse bottles with Rinse 1 and Rinse 2 solvent, respectively, and place them in the holder.

Note!

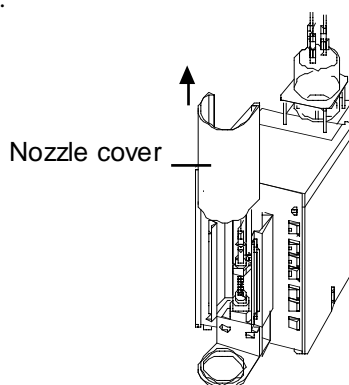
For Rinse 1 use a solvent (or water) to remove the sample liquid. For Rinse 2 use a volatile solvent such as ethanol or acetone to dry the cell. Select appropriate solutions depending on the sample.



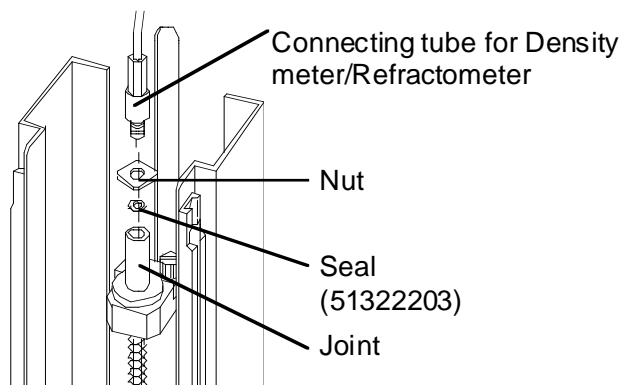
Caution!

Sample liquid, solvent 1 and 2 will be mixed together within the system and waste bottle. Avoid any solutions that may generate chemical reactions.

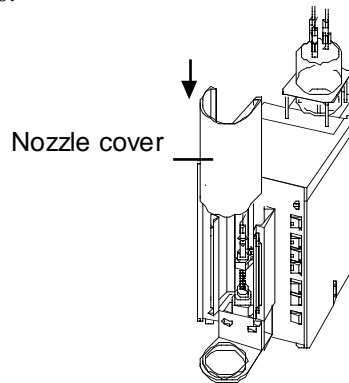
- (8) Detach the nozzle cover of SOP50.



- (9) Place the seal (51322203) inside the nozzle unit and attach the nut to the density/refractometer tube (51322236), connect the joint and rotate the nut clockwise to fix the tube.

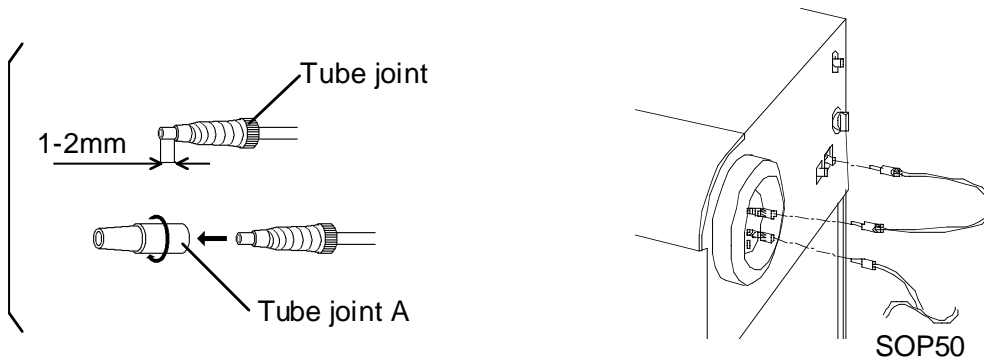


(10) Install the nozzle cover to SOP50.



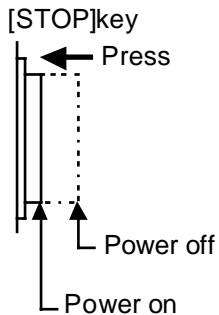
Caution!
The nozzle cover must be installed in order to avoid danger from the moving nozzle.

(11) Attach the supplied tube joint and joint A to the other end of tube (51322236) already connected to the SOP50, and connect it to sample inlet of density meter. Attach the sample outlet tube as shown.



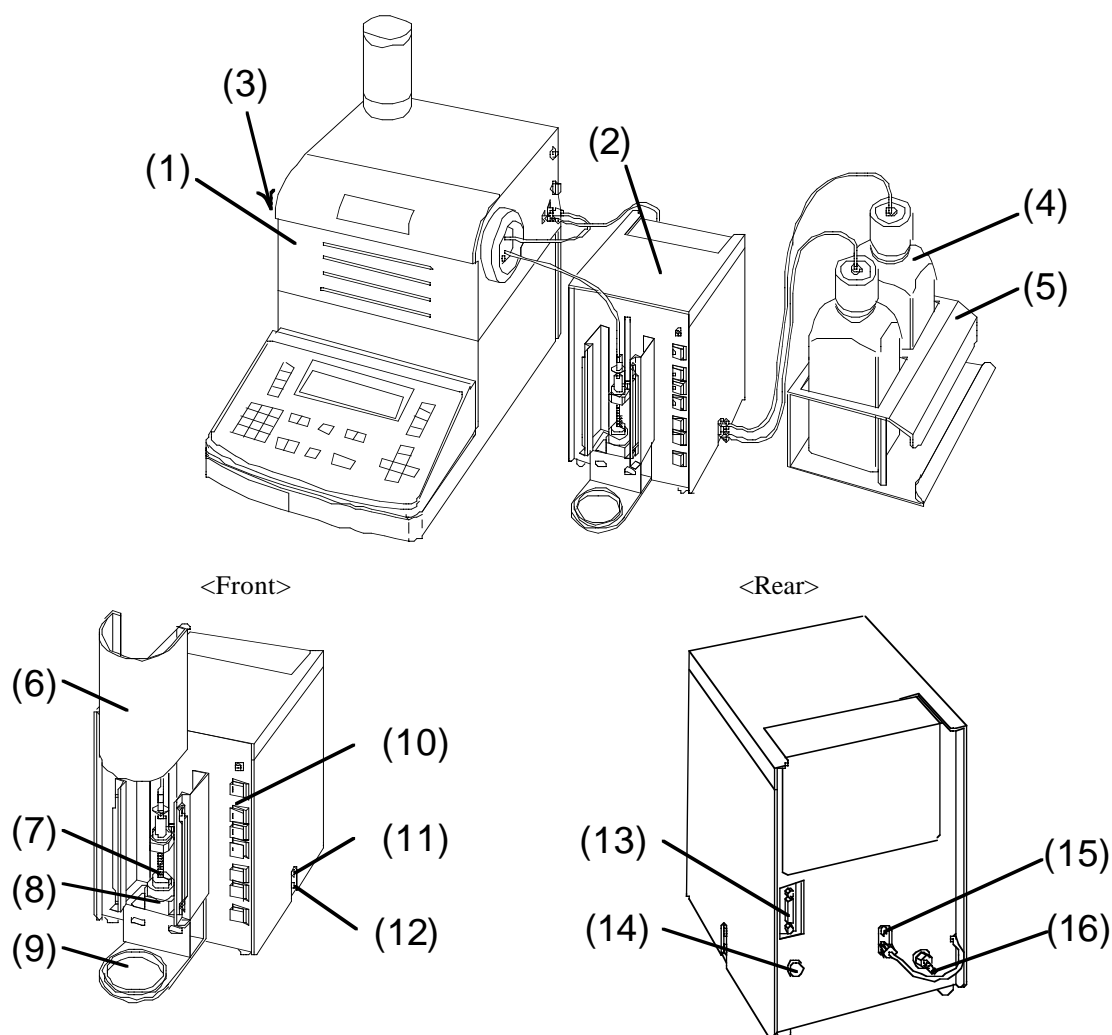
Note!
Screw the tube securely into the tube joint with its tip extended about 2mm, and then screw it into tube joint A. If not securely screwed in, the tube may pull out and cause sample liquid or solvent to leak out.

(12) The [STOP] key on the SOP50 is the on/off button and must be pressed to turn on the power.



(13) When the power of the Density meter is turned on, the POWER LED of SOP50 will light up and its power turned on.

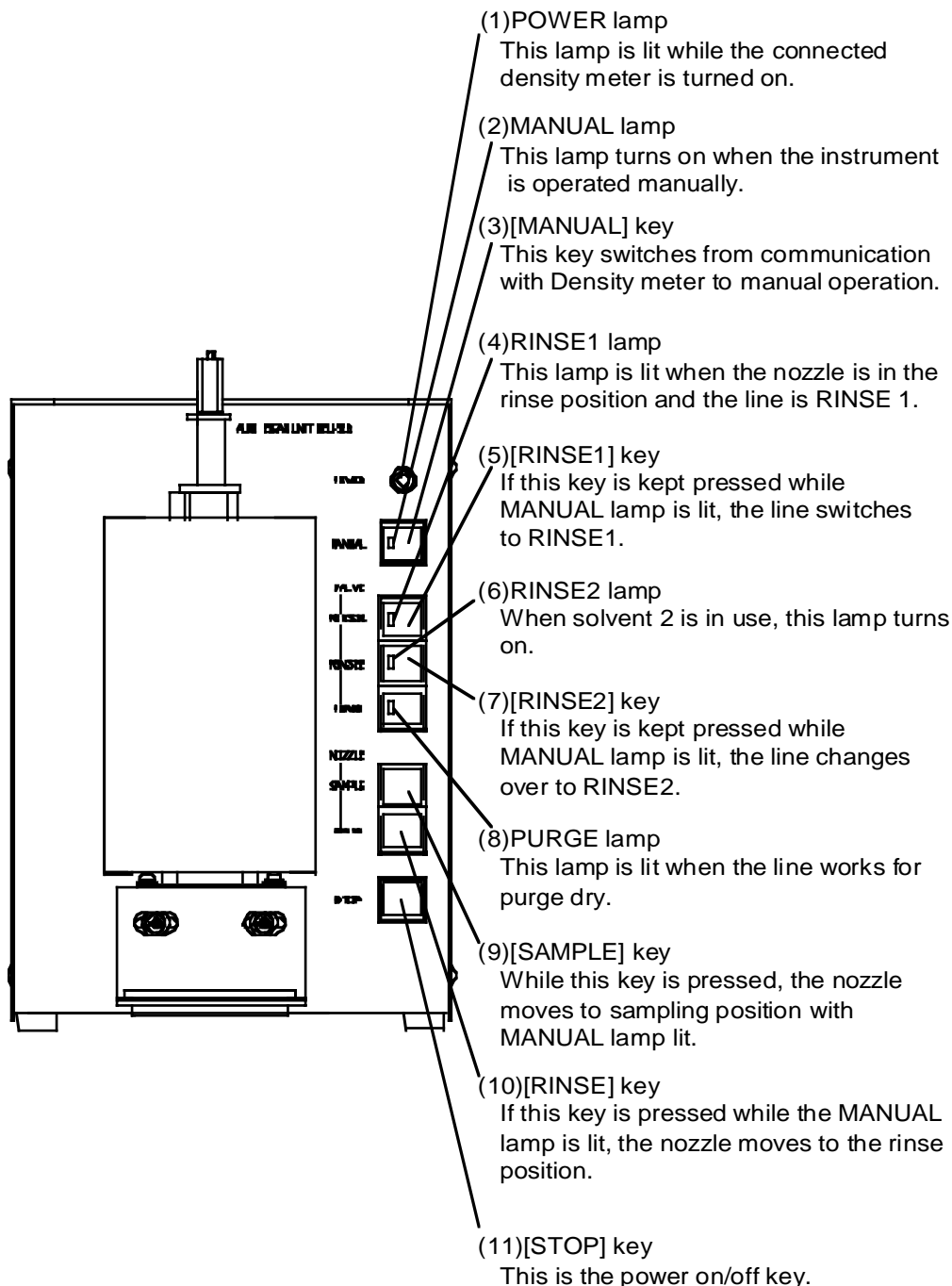
2-3.Parts names and functions



- (1) Density meter
- (2) SOP50
- (3) Waste bottle
- (4) Rinse bottle
Solvent for rinse is filled in here.
- (5) Holder for rinse bottle
Bottle holding rack for rinse solvent
- (6) Cover
The nozzle dispenses sample liquid or sucks rinse solvent or dry air.
- (7) Nozzle unit
Sampling tube is connected here for drain, rinse1, rinse 2 and purge dry.
- (8) Rinsing pot
This bath rinses the nozzle.
- (9) Beaker tray
Beaker with sample is placed on this tray. Beaker adapter can accommodate a smaller beaker.
- (10) Operating panel
This panel provides the keys for manual operation and LED indicators to show the mode of the instrument.
- (11) Rinse solvent inlet (for solvent 2)
Solvent 2 is introduced here by connecting the tube for drain/rinse.
- (12) Rinse solvent inlet (for solvent 1)
Solvent 1 is introduced here by connecting the tube for drain/rinse.

- (13) I/O connector port
The SOP50 and Density meter is connected by the connecting cable (51322048).
- (14) Connecting receptacle
An external pump can be connected here.
- (15) Dry air intake
Connect the tube B with its other end connected to the desiccant tube.
- (16) Air inlet
Connect the tube for control valve to Density meter to adjust sampling/drain switching valve automatically.

<Operating Panel>



3.Basic operation

3-1.Setting up the density meter

The sequence of draining, rinsing or drying the SOP50 is commanded by a signal from Density meter. Those parameters must be set up on Density meter in advance.

3-1-1.How to use the SOP50(Changer setup)

(1) Press [Func.] key.

```
          < Function >
0. Data File      5. Set Check
1. Sample File   6. Periodic
2. Method File   7. Auto Start
3. Changer       8. CARD Utility
4. Factor        9. Memory Clear
```

(2) Select “Changer” by cursor and confirm by [Enter] key.

```
          < Changer >
Changer          : <SOP50  >
External Pump    : Off On
Exit             : [Execute]
```

(3) Select “SOP50” by cursor using [←], [→] key and confirm by [Enter] key. Once confirmed, exit by the [Escape] key.

3-1-2.Automatic sequence (sampling, draining, rinsing, and drying) setup (Meas.Para setup)

It is necessary to setup “Sequence” parameters (Meas. Para) on the Density meter to sample, drain, rinse, and dry automatically with the SOP50.

(1) Press the [Meas.Para] key.

```
Method 0 < Meas. Parameter >
Method Name      : [Method-0]
Measurement Temp.: [ 20.00] °C
Stability (0-2)  : [1]
Limit Time       : [ 600] s
Sequence         : Off On
```

(2) Point the cursor to “Sequence” by [↑], [↓] key and “On” by [←], [→] key, and confirm with the [Enter] key.

```

Method 0 < Meas. Parameter > ▲▼
Sampling      : Off  Set  Auto
O.S.Rate     : [ 70] %
Sampling Limit : [  0] s
Drain        : Off  Set  Auto
Drain Rate   : [■100] %
  
```

↓↑

```

Method 0 < Meas. Parameter > ▲▼
Rinse-1      : Off  Set
Rinse-1 Time : [ 15] s
Rinse-2      : Off  Set
Rinse-2 Time : [ 15] s
Purge        : Off  Set  Auto
  
```

↓↑

```

Method 0 < Meas. Parameter > ▲
Cell Test    : [Off] On
Calib.       : <Air&Water>
Exit         : [Execute]
  
```

(3) The display changes as above. Move the cursor by the [↑], [↓] keys, and confirm Sample, Drain, Rinse or Purge using the [Enter] key. For details of these parameters, refer to the following <Details of measurement parameters> and <Typical parameter settings> as well as <Guide to standard parameters>.

<Details of measurement parameters>

Parameter	Setting	Setup item	Description
Sampling	Set	Sampling Time	Time to activate pump for sampling
	Auto	O.S.Rate (Over Sampling Rate)	For automatic setup of pumping time for sampling. Sample liquid is detected when it comes into the measuring cell, and based on this time, the sampling time is automatically determined by the following formula: $T(s) = T1(s) + T1(s) \times \text{O.S. Rate (\%)/100}$ Where; T(s) : sampling time T1(s) : automatically detected time for sampling Sampling pump working time is automatically selected.
		Sampling Limit	Limit time for sampling. 0s means no time limit.
Drain	Set	Drain Time	Time to activate pump for draining.
	Auto	Drain Rate	For automatic setup of pumping time for draining. Draining time is automatically set up based on time required for sampling. Draining time is automatically determined by the following formula: $T2(s) = T(s) \times \text{Drain Rate (\%)/100}$ Where; T(s) : sampling time T2(s) : draining time
Rinse-1	On	Rinse-1 Time	Time to activate pump for rinsing
Rinse-2	On	Rinse-2 Time	
Purge	Set	Purge Time	Time to activate pump for purge drying
	Auto	–	Automatic stop of pumping by sensing dried condition.
Cell Test (Only when Purge is set)	On	–	Automatically checks the state of the cell after a drying process is over.

- For parameter settings, refer to <Typical parameter settings> and <Guide to standard parameters>.
- When Off is chosen, the steps will not be performed.

Note!

When the [Rinse/Purge] key on the density meter is pressed, draining, rinsing and purging will be executed according to the sequence defined in the current method. Any “Auto”, “Off”, or “0s” settings will be ignored, however, and the underlying set times will be activated. The rinsing step will always include both rinse 1 and rinse 2.

<Typical parameter settings >

Parameter	Setup item	Setting on Density meter
Meas.Para	Method Name	Method-0
	Measurement Temp.	20.00°C
	Stability	1
	Limit Time	0s
	Sequence	On
	Sampling	Auto
	O.S.Rate	120%
	Sampling Limit	0s
	Drain	Auto
	Drain Rate	100%
	Rinse-1	Set
	Rinse-1 Time	15s
	Rinse-2	Set
	Rinse-2 Time	15s
	Purge	Auto (Set : 180s)*
	Cell Test	Off
	Calib.	Air & Water

* () shows when [Rinse/Purge] key is used.

<Guide to standard parameters>

- Sampling : Select the sampling time or over-sampling rate long enough to fill the measuring cell and the entire sample outlet tube
- Drain : Select the drain time or drain rate long enough to completely drain out the waste liquid through the drain tube. 100-200% of sampling time is recommended.
- Rinse-1 : Select time enough to rinse out sample liquid.
- Rinse-2 : Select time enough to rinse out solvent 1.
- Purge : Select time enough to dry the measuring cell.



Caution!

The capacity of the waste bottle is 250mL. If the times for Rinse-1 and Rinse-2 are too long, excessive waste liquid may be pumped in. Check sampling size and solvent volume.

Note!

Insufficient rinsing or drying may influence measurement results. If repeatability is poor, select a longer time for each step.

3-2. Pretreating the measuring cell

3-2-1. Automatic drain, rinse and dry ([Rinse/Purge] key)

When a sequence is programmed on the density meter according to “3-1. Setting up the density meter”, drain, rinse and dry can be activated by the [Rinse/Purge] key on the Density meter.

- (1) When the [Rinse/Purge] key is pressed, the message “Draining” appears on the display. The measuring cell will be drained, then rinsed by Rinse 1, Rinse 2, and finally purge dried.



Caution!

The capacity of the waste bottle is 250mL. If the times for Rinse-1 and Rinse-2 are too long, excessive waste liquid may be pumped in. Check sampling size and solvent volume.

Note!

When the [Rinse/Purge] key on the density meter is pressed, draining, rinsing and purging will be executed according to the sequence defined in the current method. Any “Auto”, “Off”, or “0s” settings will be ignored, however, and the underlying set times will be activated.

3-2-2. Manual rinse and purge dry ([MANUAL] key)

Rinse and dry can be performed manually by pressing the [MANUAL] key on the SOP50.

- (1) Press the [MANUAL] key on the SOP50.

Note!

Unless [RINSE1] or [RINSE2] key is pressed, the line stays on Purge dry.

- (2) Press the [RINSE] key to move the sampling nozzle to the rinse pot, and make sure the PURGE lamp turns on.
- (3) Press the [Pump] key on the Density meter to activate the pump, and press the [RINSE1] or [RINSE2] key on the SOP50, for rinse solution 1 or 2 to flow.

Note!

Make sure the PURGE lamp is on, before pressing the [RINSE1] or [RINSE2] key. The solvent will not flow if the lamp is not lit.

Note!

The line stays on PURGE unless the [RINSE1] or [RINSE2] key is pressed.

Note!

For manual operation, the pump of the density meter must be activated. The key on the SOP50 can only switch the line between RINSE1, RINSE2 or PURGE; it cannot activate draining, rinsing or purge drying.

- (4) When the line is on PURGE and the [Pump] key on Density meter is pressed for more than 2 seconds, the message “Purge Checking ” will appear to check the dryness of the measuring cell. When the cell is dry, the message “Ready” will appear.

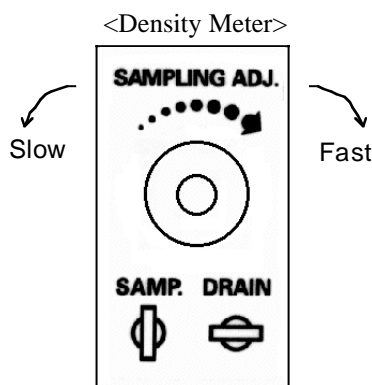
3-3. Calibration

Define a calibration method on the density meter, set up the calibration sample, and then press the [Calib.] key on the density meter.

The calibration can be performed by following the messages on the display.

3-3-1. Calibration by Air & Water

- (1) Set up parameters according to “3-1. Setting up the density meter”, and set the sequence to “On”.
- (2) Press the [Rinse/Purge] key to pre-treat (rinse and dry) the measuring cell.
- (3) Turn the Sample/Drain cock of the automatic sampling unit (on the side of the density meter) to Sample. Adjust the speed control taking into account the sample temperature and viscosity.



- (4) Place degassed pure water for calibration on the beaker tray, and press the [Calib.] key.
Following the message “Purge OK , press Enter”, press the [ENTER] key.
- (5) The display will change to “Calibrating”, and calibration by air starts.
- (6) When the calibration with air is finished, the message turns to “Sampling”. Sampling of water is started immediately and calibration with water is then started with the message “Calibrating” on the display.
- (7) After calibration is finished, drain, rinse and purge dry are performed according to the sequence. The message “OK Calibration” appears on the display.



Warning!

Do not move the sample vessel while sampling nozzle is moving. Otherwise the nozzle may be bent or the sample vessel broken.

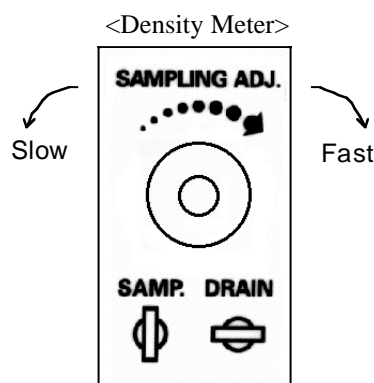


Caution!

The capacity of the waste bottle is 250mL. If the time for Rinse-1 and Rinse-2 is too long, excessive waste liquid may be pumped in. Check sampling size and solvent volume.

3-3-2. Calibration by other standards

- (1) Set up a method and parameters according to “3-1. Setting up the density meter”, and turn the sequence “On”. Set “Calib” to “Other STD”, and enter the density values of STD1 and STD2.
- (2) Press the [Rinse/Purge] key to pre-treat the measuring cell.
- (3) Turn Sample/Drain cock of the automatic sampling unit to Sample. Adjust the speed control taking into account the sample temperature and viscosity.



- (4) Place STD1 for calibration on the beaker tray, and press the [Calib.] key. Following the message “Set STD1 ⇔ Press Enter Key”, press the [Enter] key.

Note!

The diameter of beaker tray is 56mm. Use the supplied beaker adapter for other beaker sizes.

- (5) While the message “Sampling” appears, STD1 is sampled. This step is followed by the message “Calibrating” to start calibration with STD1.
- (6) When the calibration with STD1 is finished, the sequence will start draining, rinsing and drying.
- (7) After drying is finished, the message appears: “Set STD2 ⇔ Press Enter Key”. Place STD2 for calibration on the beaker tray and press the [Enter] key.
- (8) While the message “Sampling” appears, STD2 is sampled, followed by the message “Calibrating” to start calibration with STD2.
- (9) When calibration is finished, the sequence starts to drain, rinse and dry, followed by the message “Calibration OK” and the results on the display.



Warning!

Do not move the sample vessel while sampling nozzle is moving. Otherwise the nozzle may be bent or the sample vessel broken.



Caution!

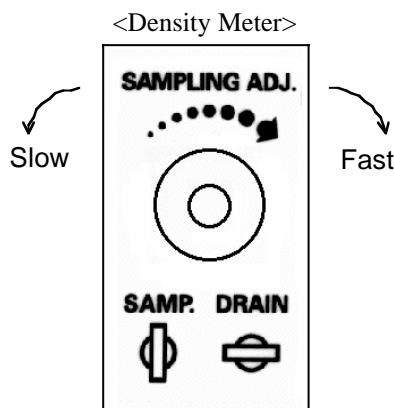
The capacity of the waste bottle is 250mL. If the time set for Rinse-1 and Rinse-2 is too long, excessive waste liquid may be pumped in. Check sampling size and solvent volume.

3-4.Actual measurement

Set up the sample and the method, and press the [Meas.] key on the density meter. The measurement will proceed automatically.

3-4-1.Rinse and dry after measurement

- (1) According to “3-1. Setting up the density meter”, set up parameters and set “Sequence” to “On”.
- (2) Turn Sample/Drain cock to Sample. Adjust the speed control taking into account the sample temperature and viscosity.



Note!

If sampling speed is too high, air bubbles may appear inside the measuring cell. Adjust the speed control for appropriate sampling speed.

- (3) Place the sample on the beaker tray and press the [Meas.] key.
- (4) While the message “Sampling” appears, the sample will be sampled in, followed by the message “Measuring” to start measurement.
- (5) After the measurement is finished, the sequence will start with drain, rinse and dry to complete the defined sequence.

Note!

Insufficient rinsing or drying may affect measurement results. If reproducibility is not satisfactory, select a longer time setting for each parameter.

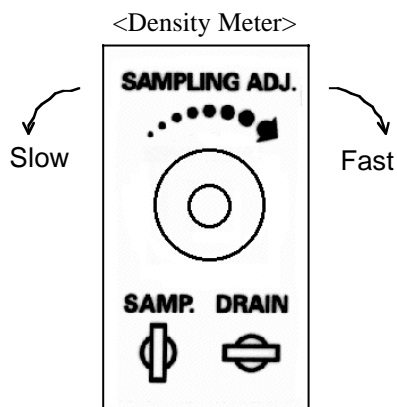
3-4-2. "Self-cleaning" the cell with sample liquid

- (1) "Self-cleaning" with sample liquid means that the measuring cell is "cleaned" out by the new incoming sample liquid, as opposed to draining, rinsing with solvents and then drying. To do this, set "Rinse-1", "Rinse-2" and "Purge" to "Off", and "Sequence" to "On" according to "3-1. Setting up the density meter". If the sample liquid is to be drained, set "Drain" to "On". If sampling is to be continuous, without draining, set it to "Off".

Note!

If drain is set to "off", do not set Sampling to "Auto". Otherwise the sample liquid may not be detected and sampling may not terminate.

- (2) Turn Sample/Drain cock to Sample. Adjust the speed control taking into account the sample temperature and viscosity.



Note!

If sampling speed is too high, air bubbles may appear inside the measuring cell. Adjust the speed control for appropriate sampling speed.

- (3) Place the sample on the beaker tray and press the [Meas.] key.
- (4) While the message "Sampling" appears, the sample will be sampled in, followed by the message "Measuring" to start measurement.
- (5) When a measurement is finished, press the [Meas.] key to continue for another measurement, since it does not drain, rinse or dry.
- (6) When the desired number of measurements is finished, press [Rinse/Purge] key to rinse and purge dry the cell. This will avoid contamination.



Caution!

Some sample liquids may stain the measuring cell. After the day's measurements are over, make sure to drain out the sample, and rinse and dry the cell.

4.Maintenance

4-1.Checking the rinse solution

Too little rinse solution results in insufficient rinse of measuring cells and may badly affect measurement values. Refill the rinse bottle when rinse solution becomes low (when the filter in rinse bottle is not soaked in rinse solution).



Warning!

Do not splash rinse solution on skin or eyes. Do not inhale vapor of rinse solution. Wear the necessary protective clothing (gloves, protective glasses, protective masks, etc.) and work in a well-ventilated area.

4-2.Replacement of filter for rinse solution

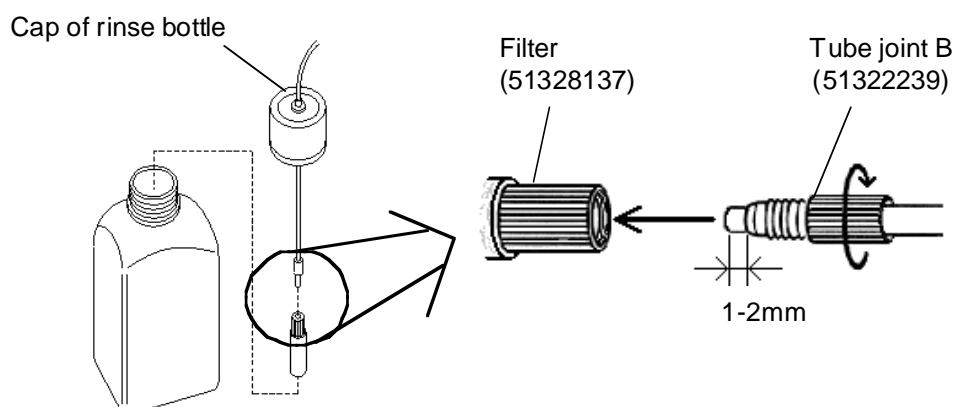
When flow rate of rinse solution slows notably (reduction of waste rate), replace the filter (51328137) in the following manner.



Warning!

Do not splash rinse solution on skin or eyes. Do not inhale vapor of rinse solution. Wear the necessary protective clothing (gloves, protective glasses, protective masks, etc.) and work in a well-ventilated area.

- (1) Unscrew the cap of the rinse bottle.
- (2) Turn the filter at the end of tube in the direction of the arrow as shown, and remove it from tube joint B (51322239). Screw the new filter into the tube with its tip protruding 1-2mm out of joint B.

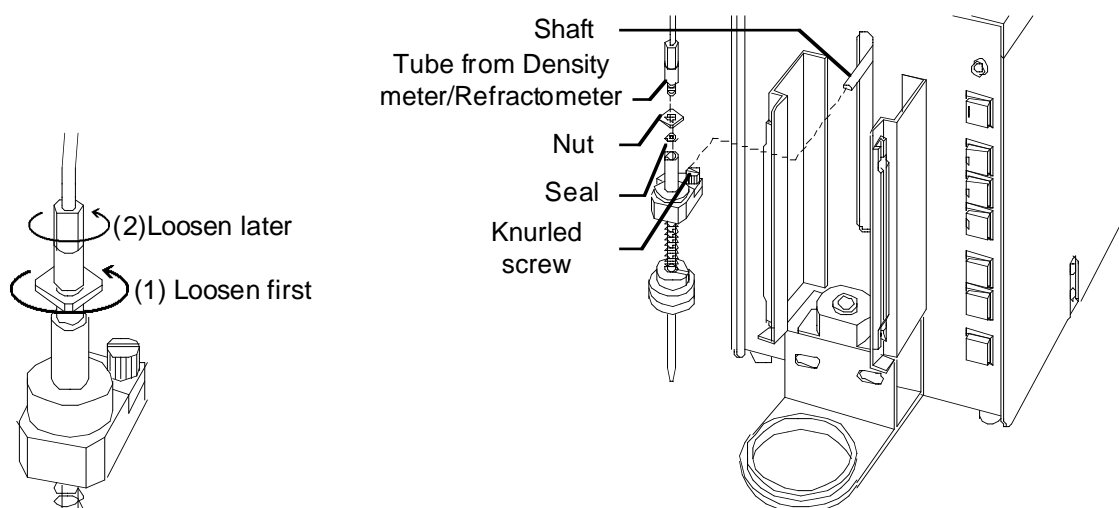


4-3.Maintenance of nozzle unit

If the nozzle unit is found defective, follow the instructions below:

4-3-1.Replacement of nozzle unit

- (1) Press the [MANUAL] key and move the nozzle unit upward with the [SAMPLE] or [RINSE] key.
- (2) Loosen the nut and remove the tube coming from the density meter, and loosen the knurled screw (see Diagram) to remove the nozzle unit from the shaft.

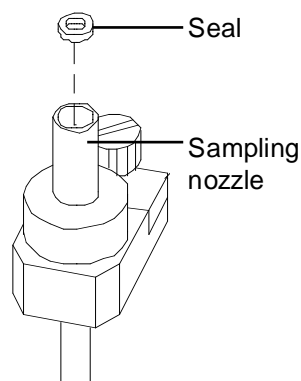


- (3) Replace the necessary parts or make adjustments, and tighten the knurled screw (carefully!) after the shaft is installed. Install the replacement nozzle unit.
- (4) Connect the tube (51322236) from density meter/refractometer, and tighten the nut.
- (5) Press the [MANUAL] key to turn off the Manual lamp and cancel the manual mode.

4-3-2.Replacement of seal

If air bubbles enter through the nozzle, replace the seal as follows:

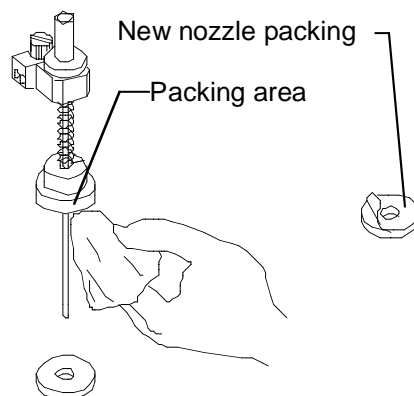
- (1) Remove the nozzle unit according to 4-3-1 and hold it upside down to remove the seal.
- (2) Insert the new seal (51322203) into the nozzle unit as shown.
- (3) Install the nozzle unit according to 4-3-1.



4-3-3.Replacement of nozzle packing

If the suction speed of the solvent slows down, replace the “nozzle packing” (51328131).

- (1) Remove the nozzle unit according to 4-3-1.
- (2) Remove the nozzle packing. (attached to the nozzle by mounting tape)
- (3) Clean the packing area of the nozzle unit, peel off the seal of the new nozzle packing and stick on the new packing.



Note!

If the nozzle packing is deteriorated, the rinse solvent may not be pumped in.

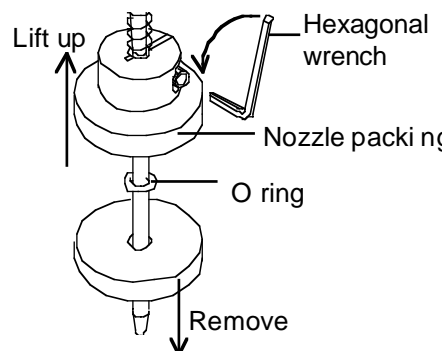
Note!

The nozzle packing is made of polyethylene. Some sample liquids or solvents may deteriorate the packing so that it needs to be replaced more frequently.

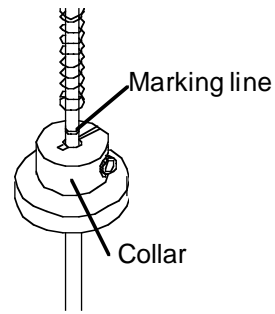
4-3-4.Replacement of O-ring

Replace the O-ring if the spring area of the nozzle unit leaks.

- (1) Loosen the hexagonal screw of the nozzle unit (detached according to 4-3-1) using the supplied wrench.
- (2) Remove the packing from the nozzle.
- (3) Press the spring to lift up the packing area as shown, and replace the O-ring.



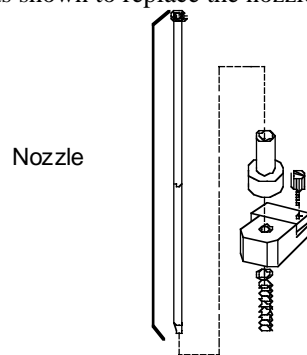
- (4) Push back the packing area to the groove line of nozzle, and fix the set collar by tightening the hexagonal screw.
- (5) Insert the new packing to the nozzle and fix it.
- (6) Install the nozzle unit according to 4-3-1.



4-3-5.Replacement of nozzle

Replace the nozzle if it is bent or clogged.

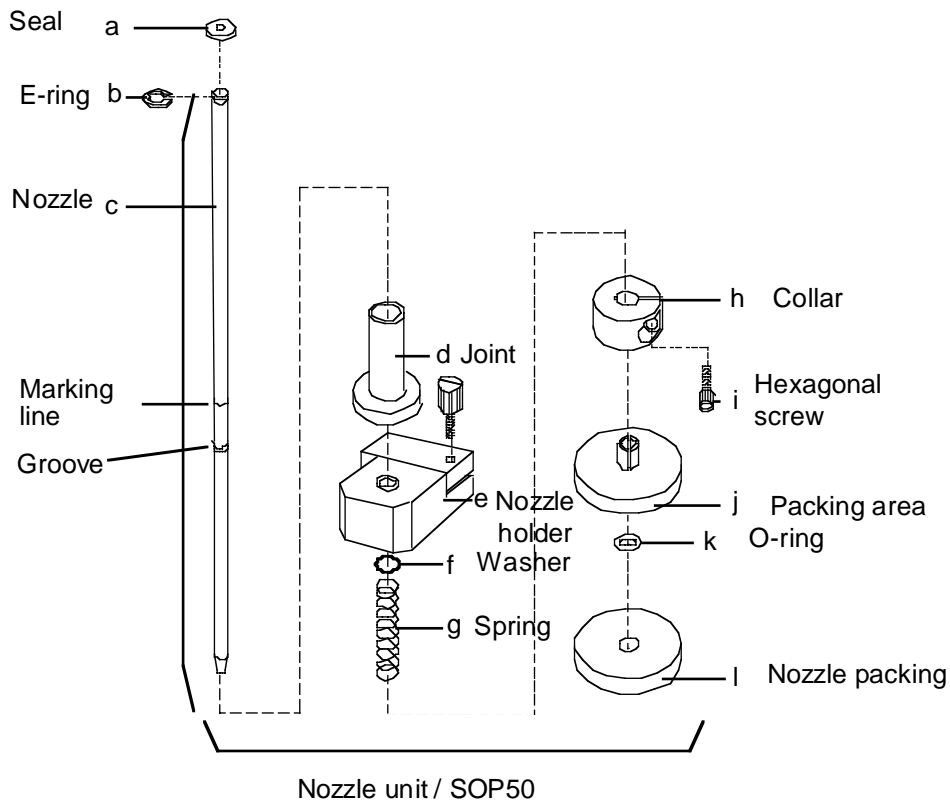
- (1) Hold the nozzle (detached according to 4-3-1) upside down to remove the seal, and loosen the hexagonal screw using the supplied wrench.
- (2) Remove the O-ring according to 4-3-4 and take off packing area.
- (3) Slide out the nozzle as shown to replace the nozzle.



- (4) According to 4-3-4, fix the set collar, packing area, O-ring and nozzle packing.
- (5) Return the seal to the nozzle unit and install according to 4-3-1.

4-3-6.Exploded view of nozzle unit

The nozzle unit consists of the following parts as shown below:

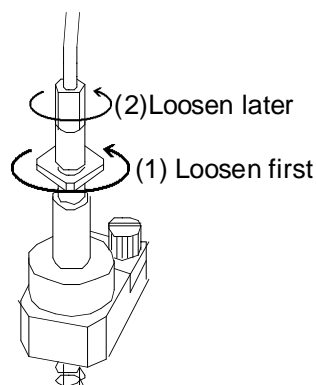


- (1) Insert c(nozzle) into d(joint). [b(E ring) is attached to c(nozzle) in plant before shipment].
- (2) Insert (1) into e(nozzle holder), and f(washer) and g(spring) into c(nozzle).
- (3) Insert h(set collar) and j(packing area) into (2), and after k(O-ring) is inserted, attach l(nozzle packing), and fix j(packing area) by I(hexagonal screw). Tighten i(hexagonal screw) so that the groove matches k(O-ring) and the marking line on c(nozzle) matches upper face of h(set collar).
- (4) Insert a(seal) into d(joint), and connect the tube to density meter/refractometer.

4-4. Check loose connection of sampling nozzle

The sampling nozzle should not be loose. Make sure to check the nozzle condition at least once a day before activating the instrument. After checking, install the cover.

- (1) Remove the cover and check any loosening of the nozzle.
- (2) If it is found loose, loosen the nut, and tighten the joint manually.



Caution!

Loosen the nut first, then tighten the nozzle unit. After tightening the nozzle unit, make sure to tighten the nut. If the nut is not tightened, the joint will eventually loosen and cause a leak.

- (3) After the nut is tightened, re-install the cover.

4-5. If the sample liquid flows back to the SOP50

If the sample liquid flows from the rinse pot to the SOP50, the system needs to be cleaned.

- (1) Press the [MANUAL] key to turn on Manual lamp.
- (2) Press the [RINSE] key to move the nozzle to the pot, and remove the tube B connected to density meter/refractometer and the desiccant tube.
- (3) Press the [Pump] key, and suck solvent 1 and 2 through tube B for rinsing.
- (4) Re-connect tube B and the desiccant tube, and dry the system.

4-6.To remove the rinse tube from solvent inlet

When the rinse tube is removed from the solvent inlet, the inside liquid may leak out.

- (1) Follow the steps below:
- (2) Press the [MANUAL] key to turn on Manual lamp.
- (3) Press the [RINSE] key to move the nozzle to the rinse bath.
- (4) Move the end of the rinse tube located inside the rinse bottle upwards so that the tube is above the level of the solution. Press the [Pump] key to remove the solvent remaining inside the tube.



Caution!

Whenever [RINSE 1] or [RINSE 2] key is pressed, move the nozzle to rinsing position. Otherwise, either rinse 1 or 2 line is open to allow liquid flowing out.

- (5) Press [Pump] key again to stop, and unscrew the rinse tube from the solvent inlet.

5.Troubleshooting

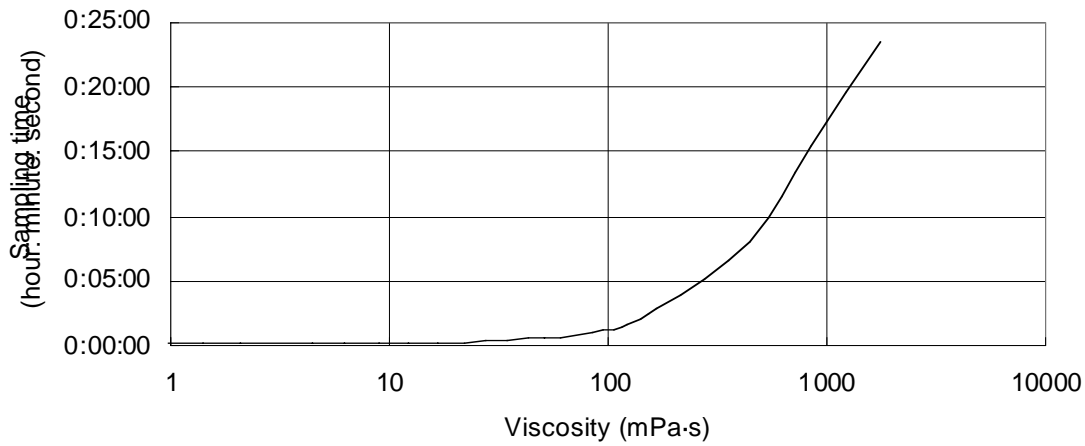
Trouble	Check	Remedy
· Power does not turn on.	· Cable is not inserted correctly.	· Power is supplied from density meter by way of the cable. Check its connection.
	· STOP key was not pressed.	· Press STOP key again to cancel STOP.
· It does not sample or takes too much time in sampling.	· Sampling speed control is too fast.	· Close the control first and then, adjust speed within 1 – 3 turns.
	· Sample is viscous.	· Slow down sampling speed. Maximum viscosity that can be taken is 500mPa·s.
	· Joints are loose.	· Retighten the joint or overhaul and reassemble.
	· Tube is bent or broken.	· Replace the tube line.
	· Sequence for Meas.Para. is improper.	· Set up again according to “3-1. Setting up the density meter”.
· Measurement results are scattered.	· Air bubble in the sample liquid in the cell.	· If the temperature of measuring cell is higher than that of the sample, air bubbles may appear in the sample liquid. Lower the measuring temperature or warm up the sample higher than measuring temperature, and measure small sample sizes at a time.
	· Joints are loose.	· Retighten the joint.
	· Sampling is not set up properly.	· Take a longer sampling time and purge time on Meas. Para.
	· Rinse cleaning is not sufficient.	· Take a longer time for Rinse-1 or Rinse-2 on Meas. Para.
	· The system is not well dried.	· Select a longer time for purge dry when “Purge Time” on Meas. Para. is “Set”.
· Manual operation does not work.	· MANUAL lamp is not turned on	· Press [MANUAL] key to turn on MANUAL lamp.
· [RINSE 1] and [RINSE 2] key do not function.	· Nozzle is not in rinse position.	· Unless the nozzle is in rinse position, the line cannot be changed over. Move the nozzle to rinsing position by pressing the [RINSE] key.

· [Meas.], [Calib.], [Check] and [Rinse/Purge] keys on density meter do not function.	· MANUAL lamp is not lit	· Press [MANUAL] key to turn off MANUAL lamp and cancel manual mode.
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6. Sample viscosity and sampling time

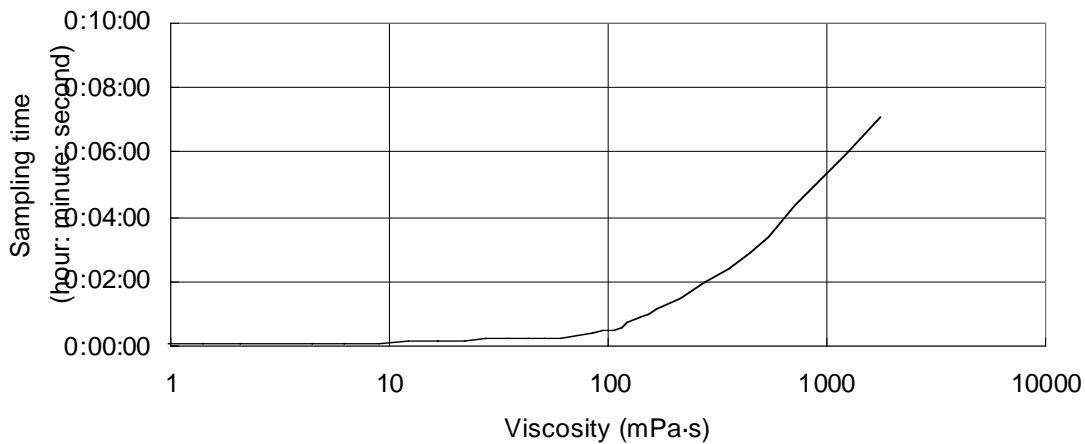
The chart below shows the relationship of sample viscosity with sampling time.

Viscosity vs. Sampling time (medium speed)



- Sampling with speed control valve of density meter closed halfway

Viscosity vs. Sampling time (high speed)



- Sampling by speed control valve of density meter closed completely

Note!

The above chart shows a model of viscosity of a sample and its sampling speed. Actual sampling may not be like the model. This relation changes depending on nature of the sample or instrumental condition.

7. Specifications

	Item	Specifications
1	Type and model	Sample Operation Programmer SOP50
2	Number of measurements	for one sample, multiple measurements possible
3	Rinse cleaning	2 kinds of solvent and dry air purge
4	Sampling method	Suction method (by a built-in pump in the density meter)
5	Sequence setup	Setup on the measuring instrument (sequence for calibration is programmed in)
6	Control	1) Auto : Start by DE unit 2) Manual : manual key only (no START key)
7	Display	Display on density meter
8	Communication	Digital cable (D-sub 15 pins connector) <to connect Density meter>
9	Ambient condition	Temperature : 5 ~ 35°C Humidity : Up to 85% RH (non-condensing)
10	Option	Automatic drain unit (AD-510)
11	Power consumption	40W
12	Dimension	83(w) × 180(D) × 176(H)mm
13	Weight	Approx. 1kg
14	CE marking	EMC (noise) EN50081-2, EN50082-2 LVD (safety) EN61010-1 conformed

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