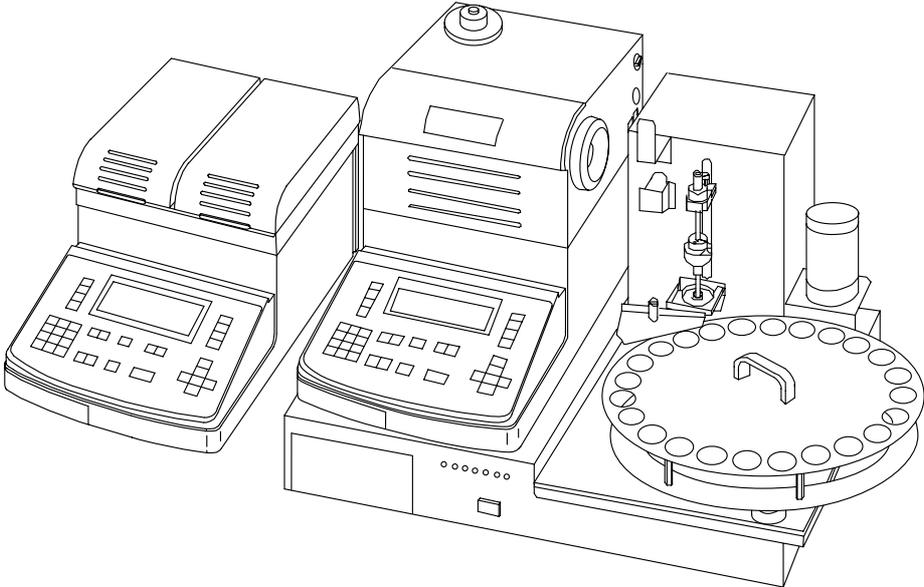
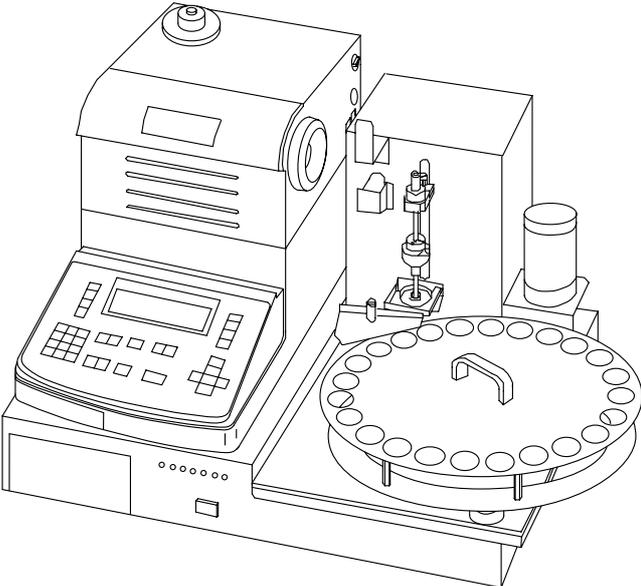


# Operating Instructions

## METTLER TOLEDO SC24 Sample Changer with Density Meter, or with Density Meter / Refractometer combination





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## 1. Installation

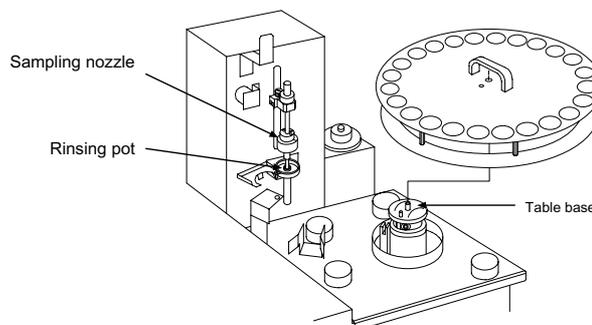
### 1.1. Installation of the SC24

Unpack the SC24 Sample Changer, the DE (\*) Density Meter and/or the RE (\*) Refractometer.

(\*) Note: We will use DE to designate DE40, DE50 or DE51 and RE to designate RE40 or RE50.

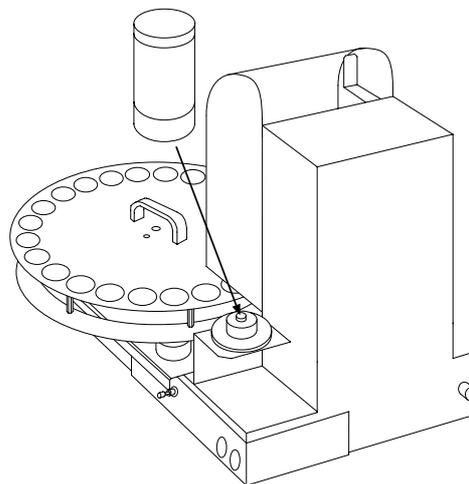
Mount the turntable on the SC24.

Connect the SC24 to the plug socket.  
Switch on the SC24 (power switch on the left side).



Mount the vial holder and attach the septum holder.

Mount the desiccator on the SC24.



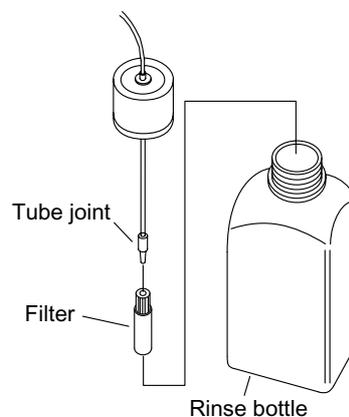
### Connection of the rinse bottles

Put the drain tube into a waste bottle.

Set the two rinse bottles next to the SC24 (on the right side into the rack). Insert the tube into the lid of the rinse bottle, mount the joint and the filter.

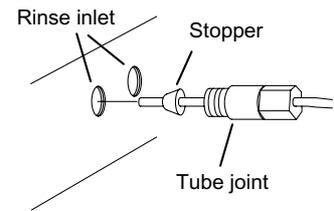
Fill the rinse-1 bottle with a dedicated solvent for your sample (e.g. pure water for beverages or saccharine solutions, toluene for heavy oils)

Fill the rinse-2 bottle with a high volatile solvent to allow a quick drying of the tubes and measuring cells (e.g. acetone)



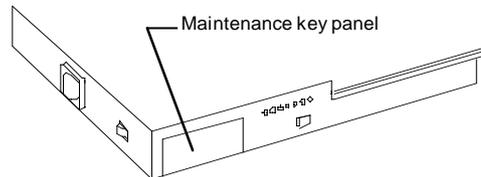
Connect rinse tube from rinse-1 bottle to rinse-1 input on SC24, using the special tube joint.

Connect rinse tube from rinse-2 bottle to rinse-2 input on SC24, using the special tube joint.



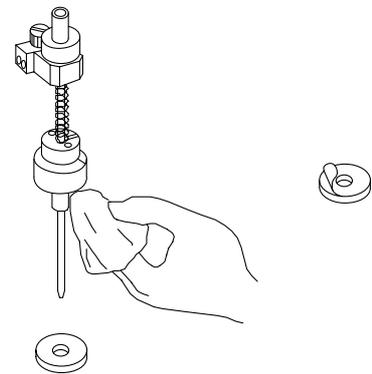
Open the maintenance key panel: press on the front left panel.

Press the <MAINTENANCE> key to move the nozzle unit into maintenance position.



Remove the temporary foam pad (white foam) from the nozzle unit and clean the area where the packing comes in contact.

Take a new foam pad, remove the seal and adhere the sealing pad to the nozzle unit.



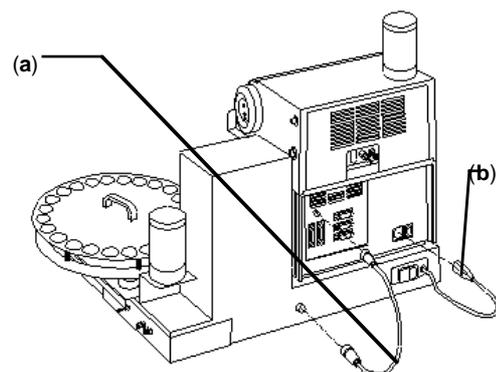
## 1.2. When installing a DE with the SC24

When using the DE with the SC24 the combination set ME: 51322007 is required.

Place the DE on the SC24.

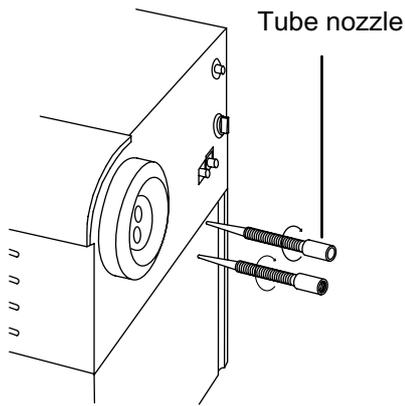
Connect the sample changer cable (black cable with round connector) to the DE **(a)**.

Connect the power cable from the SC24 to the DE **(b)**

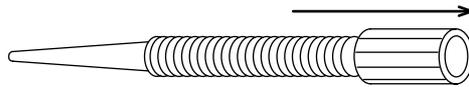


### Changing tube nozzles

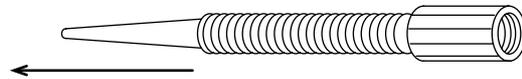
Remove the two tube nozzles from the DE measuring cell (unscrew). Replace them with the special tube nozzles (with inside thread).



Standard tube nozzle,  
without thread inside



Special tube nozzle,  
with thread inside

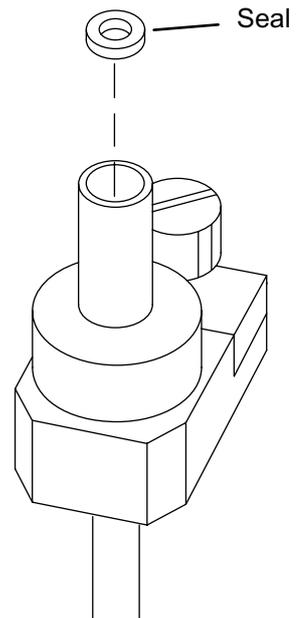
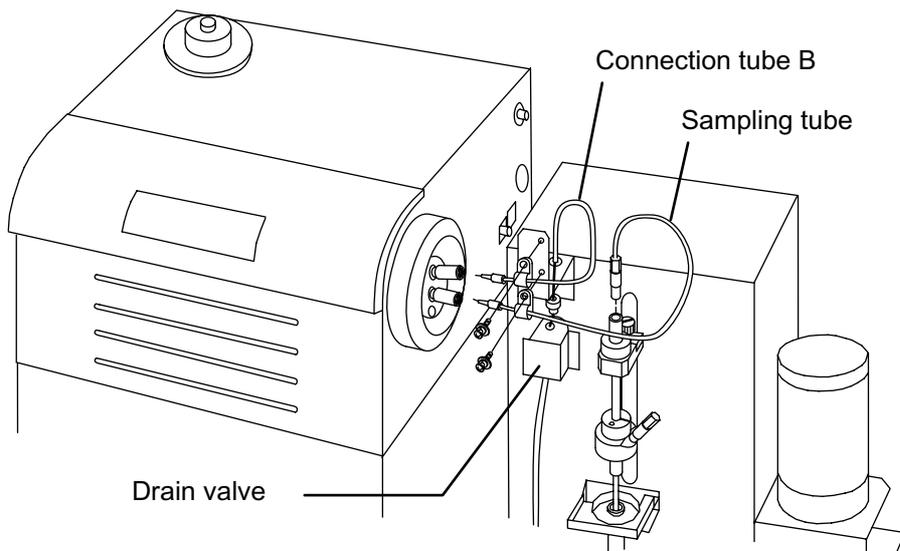
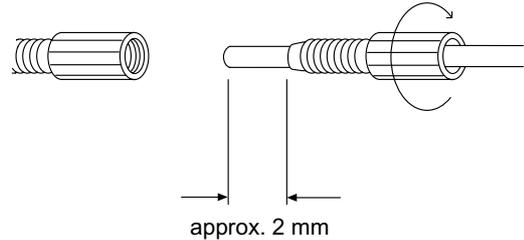


Fix the sampling tube to the measuring cell in, using the tube joint with thread (see also next drawing).

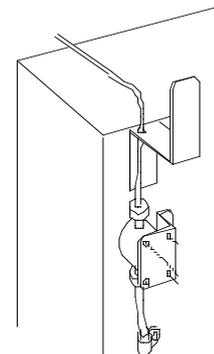
Fix the other end of the sampling tube to the sample changer nozzle, using the special seal (see next drawing).

Special tube nozzle,  
with thread inside

Tube joint with thread



Connect the drain tube from the DE (measuring cell out) to the drain valve of the SC24.



### 1.3. When installing a RE/DE combination with the SC24

When using the combination RE/DE/SC24 the combination set ME: 51322009 is required.

Remove the two tube nozzles from the DE measuring cell (unscrew). Replace them with the special tube nozzle (with inside thread). For more detail, see section changing the tube nozzle.

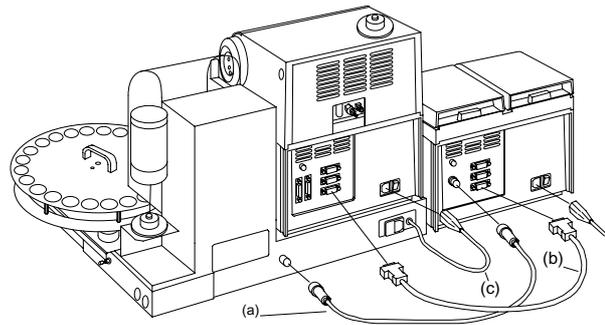
Place the DE on the SC24.

Place the RE next to the DE (on the left side).

Connect the sample changer cable (black cable with round connector) to the RE **(a)**.

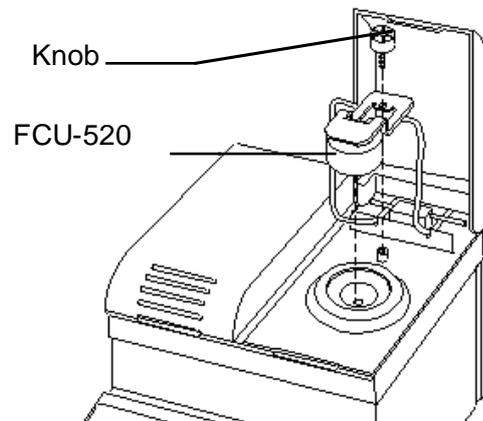
Connect the RS-232 cable from RS-232 connector on RE to RS-232 connector on DE **(b)**.

Connect the power cable from the SC24 to the DE **(c)**

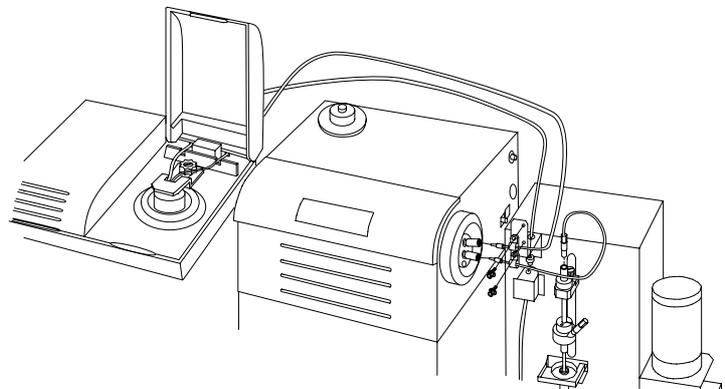


### Installation of the FCU-520

Mount the FCU-520 flow through cell on the RE.



Connect the connection tube B from the FCU-520 flow through cell (mounted on the RE) to the DE measuring cell out (upper tube connector), using the special tube joint with inside thread.



Connect the drain tube from the FCU-520 to the drain valve of the SC24 (see detail in the end of part A).

#### 1.4. Printer connection

If you have a GA42 printer, you have to connect it to the "Printer" connector of the DE (for 1.2) or on the RE (1.3) using the printer cable.

Perform following steps at the DE or the RE:

- Press <SETUP> key
- Select **0. Interface**
- confirm with <ENTER>

```
          < Setup >
0.Interface      5.International
1.Date & Time    6.Lock
2.Name          7.Beep
3.Serial/Version 8.Temperature
4.LCD contrast
```

- Select **1. Printer**
- confirm with <ENTER>

```
          < Interface >
          0.RS-232
          1.Printer
```

- Select "GA-" with the -> key
- confirm with <ENTER>
- confirm with Exit: [Execute]

```
          < Printer >
Printer      :IDP- DP- GA- Other
Exit        :[Execute]
```

## 2. Setup

### 2.1. DE with SC24 (as for 1.2)

- Press <FUNCTION> key on DE

- Select **3. Changer**

- confirm with <ENTER>

```

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

- Select **Changer: <SC24>**

- confirm with <ENTER>

```

      < Changer >

Changer          :<SC24>
Exit              :[Execute]
  
```

- Select **Calib.: Off**

- Select **Start Position: Home**

- confirm with Exit: [Execute]

```

      < Changer >

Changer          :<SC24>
Calib.           :Off On
Start Position   :Home Current
Exit             :[Execute]
  
```

- Press <METHOD> key

- Select method **0. Method-0**

- confirm with <ENTER>

```

      < Method List >
No.  Name      Temp.(°C)  Result
0. Method-0  20.00      d
1. Method-1    20.00          d
2. Method-2    20.00          d
3. Method-3    20.00          d
4. Method-4    20.00          d
  
```

- Press <MEAS.PARA> key

- Select the parameters to following values:

- confirm with <ENTER>

```

Method 0 < Meas.Parameter >

Method Name      :[Calib. ]
Measurement Temp.: [ 20.00]°C
Stability        :[0]
Limit Time       :[ 600]s
Sequence         :Off On
  
```

- Set the sequence parameters to following values:

- confirm with <ENTER>

```

Method 0 < Meas.Parameter >

Sampling         :Off Set Auto
Sampling Time    :[ 15]s
Drain            :Off Set Auto
Drain Time       :[ 15]s
Rinse-1          :Off Set
  
```

- Set the next parameters to following values:

- confirm with <ENTER>

```

Method 0 < Meas.Parameter >

Rinse-1 Time     :[ 15]s
Rinse-2          :Off Set
Rinse-2 Time     :[ 15]s
Purge           : Off Set
Purge Time       :[ 180]s
  
```

- Select Cell test OFF

- Select Air & Water calibration

- confirm with <ENTER>

```

Method 0 < Meas.Parameter >

Cell test        :[Off On]
Calib.           :[Air & Water]
Exit             :[Execute]
  
```

- Press <METHOD> key
- Select method **1. Method-1**
- confirm with <ENTER>

< Method List >			
No.	Name	Temp.(°C)	Result
0.	Calib.	20.00	d
<b>1.</b>	<b>Method-1</b>	<b>20.00</b>	<b>d</b>
2.	Method-2	20.00	d
3.	Method-3	20.00	d
4.	Method-4	20.00	d

- Press <MEAS.PARA> key
- Select the parameters to following values:
- confirm with <ENTER>

Method 1 < Meas.Parameter >	
Method Name	: [ <b>Sample.</b> ]
Measurement Temp.	: [ 20.00 ] °C
Stability	: [ <b>1</b> ]
Limit Time	: [ 600 ] s
Sequence	: Off <b>On</b>

- Set the sequence parameters to following values:
- confirm with <ENTER>

Method 1 < Meas.Parameter >	
Sampling	: Off Set <b>Auto</b>
O.S.Rate	: [ <b>30</b> ] %
Sampling Limit	: [ <b>25</b> ] s
Drain	: Off Set <b>Auto</b>
Drain Rate	: [ <b>70</b> ] %

- Set the next parameters to following values:
- confirm with <ENTER>

Method 1 < Meas.Parameter >	
Rinse-1	: Off <b>Set</b>
Rinse-1 Time	: [ <b>10</b> ] s
Rinse-2	: Off <b>Set</b>
Rinse-2 Time	: [ <b>10</b> ] s
Purge	: Off <b>Set</b>

- confirm with <ENTER>

Method 1 < Meas.Parameter >	
Purge Time	: [ <b>120</b> ] s
Cell Test	: <b>OFF</b> ON
Exit	: [Execute]

Now check the setup of the SC24/DE, see chapter 2.3

## 2.2. DE and RE with SC24

Both instruments (the DE and the RE) have to be set up to run as a combination, with the **refractometer (master) controlling the density meter (slave)**.

### 2.2.1. Density meter (DE40, DE50 or DE51): perform following steps

- Press <SETUP> key
- Select **0. Interface**
- confirm with <ENTER>

< Setup >	
<b>0. Interface</b>	5. International
1. Date & Time	6. Lock
2. Name	7. Beep
3. Serial/Version	8. Temperature
4. LCD contrast	

- Select **0. RS-232**
- confirm with <ENTER>

< Interface >	
<b>0. RS-232</b>	
1. Printer	

- Set the parameters to the default parameters
- confirm with Exit: [Execute]

```

      < RS-232C >
Baud Rate      :<4800>
Parity         :Even Odd  None
Stop bits     :1 2
Data bits     :7 8
Exit          :[Execute]
  
```

- Press <METHOD> key
- Select method **0. Method-0**
- confirm with <ENTER>

```

      < Method List>
No.  Name      Temp.(°C)  Result
0. Method-0  20.00    d
1. Method-1   20.00      d
2. Method-2   20.00      d
3. Method-3   20.00      d
4. Method-4   20.00      d
  
```

- Press <MEAS.PARA> key
- Select the parameters to following values:
- confirm with <ENTER>

```

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

- Select Air & Water calibration
- confirm with <ENTER>

```

Method 0 < Meas.Parameter >
Calib.           :[Air & Water]
Exit             :[Execute]
  
```

- Press <METHOD> key
- Select method **1. Method-1**
- confirm with <ENTER>

```

      < Method List>
No.  Name      Temp.(°C)  Result
0. Calib.     20.00      d
1. Method-1  20.00    d
2. Method-2   20.00      d
  
```

- Press <MEAS.PARA> key
- Select the parameters to following values:
- confirm with <ENTER>

```

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

**Note:** the sequence parameter must be off, otherwise some malfunction could occur.

## 2.2.2. Refractometer (RE50): perform following steps

- Press <SETUP> key
- Select **0. Interface**
- confirm with <ENTER>

```

          < Setup >
0. Interface      5. International
1. Date & Time    6. Lock
2. Name           7. Beep
3. Serial/Version 8. Temperature
4. LCD contrast
    
```

- Set the parameters to the default parameters
- confirm with Exit: [Execute]

```

          < RS-232C >
Baud Rate      : <4800>
Parity         : Even Odd None
Stop bits     : 1 2
Data bits     : 7 8
Exit          : [Execute]
    
```

- Press <FUNCTION> key
- Select **4. DE Connect**
- confirm with <ENTER>

```

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

- Select **DE Connect: On**
- confirm with Exit: [Execute]

```

          < DE Connect >
DE Connect : Off On
Exit       : [Execute]
    
```

- Select **DE Connect: On**
- confirm with Exit: [Execute]

```

          < DE Connect >
DE Connect : Off On
Output      : Printer RS-232C
Exit       : [Execute]
    
```

- Press <FUNCTION> key
- Select **3. Changer**
- confirm with <ENTER>

```

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

- Select **Changer: <SC24>**
- confirm with <ENTER>

```

          < Changer >
Changer      : <SC24>
Exit         : [Execute]
    
```

- Select **Calib.: Off**
- Select **Start Position: Home**
- confirm with Exit: [Execute]

```

          < Changer >
Changer       : <SC24>
Calib.        : Off On
Start Position : Home Current
Exit         : [Execute]
    
```

- Press <METHOD> key
- Select method **0. Method-0**
- confirm with <ENTER>

```

          < Method List >
No.  Name      Temp.(°C)  Result
0. Method-0  20.00    nD
1. Method-1    20.00         nD
2. Method-2    20.00         nD
    
```

- Press <MEAS.PARA> key
- Set the parameters to following values:
- confirm with <ENTER>

```
Method 0 < Meas.Parameter >
Method Name      :[Calib. ]
Measurement Temp.: [ 20.00]°C
Stability        :[0]
Wait Time        :[ 0]s
Sequence         :Off  On
```

- Set the sequence parameters to following values:
- confirm with <ENTER>

```
Method 0 < Meas.Parameter >
Sampling         :Off  Set  Auto
Sampling Time    :[ 15]s
Drain            :Off  Set  Auto
Drain Time       :[ 15]s
Rinse-1         :Off  Set
```

- Set the next parameters to following values:
- confirm with <ENTER>

```
Method 0 < Meas.Parameter >
Rinse-1         :Off  Set
Rinse-1 Time    :[ 10]s
Rinse-2         :Off  Set
Rinse-2 Time    :[ 10]s
Purge          : Off  Set
```

- Press <METHOD> key
- Select method **1. Method-1**
- confirm with <ENTER>

```
< Method List >
No.  Name      Temp.(°C)  Result
0.  Calib.     20.00      nD
1. Method-1  20.00      nD
2.  Method-2   20.00      nD
3.  Method-3   20.00      nD
4.  Method-4   20.00      nD
```

- Press <MEAS.PARA> key
- Select the parameters to following values:
- confirm with <ENTER>

```
Method 1 < Meas.Parameter >
Method Name      :[Combi. ]
Measurement Temp.: [ 20.00]°C
Stability        :[1]
Wait Time        :[ 0]s
Sequence         :Off  On
```

- Set the sequence parameters to following values:
- confirm with <ENTER>

```
Method 1 < Meas.Parameter >
Sampling         :Off  Set  Auto
O.S.Rate         :[ 30]%
Sampling Limit   :[0]s
Drain            :Off  Set  Auto
Drain Rate       :[ 70]%
```

- Set the next parameters to following values:
- confirm with <ENTER>

```
Method 1 < Meas.Parameter >
Rinse-1         :Off  Set
Rinse-1 Time    :[ 10]s
Rinse-2         :Off  Set
Rinse-2 Time    :[ 10]s
Purge          : Off  Set
```

- confirm with <ENTER>

Method 1	<	Meas.Parameter	>
Purge Time	:	[ 120 ]	s
Exit	:	[Execute]	

### 2.3. Check the combination setup

#### SC24 Sample Changer: check tubing connections

- Open the maintenance key panel: press on the front left panel.
- Press the <PURGE> key. The nozzle unit goes into purge position.
- Press the <RINSE-1> key. The internal valve is set to the rinse-1.
- Press the <PUMP> key. The rinse-1 solution (e.g. water) is flushed through the nozzle unit, the sampling tube, the measuring cells and the drain tube to the waste bottle.
- Press the <PUMP> key again. This stops the rinsing.

**Press <STOP> if there is any leakage during the rinsing and then check tubing connections.**

#### SC24 Sample Changer: set pump speed

- Set the sampling speed knob (on the right side of the SC24) to the middle position. Perform following steps:

- 1) Set a vial filled with water into position 1 of the turntable.
- 2) Open the maintenance key panel: press on the front left panel.
- 3) Press the <PURGE> key. The nozzle unit goes into purge position.
- 4) Press the <STEP> key to move the turntable until the vial filled with water is in front of the nozzle.
- 5) Press the <SAMPLE> key. The nozzle dips into the vial filled with water.

You will have to measure the sampling time now.

- 6) Press the <PUMP> key and start to measure the time. The air pump builds up a pressure in the vial, the sample moves into the sampling tube to the measuring cell of the density meter and to the measuring cell of the refractometer.
- 7) Wait until the water comes out of the refractometer measuring cell and fills the tube until to the drainvalve.
- 8) Press the <PUMP> key and stop the time measurement.

The measured sampling time depends on the viscosity of the sample and should be between 10 and 20 seconds. If this is not the case, adjust the sampling speed knob correspondingly and perform steps 1) to 8) again.

### 3. Calibration

Before doing a calibration make sure that the cells are clean and totally dry. To check this you could run a dry air measurement see page 18 (top).

Density meter: select calibration method (Calib.)

In case B (combination RE and DE) the following options have to be selected on the RE (master) as well as on the DE (slave).

- Press <METHOD> key
- Select method **0. Calib.**
- confirm with <ENTER>

< Method List >			
No.	Name	Temp.(°C)	Result
<b>0.</b>	<b>Calib.</b>	<b>20.00</b>	<b>nD</b>
1.	Combi.	20.00	nD
2.	Method-2	20.00	nD
3.	Method-3	20.00	nD
4.	Method-4	20.00	nD

- Press <RINSE/PURGE> key - Wait until the message **"Ready"** appears on the display

0. Calib.	01-01
Temp. (°C)	nD(none)
<b>Ready</b>	

- Set a vial with bi-distilled water into position 1
- Press <CALIB.> key
- Wait until calibration is done: message **"Calibration OK"** appears on the display
- Remove the vial from position 1

## 4. Measurement (example with 10 vials)

Select the method for the measurement (Combi.) on the DE (case A) or on both DE and RE (case B).

### DE:

- Press <METHOD> key
- Select method **1. Combi.**
- confirm with <ENTER>

< Method List >			
No.	Name	Temp.(°C)	Result
0.	Calib.	20.00	d
<b>1.</b>	<b>Combi.</b>	<b>20.00</b>	<b>d</b>
2.	Method-2	20.00	d
3.	Method-3	20.00	d
4.	Method-4	20.00	d

### RE:

- Press <METHOD> key
- Select method **1. Combi.**
- confirm with <ENTER>

< Method List >			
No.	Name	Temp.(°C)	Result
0.	Calib.	20.00	nD
<b>1.</b>	<b>Combi.</b>	<b>20.00</b>	<b>nD</b>
2.	Method-2	20.00	nD
3.	Method-3	20.00	nD
4.	Method-4	20.00	nD

In case B all further operations have to be started from the refractometer as the master. The following example shows how to measure 10 vials.

- Set your 10 vials into positions 1-10
- Press <SAMPLE> key
- Set Max.Meas.No. : 10
- Set Next.Meas.No.: 1
- Set Method : Current
- If you want to enter sample ID
- Select **Set Parameter: Execute**

<Sample>			
Sample File	:	Skip	Load Save
Max.Meas.No.	:	[ 10 ]	
Next.Meas.No.:	:	[ 1 ]	
Method	:	<b>Current</b>	Variable
Set Parameter	:	[Execute]	
Exit	:	[Execute]	

- Enter your sample IDs in the list
- Use the alphanumeric keyboard to enter the sample ID (press the <DISPLAY> key to switch between letters and numbers.

<Sample List>			
No.	M	S.No.	Sample ID
1	1	01-01	
2	1	01-02	
3	1	01-03	
4	1	01-04	
5	1	01-05	
6	1	01-06	
7	1	01-07	
8	1	01-08	
9	1	01-09	
10	1	01-10	

- Press the <MEASURE> key
- The message "**Measuring**" will be displayed
- Wait until the message "**Result**" appears on the display

1. Combi.	01-01
Temp. ( °C)	nD(none)
<b>Result</b>	

## 5. Emergency sample

It can happen that after you have started the measurement of 24 samples a new sample comes in, which has to be measured immediately. The SC24 Sample Changer has an emergency sample feature, which allows to run this urgent sample without having to interrupt the whole measurement sequence.

**Note:** When you want to measure emergency samples, make sure the "**Start Position**" in "Function x" "Changer" is set to "**Home**". Running emergency samples is not possible with the "Current" setting.

Whenever such an emergency sample has to be measured and the system is already measuring the various samples in the turntable, just press the <MEASURE> key and wait until the actual sample being measured is done (including rinsing and purging). Then the following message will be displayed:

- Select <**Emergency**>
- confirm with Exit: [Execute]

< Emergency Parameter >	
Next Sequence	:< <b>Emergency</b> >
Exit	: [Execute]

- Select the method to be used to measure the emergency sample
- Select the sampling speed:  
Low: adjusted by speed knob (\*)  
High: maximum speed
- confirm with Exit: [Execute]

< Emergency Parameter >	
Next Sequence	:<Emergency>
Method No.	: [2]
Sampling Speed	:<Low>
Exit	: [Execute]

(\*) sampling speed knob on the right side of the SC24.

Follow the instructions on the display.

## 6. How to optimize measurements

Depending on your needs, you will have to set up some parameters slightly different from the standard settings described above.

### 6.1. Sampling and drain: automatic versus set

In the standard settings you may select two different kinds of sampling/drain modes:

Method	<b>0.Calib.</b> (calibration)	<b>1.Combi.</b> (measurement)
Sampling	Set Sampling time: 15s	Auto O.S.Rate: 30%
Drain	Set Drain time: 15s	Auto Drain Rate: 70%

The reason is that the calibration is always done with water, and therefore the fixed time will guarantee to have always the same amount of water sampled and drained.

When measuring various samples we have to select a different approach. When a fix time is selected, it could happen that the sampling time would be just right for one type of sample but not for another, since these samples could differ in viscosity:

- A short sampling time would be right for a sample with low viscosity, but not long enough for a sample with high viscosity (which would perhaps not even fill the measuring cell of the density meter).
- A long sampling time would be right for a sample with high viscosity, but too long for a sample with low viscosity (after emptying the vial, air instead of the sample would fill the measuring cell of the density meter).

The auto feature for sampling and drain allows to perform the same sampling, independently of the viscosity of the sample.

#### Auto-sampling and auto-draining:

When starting the measurement the pump will switch on and the internal timer will measure the time until the refractometer detects a change in its measuring cell (which means that some liquid sample has reached the measuring cell). This measured time will be  $t_1$  (for example  $t_1 = 15s$ ). It will then add to this measured time the percentage defined in O.S. Rate (over sampling rate).

The drain time will then be calculated as a function of the total sampling time.

Example:  $t_1 = 15s$     O.S.rate = 30%    Drain rate = 70%  
sampling time =  $t_1 * (1 + O.S \text{ rate}) = 15 * (1 + 0.3) = 15 * 1.3 = 19.5s$   
drain time = sampling time \* drain rate =  $19.5 * 0.7 = 13.6s$

	t1 (detected)	O.S Rate	sampling time (calculated)	Drain Rate	drain time (calculated)
Sample with low viscosity	15s	30%	19.5s	70%	13.6s
Sample with high viscosity	40s	30%	52s	70%	36.4s

As the auto-sampling is based on detecting a change in the measuring cell, it requires a totally dry measuring cell (including all tubings before the cell)! This means that you have to make sure that the purge time is even a little bit longer than is needed to get the cell dry.

We recommend using this auto-sampling only if you have to measure samples with many different viscosities. If you only have two types of samples you can even set up two different methods with fixed sampling and drain times:

Method	<b>0.low vis</b>	<b>1.high vis</b>
Sampling	Set Sampling time: 15s	Set Sampling time: 40s
Drain	Set Drain time:14s	Set Drain time: 37s

## 6.2. Correct rinsing and purge times:

You have to find the correct rinsing time: if it is too long it will lower your measurement throughput, if it is too short residuals in the cell will contaminate your next sample. The correct rinsing time depends very much on sample and rinsing solution and therefore has to be determined experimentally.

First you have to select the two rinsing solutions. The rinse-1 solution must be a dedicated solvent for your sample, the rinse-2 a highly volatile solvent to allow a quick drying of the tubes and measuring cells. Typical rinse-1 and rinse-2 solutions are:

Sample containing ....	Rinse-1 solution (to dissolve the sample)	Rinse-2 solution (to dry the cell)
...non-polar solvents (e.g. oil products)	- Toluene - Hexane	- Ethanol
...polar solvents (e.g. aqueous solutions, juices)	- Water	- Acetone - Ethanol

Correct rinsing time means that the two measuring cells must be totally clean after the rinsing procedure (no residuals). To check if your selected rinsing times are correct you should run a pure water sample after the rinsing procedure. If both cells are 100% clean the measurement results should show the values for pure water:

	Density (g/cm <sup>3</sup> )	refractive index
<b>Water (20°C) :</b>	<b>0.99821</b>	<b>1.33299</b>

**Note:** Ethanol is less volatile than acetone, therefore the purge time would be longer with ethanol than with acetone.

Correct purging time means that the two measuring cells must be totally dry after the rinsing procedure (no more rinsing solution left). To check if your selected purge time is correct you should run a dry air measurement after the purge procedure. If both cells are 100% dry the measurement results should show the values for air:

	Density (g/cm <sup>3</sup> )	refractive index
<b>Dry air (20°C) :</b>	<b>0.00120</b>	<b>no measure</b>

**Note:** Refer to the operating manuals of the density meter and the refractometer for water and air values at other temperatures.

### 6.3. Other parameters:

#### Calibration:

Automatically performs a calibration before each measurement sequence.

```

< Changer >
Changer          :<SC24>
Calib.          :Off  On
Start Position   :Home  Current
Exit             :[Execute]
  
```

This means that you will have to put a vial filled with bi-distilled water in position 1, the samples to be measured being in position 2-24.

#### Start position:

**Home:** the measurement will start with vial in position 1.

**Current:** the measurement will start with the vial in the current position.

```

< Changer >
Changer          :<SC24>
Calib.           :Off  On
Start Position :Home  Current
Exit             :[Execute]
  
```

#### Sample file:

This is used to load a sample file from a Memory Card (and to save the current defined sample file on a Memory Card)

```

<Sample>
Sample File      :Skip Load Save
Max.Meas.No.    :[ 10]
Next.Meas.No.   :[ 1]
Method          :Current
Variable
Set Parameter    :[Execute]
Exit             :[Execute]
  
```

#### Method:

Variable is used to assign different methods to different samples.

Current means only one method (the current one) will be used to measure all samples.

```

<Sample>
Sample File     :Skip Load Save
Max.Meas.No.    :[ 10]
Next.Meas.No.   :[ 1]
Method          :Current Variable
Set Parameter    :[Execute]
Exit             :[Execute]
  
```

## 7. Error Messages

<Error messages on DE51/DE50/DE40 and RE50>

Error Messages	Contents	Countermeasures
Nozzle Error! ↕ (Displayed alternate) Remove the interference	Nozzle unit does not move in the normal way.	<ul style="list-style-type: none"> <li>• Remove the obstruction.</li> <li>• When the nozzle is bent or broken, replace it with a new one.</li> <li>• Press [STOP] key for resetting.</li> </ul>
Table Error! ↕ (Displayed alternate) Remove the interference	Turntable does not rotate properly.	<ul style="list-style-type: none"> <li>• Remove the obstruction.</li> <li>• Press [STOP] key for resetting.</li> </ul>
Connect Error! ↕ (Displayed alternate) Check Connect Cable	Communication with SC24 is not good.	<ul style="list-style-type: none"> <li>• Check and see if the cables are properly connected.</li> <li>• Check and see if "SC24" is selected in the setting of "Function 3" with the connected instrument.</li> </ul>
Other error messages	Troubles with Density meter or Refractometer	<ul style="list-style-type: none"> <li>• See the operation manuals for Density meter or Refractometer.</li> </ul>

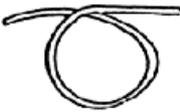
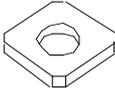
<Error messages on RE40>

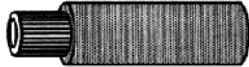
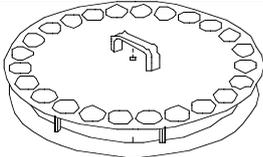
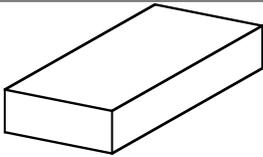
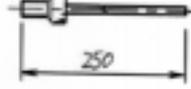
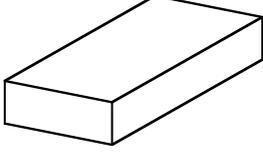
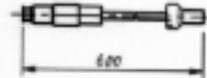
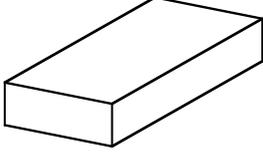
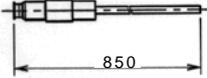
Error Message	Contents	Countermeasures
Nozzle Error!	Nozzle unit does not move in the normal way	<ul style="list-style-type: none"> <li>• Remove the obstruction.</li> <li>• When the nozzle is bent or broken, replace it with a new one.</li> </ul>
Table Error!	Turntable does not rotate properly.	<ul style="list-style-type: none"> <li>• Remove the obstruction.</li> <li>• Press [STOP] key for resetting.</li> </ul>
Connect Error!	Communication with SC24 is not good.	<ul style="list-style-type: none"> <li>• Check and see if the cables are properly connected.</li> <li>• Check and see if "SC24" is selected in the setting of "Function2" with the connected instrument.</li> </ul>
Other error messages	Troubles with the Refractometer	<ul style="list-style-type: none"> <li>• See the operation manual for the Refractometer.</li> </ul>

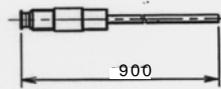
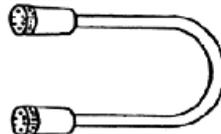
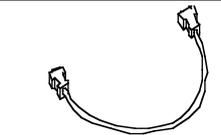
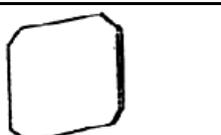
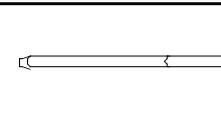
<The Display on the SC24 Indicator>

LED Display of the Main Unit	Contents	Countermeasures
Blinking of [SAMPLE] and [PURGE] LED.	The nozzle unit does not move in the normal way. (Nozzle Error!)	<ul style="list-style-type: none"> <li>●Remove the obstruction.</li> <li>●When the nozzle unit is bent or broken, replace it with a new one. Press [STOP] key for resetting.</li> </ul>
Blinking of [RINSE-1] and [RINSE-2] LED.	The turntable does not rotate properly. (Table Error!)	<ul style="list-style-type: none"> <li>●Remove the obstruction.</li> <li>●Press [STOP] key for resetting.</li> </ul>
Blinking of [PURGE] and [RINSE-1] LED. (Only for SC24H)	Temperature fan does not rotate properly. (Heater Error!)	<ul style="list-style-type: none"> <li>●Contact your local dealer of METTLER TOLEDO.</li> </ul>
Blinking of [AUTO] LED.	Holding state. (Pause)	<ul style="list-style-type: none"> <li>●Follow the messages displayed on Density meter or Refractometer.</li> </ul>
All LED turn on	Uncontrollable condition	<ul style="list-style-type: none"> <li>●Contact your local dealer of METTLER TOLEDO.</li> </ul>

## 8. Consumables and spare parts

ME-No.	Part Name	Qty	Remarks	Sketch
51328099	Vial bottle	1 set	20mL× 20pcs.	
51328127	Rinse bottle	1 pc.	1 L	
51322012	Desiccant tube	1 pc.		
105080	Silica gel	1 pc.	500g	
51322239	Tube joint B	1 pc.		
51322022	Tubular Fuse 5A	1 set	T5A/250V, 5 pcs.	
51328136	Tube for rinse needs 51322231 + 51322207 Old type of SC24	1 pc.	BT tube, 1m	
51328027	Tube nozzle A	1 pc.		
	Nozzle joint stopper (Nut)	1 pc.		
51322246	Cap	1 set	100 pcs.	
51328131	Nozzle foam pads (white PE foam)	1 set	10 sheets	
51328169	Nozzle foam pads (orange silicone rubber)	1 set	10 sheets	

ME-No.	Part Name	Qty	Remarks	Sketch
51322200	Nozzle unit	1 pc.		
51328137	Filter	1 pair	For rinsing solution 2 pcs. for one pair	
51322247	Turn table	1 pcs.		
51322007	Connection kit for Density meter	1 set	51322232 (1 pc.) 51322233 (1 pc.) 51322238 (2 pcs.) 51322239 (2 pcs.) 105010 (1 pc.)	
51322232	Connection tube A for Density meter to SC24	1	L=250mm	
51322233	Connection tube B for Density meter to SC24	1 pc.	L=250mm	
51322008	Connection kit for Refractometer	1 set	51322234 (1pc.) 51322235 (1pc.) 51322012 (1 set) 105080 (1pc.) 105010 (1pc.) FCU-520 (1 set)	
51322234	Connection tube A for Refractometer to SC24	1 pc.	L=800mm	
51322235	Connection tube B for Refractometer to SC24	1 pc.	L=600mm	
51322009	Connection set SC24/Combination	1 set	51322232 (1pc.) 51322236 (1pc.) 51322237 (1pc.) 51322238 (2 pcs.) 51322239 (2 pcs.) 51190362 (1pc.) 105010 (1pc.) FCU-520 (1 set)	
51322236	Connection tube C for Density meter to Refractometer	1 pc.	L=850mm	

ME-No.	Part Name	Qty	Remarks	Sketch
51322237	Connection tube D for Density meter to Refractometer	1 pc.	L=900mm	
105010	Connecting cable	1 pc.		
51190362	Connecting cable for RS-232C	1 pc.		
51328165	Air intake filter	1 set	5 pcs.	
51322243	Rinse bottle tube for new type of SC24	1 pc.	1m	
1322201	Nozzle (SUS)	1 pc.		
51322204	O-ring with a washer	1 set	for nozzle	
51322203	Seal	1 pc.	for nozzle	
51322231	Conical stopper for liquid pump (Stopper) Old type of SC24	1 set	5 pcs. (for solvent/pump line)	
51322207	Sample nozzle fitting (Male joint)	1 pc.	for rinse tube	

## 9. Specifications

### 9.1. Specification SC24

	Item	Specifications
1	Type and model name	SC24 Sample changer
2	Maximum sample number	24
3	Min. sample required	10mL
4	Sample vessel	20mL vial
5	Sample arrangement	Turntable system
6	Sampling system	Injection system with a built-in pump
7	Auto-processing functions	Sampling, draining, rinsing (2-way) and drying
8	Setup temperature	Ambient temperature
9	Auto-calibration sequence	Calibrated with air & water or with two standards
10	Sequence setup	Set on DE or RE
11	Control a) Automatic b) Manual	Start at DE or RE For maintenance only
12	Display method	LED
13	External I/O	Simple serial I/F
14	Connectable equipment	Density/specific gravity meter DE51, DE50, DE40 Refractometer RE50, RE40
15	Ambient condition	1) Temperature: 5 ~ 35°C 2) Humidity: Up to 85% RH (non-condensing)
16	Power supply	1) AC100-120 or 200-240V 2) 50 or 60Hz 3) 760W (maximum)
17	Power consumption	Approx. 40W (main unit only)
18	Dimension	595 (W) × 422 (D) × 407 (H) mm
19	Weight	Approx. 16kg
20	CE marking	EMC (noise) EN55022, EN50082-1 LVD (Safety) EN61010-1 (fully compliant)

## 9.2. Specification SC24H

	Item	Specifications
1	Type and model name	SC24H Sample changer
2	Maximum sample number	24
3	Min. sample required	10mL
4	Sample vessel	20mL vial
5	Sample arrangement	Turn table system
6	Sampling system	Injection system with a built-in pump
7	Auto-processing functions	Sampling, draining, rinsing (2-way) and drying
8	Setup temperature	Ambient temperature ~ 70°C
9	Auto-calibration sequence	Calibrated with the two standards, dried air and degassed pure water
10	Sequence setup	Set on DE xx
11	Control a) Automatic b) Manual	Start at DE xx Only manual entry (No [Start] key available)
12	Display method	LED
13	External I/O	Simple serial I/F
14	Connectable equipment	Density/specific gravity meter DE51, DE50, DE40
15	Ambient condition	1) Temperature: 5 ~ 35°C 2) Humidity: Up to 85% RH (non-condensing)
16	Power supply	1) AC100/120/ 220/230/240V 2) 50 or 60Hz 3) 1050W (maximum)
17	Power consumption	Approx. 330W (main unit only)
18	Dimension	603 (W) × 430 (D) × 425 (H) mm
19	Weight	Approx. 25kg
20	CE marking	EMC (noise) EN55022, EN50082-1 LVD (Safety) EN61010-1 (fully compliant)

The SC24H itself will automatically adjust to your line voltage. But you have to select the correct voltage for the heating part. Factory setting is 220 - 240 V.

The temperature for the sample changer is set on the manual knob in the front of the SC24H.

For a quicker starting-up it is advisable to set the temperature to 00 °C because the SC24H will only work when the set temperature has been reached.

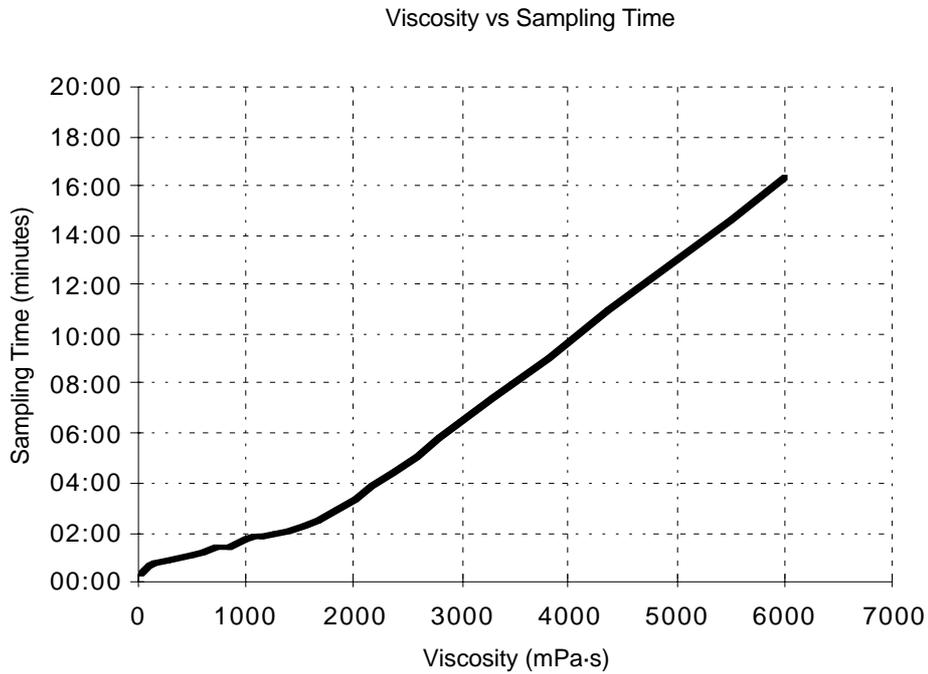
### 9.3. Specification SC24L

	Item	Specifications
1	Type and model name	SC24L Sample changer
2	Maximum sample number	24
3	Min. sample required	10mL
4	Sample vessel	20mL vial
5	Sample arrangement	Turn table system
6	Sampling system	Injection system with a built-in pump
7	Auto-processing functions	Sampling, draining, rinsing (2-way) and drying
8	Setup temperature	4 °C ~ Ambient temperature
9	Auto-calibration sequence	Calibrated with the two standards, dried air and degassed pure water
10	Sequence setup	Set on DE or RE
11	Control a) Automatic b) Manual	Start at DE or RE Only manual entry (No [Start] key available)
12	Display method	LED
13	External I/O	Simple serial I/F
14	Connectable equipment	Density/specific gravity meter DE51, DE50, DE40 Refractometer RE50, RE40
15	Ambient condition	1) Temperature: 5 ~ 35°C 2) Humidity: Up to 85% RH (non-condensing)
16	Connecting tube in/outlet	INLET: $\phi$ 10 taped joint OUTLET: $\phi$ 10 taped joint
17	Thermal insulation required for connecting tube between main unit and bath	Tube length: within 1200mm Insulation tube: more than 200mm Inside thickness of tube: more than 10mm Thermal conductivity of tube: less than 0.04W/(m·K)
18	Cooling capacity required for thermal bath	Over 200kcal/h/35°C for use at 5 to 35°C ambient Over 160kcal/h/25°C for use at 5 to 30°C ambient
19	Power supply	1) AC100-120 or 200-240V 2) 50 or 60Hz 3) 760W (maximum)
20	Power consumption	Approx. 40W (main unit only)
21	Dimension	603 (W) × 430 (D) × 407 (H) mm
22	Weight	Approx. 20kg
23	CE marking	EMC (noise) EN55022, EN50082-1 LVD (Safety) EN61010-1 (fully compliant)

Please note that the water compartment of the SC24L is not sealed. If too much water is filled in (or too many air bubbles) this may result in water leakage through the screw holes around the turntable.

## 9.4. Reference

### 9.4.1. Sample viscosity and sampling time



Measurement Parameter: Sampling (Auto), Over Sampling Rate (100%)  
Drain (Auto), Drain Rate (150%)  
Sampling Speed (High)

Examples of viscosity values at 20°C

Water:	1 mPas
Olive oil:	100 mPas
n-Hexane:	0.31 mPas
Liquid Honey:	10 <sup>4</sup> mPas

**Note:** In the example shown the septum for closing the vials is not used. The sampling time will be longer when the septum is used.

### 9.4.2. Measuring System

#### Flow Chart

