Automatic Potentiometric Titrator



Operation Manual



Please read this manual thoroughly in advance for the best performance of the equipment.

KYOTO ELECTRONICS MANUFACTURING CO., LTD. http://www.kyoto-kem.com AN 59-00419-01Ver.00

Introduction

Overview of the instrument

We thank you for your continued patronage of KEM products. The AT-710 Automatic Potentiometric Titrator you have purchased is the latest titration system to determine concentration of target substance in liquids or solids, operated easily and resulting quickly with high precision and accuracy. By changing the electrode and preamplifier, those titrations like acid base, redox and photometric can be equally performed as well.

[Features]

1) Compact design

Burette drive unit is designed more compact than before and can be installed in A4 size.

2) Highly accurate burette

A highly accurate burette of burette resolution 1/20,000 is installed. The piston head is improved, so the design becomes that air-bubble is not produced so much.

3) USB flash drive is designed at external control

The measurement result and the method are stored in USB flash drive, and data can be managed as an electron record. Moreover, the measurement result can be stored as PDF file, and the convenience of data has been improved. A keyboard for the input of number, a barcode reader for the sample setting and a foot switch that can start to measure without touching a device are installed as option. The working efficiency of measurement improved for customer's usage.

4) Method making software is equipped as standard

Method can be made on PC and can be transferred to the memory of main unit by copying equipped Software to CD-ROM with USB.

5) Burette can be selected 1 unit and 2 unit type.

AT-710 is installed 1 burette, and in addition, can be installed one more burette. 2 burettes can be used without increasing space.

6) For several languages

Chinese (Chinese classics), Korean, Russian and Spanish are installed besides English and Japanese.

7) <u>GLP/GMP conformed</u>

Operator names can be registered. And check results with standard substances and calibration results of electrodes can be recorded.

8) Sample changer (CHA-700)(option) can be connected

Sample changer of compact 6 samples or 11 samples can be connected, and can be used for multiple sample measurement. It can be connected electrode cleaning as option and a beaker after measurement can be used.

9) <u>Can be upgraded to high-end model.</u>

Measurement by moisture titrator and potentiometric titrator can simultaneously be performed by connecting with the MCU-710.

10) Smart electrode (CHA-700)(option) can be connected

You can use the smart electrode on which electrode information or calibration information can be recorded. An electrode error can be handled or an expiration date of the electrode can be monitored.

11) SOFT-CAP(option)

Data of Excel and CSV format can be edited directly by SOFT-CAP with PC.

Important:

You must observe the following rules in order to prevent physical or property damage of yourself as well as of the others.

Meaning of Symbols

Warning	Danger of severe injury or possible death
Caution	Risk of physical or property damage
\bigcirc	This symbol means Prohibition.
	This symbol means Mandatory.

Place for Installation

Use the devices indoors, and avoid a place under any of the following conditions to avoid malfunction.

	Caution					
\bigcirc	Operation of devices with strong electric motors using common power source	\bigcirc	Under direct sun light	\bigcirc	Corrosive gas atmosphere	
\bigcirc	Near strong magnetic/electric field					
\bigcirc	Heavily loaded and fluctuated or near power source or magnetic field	\bigcirc	Excessive range of temperature other than specified	\bigcirc	Ambient humidity exceeding 85%RH	
\bigcirc	Under vibration	\bigcirc	Location with large temperature difference			

Power Source



Test Sample

Warning



Some sample or chemical requires protective gloves, glasses and mask. Ventilate the room. Splashing chemical may injure the eyes or skin. Windpipe

may be hurt if fume is inhaled.

Do not use chemical which may generate inflammable gas or work in such atmosphere. Be aware of a risk of explosion inside the system.

About place for storage

If the unit is not used for an

regent in the burette, and clean it with pure water or

methanol before storage.



It is recommended to extended period of time, first pack the main unit in clean the electrode and place the carton box in it for storage. Also discard the which the instrument was first delivered

Avoid the places for storage under inadequate ambient conditions such as extremely high/low temperature, high humidity or heavily dusty atmosphere

About Use



About reagents



The liquid contact part on burette and reagent bottle is made of materials such as glass, ceramics or fluorocarbon polymer. Refrain from using reagents containing solid medium that may be incompatible with these materials.

Note that Precautionary statements of the reagent label.

Dispose of in accordance with laws and regulations.

Other Cautions

Caution					
\oslash	Do not attempt overhaul or repair the unit by unauthorized person except authorized by KEM. Danger of electric shock, fire or malfunction.	Do not use the unit in a way other than specified. Danger of fire, electric shock or malfunctioning of the unit.			
\oslash	instrument. Doing so may adverse discoloration or cracks. When cleaning tissue paper, after applying detergent	acetone, thinner or the like for cleaning this y affect the instrument, e.g. deformation, g this instrument, wipe it with a soft cloth or diluted with water to the soft cloth or tissue cess water in order not to allow water drops to			
Enviro	nment				
		lowing conditions classified in the section 1.4.1			
		ve, 2014/35/EU, EN61010-1): altitude up to			
	000m; over voltage CAT II; pollution dec				
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules and RE Directive. These limits are designed to					
provide reasonable protection against harmful interference in a residential installation. This					
equipment generates, uses and can radiate radio frequency energy and, if not installed and					
	used in accordance with the instructions, may cause harmful interference to radio				
communications. However, there is no guarantee that interference will not occur in a					
particu	ular installation.				

About the Manual

Read this operation manual thoroughly before use. It describes all that are required for routine measurements. Keep this manual beside your equipment so that you can refer to whenever necessary.

For detailed test methods, see the separate Function Description.

The following symbols indicate the important notes that raise your attention.

1. Note



Unless you observe the note, you may not be able to obtain specified performance of the unit, and your unit may not be covered by warranty.

2. Hint



This symbol notes technical tips which are convenient to your measurement work.

- %In this manual, [\land], [\lor], [<SAMPLE] and [STIRRER>] key are explained the sign each of[↑], [\downarrow], [\leftarrow]and [\rightarrow].
- XIt is prohibited to duplicate any part or all of manual without prior consent.
- *This manual has been prepared to the best of our knowledge; however, if you should find any missing or ambiguous description, please contact your nearest dealer or sale representative.
- %Maker will not be liable for any loss or damage caused by use of or the result of the product.
- XAII other product and service names listed in this website are trademarks or registered trademarks of their respective companies.
- ※Internet Explorer and Microsoft Excel® is the registered trademark of US Microsoft Corporation in US and other countries. Google and Android are trademarks or registered trademarks of Google Inc.
- *This manual describes usage according to standard specification. For special version, refer to the accompanying document.



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1. Preparations for measurement

1-1. Supplied parts

Check the supplied parts referring to the following parts list. If you should find any missing or broken parts including the main unit, accessories or manual, contact your sales representative or local dealer.

Part Description	Qty	Remarks
Main Unit	1	
MS-710A Magnetic Stirrer	1	
Propeller Stirrer Set		
EBU-710 Burette Unit	1	
Vial for Degassing (with Septum)	1	
Seal	1	
Clamp Filter	1	
AC Adapter Type4	1	
Power Cord (EU,KR) with PlugC(WS-010)		200-240 V
Power Cord (US,TW) with PlugB(WS-001)	1*	100-120 V
Power Cord (GB) with PlugG(WS-012A)	T.	220-240 V
Power Cord (CN) with PlugI(WS-015D)		200-240 V
Piston Removing Tool	1	
AT-710 Operation Manual (CD-ROM)	1	With Software
AT-710 Quick Reference	1	
AT-710 Quick Reference	1	
Safety Instructions	1	
Packing List	1	
Contact	1	
Inspection Certificate/Warranty	1	
	Main UnitMS-710A Magnetic StirrerPropeller Stirrer SetEBU-710 Burette UnitVial for Degassing (with Septum)SealClamp FilterAC Adapter Type4Power Cord (EU,KR) with PlugC(WS-010)Power Cord (US,TW) with PlugB(WS-001)Power Cord (GB) with PlugG(WS-012A)Power Cord (CN) with PlugI(WS-015D)Piston Removing ToolAT-710 Operation Manual (CD-ROM)AT-710 Quick ReferenceAT-710 Quick ReferenceSafety InstructionsPacking ListContact	Main Unit1Main Unit1MS-710A Magnetic Stirrer1Propeller Stirrer Set1EBU-710 Burette Unit1Seal1Clamp Filter1AC Adapter Type41Power Cord (EU,KR) with PlugC(WS-010)1Power Cord (GB) with PlugG(WS-012A)1*Power Cord (CN) with PlugI(WS-015D)1Piston Removing Tool1AT-710 Quick Reference1AT-710 Quick Reference1Safety Instructions1Packing List1Contact1

*Make sure your country's power requirement.



Please refer to the section "8-1. Parts list" when ordering these parts.

1. Preparations for measurement

eemperience				
Part Number	Part Description	Qty	Remarks	
-	MS-710A Magnetic Stirrer	1		
20-06836	Stand Bar	1		
-	Stopper	1		
12-04299	Multi Electrode Holder	1		
64-01156	Connecting Cable 0.6m	1	For Stirrer	
66-00125-04	Stirrer Rotor L=25	1		

- Components of MS-710A Magnetic stirrer (12-05356) -

- Components of Propeller Stirrer set (12-05639) -

Part Number	Part Description	Qty	Remarks
12-03566	Propeller Stirrer	1	
12-03567	Holder Unit	1	
12-04299	Multi Electrode Holder	1	

- Components of EBU-710 Burette Unit (12-05641-05, 10, 20) -

Part Number	Part Description	Qty	Remarks
-	Burette Unit	1	
12-01260-01	Desiccant Tube φ18×120 with Zeolite	1	
20-04052-00	Nozzle Cover	1	
12-03644	Connection Tube2×3 L=620 PFA	1	
12-03044	(for Nozzle)		
12-03645	Connection Tube2×3 L=730 PFA	1	
12-03045	(for Bottle)		
12-00169-02	Diffusion Proof Nozzle(with Degassing	1	
12-00109-02	Tube)		
20-04050-00	Nozzle FEPφ3×2-0.5 L=150	1	
12-03926	Reagent Bottle Cap with Plug	1	
20-09813	Bottle stand	1	
69-00028-00	Polyethylene Bottle 1L	1	
20-06823	Bottle holder (1)	1	φ85

1

Please refer to the section "8-1. Parts list" when ordering these parts.

Note



The following parts, electrode, electrode cable, temperature compensation electrode and electrode internal solution are included when separately ordering.

When the photometric titration kit is purchased, the following parts are also included in the kit.

Part Number	Part Description	Qty	Remarks
12-00110-00	Photometric Sensor	1	
64-01018	Connection Cable (MiniDIN8P-8P)1.5m	1	
12-00112-00	Interference Filter(530nm)	1	Equipped to the photometric sensor.
12-00112-01	Interference Filter(630nm)	1	
20-07257	Shutter	1	

When the polarization titration kit is purchased, the following part is also included in the kit.

Part Number	Part Description	Qty	Remarks
12-03840	Twin Platinum Electrode(M-511)	1	

When the conductometric titration kit is purchased, the following part is also included in the kit.

Part Number	Part Description	Qty	Remarks
12-01762	Conductivity Cell(K-321)	1	

When the burette unit is purchased, the following parts are also included in the kit.

Part Number	t Number Part Description		Remarks
-	Burette Unit		
12-01260-01	Desiccant Tube φ18×120 with Zeolite	1	
20-04052-00	20-04052-00 Nozzle Cover		
12-03644 Connection Tube2×3 L=620 PFA (for Nozzle)		1	
12-03645	Connection Tube2×3 L=730 PFA (for Bottle)	1	
12-00169-02	Diffusion Proof Nozzle(with Degassing Tube)	1	
20-04050-00	20-04050-00 Nozzle FEPφ3×2-0.5 L=150		
12-03926	Reagent Bottle Cap with Plug	1	
20-09813	Bottle Stand	1	
69-00028-00	Polyethylene Bottle 1L	1	
20-06823	20-06823 Bottle holder (1)		φ85
12-03645-01	Connection Tube2×3 L=980 PFA (for Bottle)	1	



Please refer to the section "8-1. Parts list" when ordering these parts.

1-2. Installation and start-up

1-2-1 Installation of burette unit

- 1) As shown below, slide the burette unit from the right, and hitch the piston pushrod to the drive screw. If you put the housing on the guide pin and slide it, you will find it easier to adjust the height.
- 2) To place the burette unit, insert the hole of the housing of the burette unit into the two guide pins.



If the length of the piston pushrod out of the cylinder is too short or too long, the burette unit cannot be put to the shaft of the main unit. Refer to "3-13. Replacing burette unit" to adjust the length of the piston pushrod.

3) To fix the burette unit, hold down the top of the burette unit and tighten the burette stopper.



1-2-2. Assembly of magnetic stirrer

<For propeller stirrer>

1) Loosen screws of bottom in main unit. Slide the holder unit to insert to the interior, and tighten screws again.



2) Install the multi electrode holder to the stand bar. Install the electrode holder with the lever under the electrode holder.



1. Preparations for measurement

<For Magnetic stirrer>

- 1) Squeeze the stand bar into the Magnetic Stirrer as shown below.
- 2) Install the multi electrode holder to the stand bar for Magnetic Stirrer. Install the electrode holder with the lever under the electrode holder.



3) Connect Magnetic Stirrer and Automatic Potentiometric Titrator with the Connecting Cable as shown below.



1-2-3. Assembly of burette unit

- 1) Install the nozzle cover to bottle stand.
- 2) Tighten the connection tube (L=620mm) (No.2) to the position of No.2 of the switching valve. Tighten the diffusion proof nozzle to the tip of a reverse-side, and store it in the electrode holder. Place the diffusion proof nozzle with its discharge outlet facing outside.

When using the titration nozzle in order to perform constant dose, change the tip of diffusion proof nozzle (12-00169-02) to the Nozzle FEP ϕ 3×2-0.5 L=150 before connecting it with the tube. (Refer to "6-2-6. Replace titration nozzle").

- 3) Pass through the connection tube (L=730mm) (No.1) to the reagent bottle cap and tighten to install it (Please check that the Long male union and the stopper are attached to the tube). Match the tube to the position that reaches the bottom of the reagent bottle. Tighten the tip of a reverse-side to the position of No.1 of the switching valve.
- 4) Peel off the seal on Desiccant Tube ϕ 18×120 with Zeolite, and install it onto the reagent bottle cap.



Remove the seal on the Desiccant tube first.

Hold the tube not to loosen and turn only the union when installing the tube to **Note** the switching valve. Be careful not to break the tube.

A GL45 1L bottle or a 500mL container with 27mm bore can be placed to the reagent bottle screw cap. If the bore of your reagent bottle does not match the bottle stand, use the provided bottle holder.

You may remove the blue cover of the connecting tube when you use a titrant which is not affected by deterioration of a reagent.

1-2-4.Installation of electrode and Stirrer

Install each electrode (option) and propeller stirrer (not required with a magnetic stirrer) to the electrode holder and fix it with the lock screws as figure below. Place an electrode farthest from the nozzle when stirring.



The electrode cable must be securely connected to the electrode connector as figure until it clicks in, and then tighten the cap. Loose connection may result in abnormal signal detection. An electrode with the lead already connected does not require this step.

Fix the stopper at the height that the electrode does not hit a beaker even if the electrode holder goes down at the bottom. Adjust the vertical position of electrode holder with the lever under the electrode holder.



Connect the electrode lead to the preamplifier in the back of main unit. Turn round and lock the terminal G1 after inserting the connector. Connect the cable (which is not an electrode lead wire) of the smart electrode to the ELE connector. Install the propeller stirrer (or Magnetic Stirrer) and the temperature combined electrode as to match the direction of the connector in the figure below.



Combined glass electrode

(ombination and (onnecting position of electrode and electrod	
Combination and Connecting position of electrode and electrod	e cable

		Detector 1		Detector 2	
		G1: Glass electrode	R1:Reference	M2: Metal electrode	R2:Reference
		connecting	electrode connecting	connecting	electrode
		terminal	terminal	terminal	connecting terminal
Combined	Electrode	Combined glass			
glass		electrode			
electrode	Electrode	64-00726-31 or			
	cable	64-00726-41			
Glass	Electrode	pH glass electrode	Reference electrode		
electrode		or ion electrode			
or Ion	Electrode	64-00726-31 or	Transparent side cable		
electrode	cable	64-00726-41	for 64-00726-33 or		
			64-00726-43		
Metal	Electrode	Metal electrode	Reference electrode	Metal electrode	Reference electrode
electrode		(M-2xx) (M-3xx)		(M-2xx) (M-3xx)	
	Electrode	64-00726-31 or	Transparent side cable	Transparent side	Transparent side
	cable	64-00726-41	for 64-00726-33 or	cable for	cable for
			64-00726-43	64-00726-33 or	64-00726-33 or
				64-00726-43	64-00726-43
Combined	Electrode	Combined electrode		Combined electrode(C-2xx ,-3xx,-8xx)	
electrode		(C-2xx ,-3xx,-8xx)			
	Electrode	64-00726-31 or		64-00726-33 or 64-00726-43	
	cable	64-00726-41		Transparent side	Black side cable
				cable	

The electrode is made of glass. If given excessive force, it may break and hurt your hand. Care should be taken when handle the electrode.

Please refer to the section "8-1. Parts list" when ordering these parts. **Note**

1-2-5.Installation of Clamp Filter

Install the clamp filter to AC adapter as figure below. Hold the clip of the clamp filter and open as figure below, and wrap treble remaining the tip by about 30mm.





Installation of the clamp filter to AC adaptor is needed to satisfy the condition of EMC standard.

1-2-6.Power cable

1) Make sure the power switch is in Off position as figure below.



3) Connect Power cord to the power outlet.

2. Parts configuration and each function 2-1. Appearance and Name <Front> 3)BuretteNo.1 4) BuretteNo.2 5)Stand bar 6)Propeller stirrer 2)Liquid crystal display 7)Electrode holder 1)Key panel 1) Key panel Use for each setting. 2) Liquid crystal display Display the measurement result or parameters. 3) Burette No.1 This burette can be used when the parameter of burette No. is set "1". 4) Burette No.2 This connects the additional burette, and can be used when the parameter of burette No. is set "2". 5) Stand bar Hold the electrode holder. 6) Propeller stirrer The stirrer spins to stir sample liquid.

7) Electrode holder This holder fixes the electrode and the titration nozzle.



8) Power switch

This switch turns on or off the unit. It should be noted the power must be turned on again at least 10 seconds interval.

9) STIRRER port

This connects the propeller stirrer or the stirrer to stir sample solution.

10) USB connecter

This connects USB flash drive to store the measurement result and method. Moreover, can be connected USB printer, the key board for inputting letters, the barcode reader for sample setting or the foot switch that can start to measure without touching the unit. The control with PC and the data communication with PC are possible by connecting PC (special data installation software "SOFT-CAP" is

necessary). 11) COM1 and COM2 port

These ports are for connections to Dot printer, Balance or PC. Dot printer can be connected only COM1 port.

12) SS-BUS port

This is for connection of options such as changer.



13) Preamplifier unit

This is the detector to detect potential of sample solution.

5 kinds of preamplifiers are prepared including the option.

Detector 1

G1: For connecting with the glass electrode

R1: For connecting with the reference electrode

T1: For connecting with the compensation electrode

Detector 2

M2: For connecting with the metal electrode

R2: For connecting with the reference electrode

Detector 3

Refer to "4-1. Use Preamplifier other than STD" for details.

14) TEMP.COMP. port

This is the connector to connect with the titrant temperature compensation sensor for the burette No.1.

15) ELE. port

This is for connecting the Smart electrode.

16) Power connecter (IN)

This is for connecting the power cable.

17) Power connecter (OUT)

This is for connecting the power cable for MCU-710.

<Burette Unit : (Ex. EBU-710-20)>

A titrant-injecting burette, a switching valve and a titration reagent bottle are included in this burette unit.



18) Switching valve

This is the cock switching the line between cylinder \leftrightarrow reagent bottle, cylinder \leftrightarrow titration nozzle.

19) Cylinder

The glass cylinder contains Karl Fischer reagent supplied in it.

20) Connecting tube No.1

Transmit titrant solution from the reagent bottle to the cylinder.

21) Connecting tubeNo.2

Transmit titrant solution from the cylinder to the reagent nozzle.

22) Desiccant tube

This tube with zeolite(molecular sieves (5A)) reduces dissolved gas like carbon dioxide that affects titrant.

23) Nozzle

This is the titration nozzle.

24) Reagent bottle

It contains reagent for titration.

25) Piston removing tool

Use this tool to manually operate the piston head of the burette.

2. Parts configuration and each function

<Stirrer>



26) Magnetic stirrer

The stirrer spins to stir sample liquid.

27) Stirrer bar

The stirrer bar spins to stir sample liquid.

28) Stirrer speed control Knob

Use this knob to adjust the stirrer rotating speed of the magnetic stirrer. Stirrer speed is adjusted by the set value of method of the titrator; however, stirrer speed can be adjusted with the stirrer speed control knob while measurement is in progress.

29) STIRRER port

This is the connector to which the cable from the stirrer to the main unit is connected.

2-2. Key functions (general)

Each key is positioned as shown below:



Description of each key

Key	Description
START/STOP	Key to start titration and to stop measurement on the main screen, and to stop the operation of burette on each of "MENU-1.Manual Operation." Key to return to the previous screen on a screen other than the above.
MENU/HOME	Key to move to menu screen from the main screen and to set the parameter. Also key to return to the main screen from each input screen.
\wedge	Cursor key and to change number.
V	Cursor key and to change number.
<sample< td=""><td>Cursor key and to move to the sample setting screen from the main screen. Parameter regarding the sample such as number or size can be set on the sample setting screen.</td></sample<>	Cursor key and to move to the sample setting screen from the main screen. Parameter regarding the sample such as number or size can be set on the sample setting screen.
STIRRER>	Cursor key and to operate On/Off of the stirrer on the main screen. The rotational speed is "Stirrer speed" you are currently selecting method. The speed can be adjusted with the knob when the magnetic stirrer is used.
ENTER	Key to confirm.

2-2-1.Basic key operation

<Select menu>

Menu screen displays when [MENU/HOME] is pressed. To select an item on the menu, move the cursor with [\uparrow], [\downarrow] and confirm with [ENTER].

▲ ▼ shows that the following screen exists.



<Select parameter>

To move parameters, use [\uparrow], [\downarrow]. When an item on the screen is shown by < $\circ \circ \circ$ > parenthesized, it must be selected by key entry. To show item for selection, use [\leftarrow], [\rightarrow] and confirm with [ENTER].



<Entry of parameter and character>

Parameters shown by $[\triangle \triangle \triangle]$ in parenthesis on the screen are set the alphabetic with $[\uparrow][\downarrow]$ after moving the cursor with $[\uparrow][\downarrow]$ and pressing [ENTER] or $[\leftarrow][\rightarrow]$. The movement of inside [] is operated with $[\leftarrow][\rightarrow]$ and confirmed with [ENTER]. The character is changed with $[\uparrow]$ in order in the following tables, and with $[\downarrow]$ to the opposite direction in the following tables. Input only the number due to the position of " ." are fixed when inputting the number.

ex) To input C at the uninput cursor position, press [\uparrow] 3 times. Moreover, to input [2] at the uninput cursor position, press [\downarrow] 16 times. [-] is input with [\uparrow][\downarrow] when inputting the number after moving to the left with [\leftarrow]. Input only the number due to the position of "." is fixed when inputting the number after matching the digit with [\leftarrow][\rightarrow].

Table.2-2-1-1			
Operation key	[↑]		
Alphabetic	$(space) \rightarrow A \rightarrow B \rightarrow C \rightarrow D \rightarrow E \rightarrow F \rightarrow G \rightarrow H \rightarrow I \rightarrow J \rightarrow K \rightarrow L \rightarrow M \rightarrow N \rightarrow O \rightarrow P$		
parameter	$\rightarrow Q \rightarrow R \rightarrow S \rightarrow T \rightarrow U \rightarrow V \rightarrow W \rightarrow X \rightarrow Y \rightarrow Z \rightarrow 0 \rightarrow 1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5 \rightarrow 6 \rightarrow 7$		
	$\rightarrow 8 \rightarrow 9 \rightarrow$. $\rightarrow - \rightarrow + \rightarrow \checkmark \rightarrow \times \rightarrow$ (\rightarrow) $\rightarrow \% \rightarrow$ (space)		
Numeric	$(space) \rightarrow 0 \rightarrow 1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5 \rightarrow 6 \rightarrow 7 \rightarrow 8 \rightarrow 9 \rightarrow - \rightarrow (space)$		
parameter			

2-2-2. Description of display messages

When the power is turned on, the initial displays appear one after another as follows:



When the main screen displays, it is the standby mode ready for titration.

< Main screen >

CO1
01/METHOD-01 01-01 4.255pH 23.6°C C01
4.255PH 23.6°C C01 Maiting tites
CO1 Con
Maiting tites
is o
whe
Gui

Active method number Active method name Current sample number

Dispending volume and detected potential and so on

Concentration is calculated in real time from the present titration volume and displayed here. (Displayed concentration is calculated based on the calculation where EP1 is set in Calculation1.)

Guiding messages and mode of the system

2-3. Setting Language

Set language displayed on the screen.

1) Press [MENU/HOME].

- Press [↑] twice, select "11.Setup" and [ENTER] to confirm.
- 3) Press [↓] 6 times, select "7.Language" and confirm with [ENTER].
- 4) Select language with $[\leftarrow] [\rightarrow]$ and confirm with [ENTER].

Move the cursor to [Exit] and with [ENTER] to escape from the screen.









Manual Operation Data File

<u>to</u>r List

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Ŧ

[MENU]

Method

Calibration Data Copy Changer

 \mathbf{or}

8.Sample 9.Blank List

[Setup]

আ⊒ [Exit]

.Burette Set

Time

erial No. CD Contrast

<u>nguage</u>

.Interface Operator

Date &

2-4. Setting date and time

Set date and time.

1) Press [MENU/HOME].

- Press [↑] twice, select "11.Setup" and [ENTER] to confirm.
- 3) Press [↓] 3 times, select "4.Date & Time" and confirm with [ENTER].
- 4) Select "Date Style" with [←][→] and confirm with [ENTER]. Press [ENTER] at "Date" and "Time", set with each of [↑] [↓] [←] [→], and confirm with [ENTER].
 Move the cursor to [Exit] and with [ENTER] to escape from the screen.



The time of clock starts when "Time" is confirmed with [ENTER].

2-5. Setting Burette Volume

Set the volume of burette cylinder.

1) Press [MENU/HOME].

- Press [↑] twice, select "11.Setup" and [ENTER] to confirm.
- 3) Select "1.Burette Set" and confirm with [ENTER].
- Select the burette No. with [↑] [↓] and confirm with [ENTER].
- 5) Select the burette volume with [←] [→] and press [ENTER].
 Move the cursor to [Execute] and confirm the volume with [ENTER].
 Move the cursor to [Exit] and with [ENTER] to escape from the screen.



Set both of burette volume when 2 burette cylinders are connected. The volume of burette cylinder should be set correctly, otherwise the measurement result is not correctly displayed.









3. Basic operation

Here is the description on basic measurement sequence using pH electrode for acid/base titration.

3-1. Sequence of measurement

For remembering a basic operation, here is an example of the measurement which the concentration (ppm) of sodium hydroxide is obtained with the hydrochloric acid.

1.	Preparation of electrodes	Install a combination glass electrode and temperature compensation electrode.
	Ļ	* Prepare an electrode or sensor and preamplifier appropriate for the titration.
2.	Calibrate the	Calibrate the electrode and preamplifier with pH standard solution
	electrode or sensor	(pH7/pH4).
	L	* Calibration method differs depending on preamplifier type and the electrode or sensor.
3.	Check titration	Confirm preset conditions.
	condition	* Once titration methods are preset for individual samples, all you have to do is to change the method, and can start titration right away.
4.	Fill titration	Fill the burette with 0.1 mol/L-hydrochloric acid.
	solution	* For filling procedure, refer to Function Description "3-1. Manual
	1.	Operation."
5.	Purge titration	Purge the titration solution.
	solution ↓	
6.	Preparation of a	Prepare the sample for titration.
	sample •	* Sample conditions can be stored in USB as a sample file. Once stored in advance, all you need to enter is the sample size.
7.	Start titration	Dip the electrode in the sample in vessel, and press [START/HOME].
8.	After titration	Clean the electrode and keep it in pure water dipped.



<Preparation>

Automatic Potentiometric Titrator	AT-710	1unit
Combined glass electrode (C-171)		1pc
Electrode cable		1pc
Temperature compensation electrode(T-	171)	1pc
0.1 mol/L-hydrochloric acid(given conce	ntration) 500mL	1pc
0.1mol/L- sodium hydroxide	500mL	1pc
Rinse bottle(include water)	500mL	1pc
200mL beaker		2 - 3pcs
Whole pipette (volume 5mL)		1pc
Safety pipette		1pc
Tissue		
pH7 standard solution		
pH4 standard solution		

3-2. Preparation of the electrode

- 1) Connect the cable to the combination glass electrode and plug its connector into the connector (G1).
- 2) Connect the temperature compensation electrode T-171 to the connector (T1).
- 3) Install the electrodes and titration nozzle to the electrode holder and fix it with the lock screws as shown below.
- 4) Keep each electrode and burette nozzle in a beaker filled with pure water. Open the rubber plug of the refill hole of the combined glass electrode so that the reference fill can flow out.
- 5) Check that the electrode holder fixation metal is at the height that the electrode does not hit a beaker even if the electrode holder goes down at the bottom.




3-3. Calibration of preamplifier (pH calibration)

For precise measurement results by potentiometric titration, it is necessary to calibrate the preamplifier and electrode. Here is the description on basic pH calibration.

- 1) Check that message is "Waiting titr."
- 2) Press [MENU/HOME].

01/METHOD 01-01	-01 ▲ 0.0000mL 4.255PH 23.6°C
CO1 ·	··································
Waiting	ı titr.

- 3) Select "4.Calibration" with [\uparrow] [\downarrow] and confirm with [ENTER].
- 4) Move the cursor to Ch.1 [Cal.] and confirm with [ENTER] as to pH calibration Ch.1.





5) Set the calibration mode (Auto/Manual) of pH calibration. The calibration procedure and setting items differ depending on setting of calibration mode. Refer to"3-3-1" for Auto, and "3-3-2" for Manual.

[Calibration]	
(Auto) [Manual]	
[PH Table] [Exit]	

Refer to Function Description "4. Calibration" for setting the calibration condition.

Note pH electrode is calibrated when neutralization titration is operated. The calibration method of detector Ch3 differs depending on connected preamplifier. Refer to "4-1. Use Preamplifier other than STD."

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3-3-1.pH calibration when Calib.Method is "Auto"

This mode automatically sets calibration value using pH temperature compensation table pre-installed or the temperature compensation table selected on MENU^{\\}10.pH Table"-\User."

- 1) Set the parameter referring to Function Description "4. Calibration."
- 2) Move the cursor to [Calibration] and press [ENTER] to start calibration after setting.

<ex) when " calibration point" is "pH7/4">

- 3) pH7 calibration is displayed.
- 4) Dip the electrode in pH7 standard solution. Press [STIRRER].)
 On the left, the electrode reading is displayed.
 On the right, the calibration value is displayed.
 Press [ENTER] when the left and right values are stable.
- pH4 calibration is displayed after pH7 calibration. Press [STIRRER] to stop the stirrer once, then rinse the electrode with pure water and wipe off water around the electrode by tissue.
- 6) Dip the electrode in pH4 standard solution. Press [STIRRER] to turn the stirrer.Press [ENTER] when the left and right values are stable.Start the calibration according to the setting

conditions.

Press [STIRRER] to stop the stirrer once before changing the standard solution when using the propeller stirrer. Be careful that spray disperses when the solution is replaced with the propeller stirrer operated.

Before the electrode is dipped in a different standard solution, rinse it with pure water and wipe off with tissue paper. If you neglect this process, calibration value will deviate and correct measurement cannot be expected.

[Calibration] Set pH7 [6.89]>>[43%250012]	6.86]
Execute	

еН7/еН

lemp,

> 7

[Calibrat

Calibrati

Temp. Table





7) As shown on the right, a potential difference and a slope value per pH are displayed once a calibration is done. When it fails, "Calibration Failed" is displayed. If calibration was not completed, refer to "7. Troubleshooting." Calibration record can be checked on "MENU"-"7.History."



8) Press [ENTER] to finish the calibration.



Note

Press [START/STOP] when the calibration is discontinued on the way.

The pH displayed on the left side of the screen at the calibration is a peculiar value of the electrode. The change in the state of the electrode can be checked by recording the value of this pH.

3-3-2.pH calibration when Calib.Method is "Manual"

Use this mode when calibrating by desired calibration solution.

- 1) Set the parameter referring to Function Description "4. Calibration."
- 2) Move the cursor to [Calibration] and press [ENTER] to start calibration after setting.



6.68]

- 3) "first calibration point pH value" is displayed.
- 4) Dip the electrode in the displayed standard solution.

Press [Stirrer].

On the left, the electrode reading is displayed. On the right, the calibration value is displayed.

Press [ENTER] when the left and right values are stable.

- 5) "second calibration point pH value" is displayed after "first calibration point pH value" calibration. Press [STIRRER] to stop the stirrer, then rinse the electrode with pure water and wipe off water around the electrode by tissue.
- 6) Dip the electrode in standard solution of "second calibration point pH value".

Press [STIRRER] to turn the stirrer.

Press [ENTER] when the left and right values are stable.

Start the calibration according to the setting conditions.

Press [STIRRER] to stop the stirrer once before changing the standard solution when using the propeller stirrer. Be careful that spray disperses when the solution is replaced with the propeller stirrer operated.
 Before the electrode is dipped in a different standard, rinse it with pure water

Before the electrode is dipped in a different standard, rinse it with pure water and wipe off with tissue paper. If you neglect this process, calibration value will deviate and correct measurement cannot be expected.



Execute



7) When calibration is finished, the display changes as shown on the right. When it fails, "Calibration Failed" is displayed. If calibration was not completed, refer to "7. Troubleshooting." Calibration record can be checked on "MENU"-"7.History."



8) Press [ENTER] to finish calibration.



Note

Press [START/STOP] when the calibration is discontinued on the way.

Note

The pH displayed on the left side of the screen at the calibration is a peculiar value of the electrode. The change in the state of the electrode can be checked by recording the value of this pH.

3-4. Confirmation of titration method

a) Method setup

- 1) Press [MENU/HOME].
- 2) Select "3.Method" with $[\uparrow] [\downarrow]$ and confirm with [ENTER].
- 3) Select "METHOD-01" with [\uparrow] [\downarrow] and confirm with [ENTER].

Parameter can be made with PC by using the equipped software. Refer to "4-3." Use Method Making Software" for details.

- b) Titration parameter
 - 1) Select "1.Titration" with $[\uparrow][\downarrow]$ and confirm with [ENTER].
 - 2) Scroll the screen with $[\uparrow][\downarrow]$, and set as shown in the table below. Change as shown in the table below when the setting is different.

Item	Setup value	Remarks
Method Name	(METHOD-01)	
Mode	AutoTit.	
Form	EP	
Burette No.	1	
Channel/Unit	Ch1/pH	
Elec.Type Check	No Check	
Direction	Auto	
Max. Volume	20.000(mL)	
Wait Time	0(s)	
Dose Mode	None	

3) Move the cursor to [Exit] and confirm with [ENTER].

c) Control parameter

- 1) Select "2.Control" with [\uparrow][\downarrow] and confirm with [ENTER].
- 2) Scroll the screen with $[\uparrow][\downarrow]$, and set as shown in the table below. Change as shown in the table below when the setting is different.

Item	Setup value	Remarks
End Point No.	1	
End Sense	Auto	
Gain	1	
Control Speed	Medium	
Stirer Speed	4	

3) Move the cursor to [Exit] and confirm with [ENTER].

d) Calculation parameter

- 1) Select "3.Calculation" with $[\uparrow][\downarrow]$ and confirm with [ENTER].
- 2) Scroll the screen with [↑][↓], and set as shown in the table below. Change as shown in the table below when the setting is different.

Item	Setup value	Remarks
Calculation Type	Sample	
Calculation		
Calculation1	Set	
Formula	(EP1-BL1)×TF1	
	×C1×K1/S	
Unit	PPM	When setting with PC and the
EP No.	1	keyboard, the small letter can be used
Calculation2	Off	to input.
Calculation3	Off	
Calculation4	Off	
Calculation5	Off	
Constant		
C1	Change 1→4	Adapt for the calculating formula C1.
K1	Change 1→1000	Convert into ppm. Adapt for the
Temp. Com.		calculating formula K1.
Temp. Comp.	Off	

1) Move the cursor to [Exit] and confirm with [ENTER].

e) Print parameter

- 1) Select "4.Report" with $[\uparrow][\downarrow]$ and confirm with [ENTER].
- 2) Scroll the screen with [↑][↓], and set as shown in the table below. Change as shown in the table below when the setting is different.

Item	Setup value	Remarks
Format	Short	*Report is not printed when the
Data List	Off	printer is not connected.
Graph	Titr. Curve	

1) Move the cursor to [Exit] and confirm with [ENTER].

f) Pre-dosing parameter

- 1) Select "5.Pre Dose" with [\uparrow][\downarrow] and confirm with [ENTER].
- 2) Scroll the screen with $[\uparrow][\downarrow]$, and set as shown in the table below. Change as shown in the table below when the setting is different.

Item	Setup value	Remarks
01	None	
02	None	
03	None	
04	None	
05	None	

1) Move the cursor to [Exit] and confirm with [ENTER].

g) Continuous measurement parameter

- 1) Select "6.After Titr." with [\uparrow][\downarrow] and confirm with [ENTER].
- 2) Scroll the screen with [1][1], and set as shown in the table below. Change as shown in the table below when the setting is different.

Item	Setup value	Remarks
Titration	Off	

3) Move the cursor to [Exit] and confirm with [ENTER].

h) Information on reagent

- 1) Press [MENU/HOME] twice.
- 2) Select "10.Factor List" with [\uparrow][\downarrow] and confirm with [ENTER].
- 3) Scroll the screen with [↑][↓], and set as shown in the table below. Change as shown in the table below when the setting is different.

		5
Item	Setup value	Remarks
1	1→(1.000)	Input the factor of 0.1 mol/L-hydrochloric acid (given concentration). Adapt for the calculating formula TF1.

4) Move the cursor to [Exit] and confirm with [ENTER].

3-5. Filling titration solution

- 1) Fill the reagent bottle with 0.1mol/L-HCl.
- 2) Press [MENU/HOME], select "1. Manual Operation" and confirm with [ENTER].
- 3) Select [Manual] and confirm with [ENTER].
- 4) Set Burette No. according to Function Description "1-1. Manual Operation."
- 5) Set Burette Speed to "Medium."
- 6) Set Purge Type to "to Nozzle."
- 7) Allow the tip of the titration nozzle to move into a beaker or the like.
- 8) Select [Purge] and press [ENTER]. When the air inside the burette is pushed out to a beaker and the reagent starts dripping from nozzle tip, press [ENTER] to stop the piston.



Wear a protective pair of glass in order to avoid splashing reagent in case the tube union is loosened or disconnected.

3-6. Purge the reagent

Purging is necessary to eliminate the difference in concentration between the reagent in burette and in reagent bottle.

- 1) Press [MENU/HOME] and select "1. Manual Operation" and confirm with [ENTER].
- 2) Select [Manual] and confirm with [ENTER].
- 3) Set Burette No. and Purge Times according to Function Description "1-1. Manual Operation."
- 4) Set Purge Type to "to Bottle".
- 5) Select [Purge] and purge the reagent with [ENTER]. The piston head is moved vertically, and repeat to fill and discharge the reagent to the burette when selecting "to Burette."
- 6) Remove the titration nozzle from the electrode holder after purging, insert the tip of titration nozzle to the equipped Vial for Degassing (with Septum).
- 7) Hold the bottle and nozzle slightly upward as shown, select [UP] and press [ENTER].



- 8) After air bubbles in the nozzle are removed, press [ENTER] again and remove the Vial.
- 9) Install the titration nozzle to the electrode holder.
- 10) Select [Exit] and press [ENTER] to back to the previous screen after the piston head is returned to the bottom.

3-7. **Preparation of sample**

a) Sample

- 1) Attach the safety pipette to 5mL whole pipette.
- 2) Sample small amount of 0.1mol/L-sodium hydroxide, and self clean the inside wall of whole pipette.
- 3) Sample 5mL of 0.1mol/L-sodium hydroxide by the pipette, and transfer it to a 200mL beaker.
- 4) Add 100mL water.
- 5) Put a stirrer rotor in the beaker when you use a magnetic stirrer.
- 6) Place an empty beaker under the electrode. Rinse the electrode with water, and wipe off water around the electrode by tissue paper.
- 7) Place a beaker with sample in it on stirrer, and dip the electrode in the sample.
- b) Sample parameter
- 1) Press [SAMPLE].
- 2) Scroll the screen with $[\uparrow][\downarrow]$, and set as shown in the table below.

Item	Setup value	Remarks
No.	01-01	
Size	5.000	Adapt for the calculating formula S.
Unit	mL	
Name	(none)	
Method No.	1	

3) Move the cursor to [Exit] and confirm with [ENTER].

3-8. Start titration

- 1) Press [START/STOP] on the main screen to start titration.
- 2) When titration is finished by reaching an endpoint, the results will be shown on the screen.



% Press [START/STOP] again when the measurement is discontinued on the way.

3-9. Cleaning after titration

- 1) Remove a beaker with sample in it from stirrer. Place an empty beaker under the electrode. Rinse the electrode with water in the cleaning bottle.
- Keep the electrode dipped in pure water. In the case of the next sample measurement, wipe off water around the electrode with tissue paper.



Refer to "6-2-1 Storage of the instrument" for details of storage when not to use for a long term.

<u>Op</u>eration

3-10. Re-calculate titration data

Result of size, unit, blank and factor, and print format can be changed.

- Press [MENU/HOME], select "2.Data File" with [↑] [↓] and press [ENTER].
- 2) Select the result with $[\uparrow] [\downarrow]$ and press [ENTER].

3) Select [Re-Calculation] and confirm with [ENTER].

4) Change the sample size, unit, print format with [↑]
[↓][←][→], and move the cursor to [Execute] and press [ENTER] to re- calculate.
ex)Change the sample size

Note

[Blank List] [Factor List]	Ŧ
Sample size	

Move the cursor to [Cancel] and press [ENTER] if the change is not executed.

4.Calibration 5.Data Copy 6.Changer 7.History 8]. [Data File]

[MENU]

Manual Nata P Method

	[Dat:	a File]		_▲
	01	04/01	15:57	
		01-03		
	02	04/01	15:53	
	~~	01-02		
	03	0́4∕0́ī	15:49	
		01-01		_
ļ				

[Re-Calculation]





3. Basic operation

5) Select "Size" with $[\uparrow] [\downarrow]$ and press [ENTER]. Change the sample size with $[\uparrow] [\downarrow] [\leftarrow] [\rightarrow]$ and press [ENTER].

[Re-Calculation] Size [[]. 1069] Unit < 9 > [Blank List]	•
[Factor List]	Ŧ
Sample size	

6) Move the cursor to [Execute] with [↑] [↓] and press [ENTER] to re- calculate. Move the cursor to [Exit] and with [ENTER] to escape from the screen.

(Execute) [Exit]	•
	Ŧ
Execute	

<u>Op</u>eration

15:57

15:53

15:49 Higs Â

3-11. Batch processing of titration data

Batch the calculated data on the list. The batch calculation determines Mean value, Standard deviation (SD) and Relative standard deviation (RSD).

- Press [MENU/HOME], select "2.Data File" with [↑] [↓] and press [ENTER].
- Move the cursor to [Statistics] with [↑] [↓] and press [ENTER].
- Sort out the data for batch calculation. Select High Sample No., Method No. and Date with [↑] [↓] [←] [→], and move the cursor to [Execute] and press [ENTER] to batch.
 ex)Sort out Method No. and Date
- Select "Method No." with [↓] and press [ENTER]. Change "On" with [←] [→] and press [ENTER].

5) Set Method No. with $[\uparrow] [\downarrow] [\leftarrow] [\rightarrow]$ and press

AT-710

[ENTER].

1	[Statistics] High Sample No. Set < Dff >	•
		Ŧ
	High Sample No.	

[MENU]

48

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anual ata F ethod

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й

01

×it1

Method No. Set < MT	•
	•
Method No.	

Method No. Set < On > [111]	•
Method No.	

6) Change "Titration Date" to "On" with [←] [→] and press [ENTER].

Titration Date Set < DTT >	•
	Ŧ
Titr.Date Set	

Set the term of date with [↑] [↓] [←] [→] and press [ENTER].

Titration Date ▲ Set < On > [8014/04/01]~ [2014/04/01] ▼
Titr.Date Set

 Press [ENTER] to batch at [Execute] and the result is displayed.
 Move the cursor to [Exit] and with [ENTER] to escape from the screen.

[Execute] [Exit]	•
	•
Execute	

The result can be excluded from the batch calculation by pressing $[\leftarrow]$ on the result list. "*" is displayed ahead of the exclude result.

3-12. Read Data, Store in USB Flash Drive

Store the result data in USB and can be used on PC.

- 1) Press [MENU/HOME], select "5.Data Copy" with [1] $[\downarrow]$ and press [ENTER].
- 2) Select "1.Result Data" and press [ENTER].
- 3) Select the stored format, which is CSV or PDF with $[\leftarrow] [\rightarrow]$ and confirm with [ENTER].
- 4) Insert USB to the USB connecter.

AT-710







AT-710→USB

[Exit]

For mа



OP4 Result Data .Method Data .PH Table

[Ēxīt]

3.PH

6) Select [Yes] with [↑] [↓] and press [ENTER] to store.



USB of FAT16 and FAT32 format can be used. However all operation of USB is not guaranteed.

Remove USB only after saving data is complete.



When data reading is underway, all buttons stop functioning.

Note Never remove it halfway. Otherwise, it may be broken.

There is no guarantee of data stored in USB flash memory regardless of any failure source. Make sure to backup data routinely as necessary with your responsibility.



All date of the result is collectively stored.

3-13. Replacing burette unit

<How to remove the burette unit>

- 1) Turn on the equipment.
- 2) Go from "MENU" to "1. Manual Operation" \rightarrow [Manual]. Then move the cursor to "Down" and press [ENTER]. Make sure that "Reset" appears on "State" screen.
- 3) Turn the burette stopper to loosen.



$\underline{\underline{M}} \\ \underline{\underline{M}} \\ \underline{M} \\ \underline{\underline{M}} \\ \underline{\underline{M}$

4) Uplift the burette and once the burette is removed from the two guide pins, slide the burette to the right to take it away.



3. Basic operation

5) As shown below, hitch the removed burette to the bottle stand to store.



<How to install the burette unit>

1) As shown, turn the lever counterclockwise.



2) Adjust the height of the Piston pushrod of the burette.

<When the burette is viewed from right beside and the scribe line of the Piston pushrod can be seen>

Place the burette on the center hole of the bottle stand and push down, and push the Piston removing tool into the glass cylinder.





Wear a protective pair of glass in order to avoid splashing reagent in case the tube union is loosened or disconnected. When the piston pushrod of the burette is pushed in, reagent will move to the tubing on the reagent bottle side. Put a reagent bottle to the tip of the tubing on the reagent bottle side. Reagent may spatter and splash in your eyes.

<When the burette is viewed from right beside and the scribe line of the Piston pushrod cannot be seen>

Put the piston removeing tool to the Piston pushrod and pull out the Piston pushrod until scribe line of the Piston pushrod an be seen. Then place the burette on the center hole of the bottle stand and push down, and push the Piston pushrod into the glass cylinder.



- 3) As shown below, slide the burette unit from the right, and hitch the piston pushrod to the drive screw. If you put the housing on the guide pin and slide it, you will find it easier to adjust the height.
- 4) To place the burette unit, insert the hole of the housing of the burette unit into the two guide pins.



5) To fix the burette unit, hold down the top of the burette unit and tighten the burette stopper.



6) If the volume of the replaced burette unit is different from that of the previous one, refer to "2-5. Setting Burette Volume" to set up the burette volume.

4. Others

4-1. Use Preamplifier other than STD

Shall explain a procedure to calibrate channel 3 of the preamplifier.

4-1-1. Preamplifier for photometric titration (PTA)

Photometric titration

This method detects endpoint by color tone or color depth of titrated solution. However, if the sample is turbid, it may not detect correct endpoint. Photometric titration is widely used in chelatometric titration with indicators.

It is recommended to have a full understanding of the characteristics of the reacting metals the selection of metal indicators, titration conditions such as pH, titration procedures and others.

The week point of this method is the difficulty of receiving optical signal correctly is the Sample is turbid.

In this case, remove the turbid substance in the sample by filtering.

\circ Metal Indicator

Chelatometric titration on the photometric titration detects endpoint by the change of color with the indicator. This indicator is called a metal indicator since it changes its color responding to metal ions.

•Buffer solution in chelatometric titration

In chelatometric titration, buffer solution must be added in order to control the pH of titrated solution depending on the sorts of reacting metals.

<Parts name and installation>

- 1) Install an interference filter with suitable wave length for the titration.
- 2) Connect the photometric sensor and the connecting port for detector with the connecting cable.
- 3) After change an electrode holder to a supplied multi electrode holder, attach the photometric sensor to the electrode holder.



<Preparation for measurement>

 Ensure the interference filter is inserted in the photometric sensor. The relation of the interference filter to use titration and liquid color are shown below. Color change from to Wave length of filter

	anye n			wave length of th
Yellow	$\leftarrow \rightarrow$	Red	:	530nm
Clear	$\leftarrow \rightarrow$	Red	:	530nm
Yellow	$\leftarrow \rightarrow$	Blue	:	630nm
Clear	$\leftarrow \rightarrow$	Blue	:	630nm
Blue	$\leftarrow \rightarrow$	Red	:	530nm or 630nm

- 2) Ensure no dirt or stains around the cell window of photometric sensor. (To remove the dirt or stains, carefully wipe the cell window with gauze soaked in methanol or cleanse it with detergent)
- 3) Dip the cell window completely into the solution. At this point, be careful not to generate any air bubbles around the cell window by stirring or otherwise.
- 4) Here you calibrate the preamplifier. Press [MENU/HOME] on the main screen.Select "4. Calibration" and press [ENTER].

5) Select "Cal." of "Ch.3" and press [ENTER].



- 6) Enter zero point value, and press [ENTER].
- 7) Enter span point value, and press [ENTER]. (Typically, enter `100')



- 8) Dip the photo sensor in pure water, and select "Calibration" and press [ENTER].
- 9) Here you perform 100%T calibration. When the %T displayed on the left is stable, press [ENTER].

[Exit] [Print]
▼
Calibration
[Calibration] Span Point [100.00] >> [100.00] [100.00]
Execute

10) Now you perform 0%T calibration. Lift the photo sensor out of the liquid, and insert the shutter into the cell window. When the %T shown on the left is stable, press [ENTER].

[Calibration] Zero Point [0.00] >> [[axecute]	0.001			
Execute				

11) Press [ENTER].

[Calibration] Detector No. 3 Calibration Completed	
(Exit)	



Shutter operation manual

<How to titrate>

- Parameter setup on the measuring unit For photometric titration, use "Auto Int." mode and "Ch3/%T" for Channel, Unit (Channel/Unit) as titration parameter.
- 2) Operation

Dip the photometric sensor in sample solution deep enough, and press [START/STOP] to start titration.

4-1-2. Preamplifier for polarization titration (POT)

Polarization titration

There are two methods in polarization titration; one is called, "Amperometric titration method at constant voltage", which determines endpoint by measuring the current change in applying very low voltage between the two electrodes after submerging the twin platinum electrodes into the titration solution, and another method is called, "Potentiometric titration method at constant current", which determines endpoint by measuring the potential between the two electrodes in applying constant current of very low ampere.

These methods feature distinctive change in potential or current because the phenomena, polarization converting to depolarization or vice versa, are observed at the end point.

<Part description>



+ ,- : Connecting terminal for Twin platinum electrode <Preparation for measurements>

- 1) Fix the twin Pt. electrode (M-511) onto the holder.
- 2) Insert the cable from the electrode into the + terminal of POT- preamplifier.
- 3) Here you set up a configuration for the preamplifier. Press [MENU/HOME] on the main screen.Select "4. Calibration" and press [ENTER].
- 4) Select "Cal." of "Ch.3" and press [ENTER].



- 5) Set up parameters for calibration.
- a) [Constant current polarization] Select "Current" for calibration mode, and press [ENTER]. Enter the polar current and press [ENTER].

Select "Calibration" and press [ENTER].

[Calibration] Mode 〈 Gurrent 〉 Current [5.00]uA [Calibration] [Exit]	F
Calib.Mode	
[Calibration] Mode 〈 Current 〉 Current [5,00] uA [Calibration] [Exit] Ÿ	Ŧ
Calibration	

After dipping the Twin Pt. electrode in the solvent to be used and confirming that the current level on the left and right agrees, press [ENTER].

[Calibration] Current [5.00] >> [5.00]		
Execute		

b) [Constant voltage polarization] Select "Voltage" for calibration mode, and press [ENTER]. For polar voltage, enter the constant voltage of the standard solution at time of calibration, and press [ENTER]. Select "Calibration" and press [ENTER].



Dip the Twin Pt. electrode in the solvent to be used. After confirming that the potential level on the left and right agrees, press [ENTER].



6) Press [ENTER].

[Calibration] Detector No. 3 Calibration Completed	

<How to titrate>

1) Parameter setup on the measuring unit

For constant current polar potential titration, set Channel, Unit (Channel/Unit) to "Ch3, mV" as titration parameter. For constant voltage polar current titration, set Channel, Unit (Channel/Unit) to "Ch3, μ A" as titration parameter.

2) Operation

Dip the platinum of the electrode in a sample solution well and then press [START/STOP] to start a titration.

4-1-3. Preamplifier for conductometric titration (CMT)

Conductometric titration

This method detects an equivalence point on the titration curve of "titer VS.Conductivity", making use of the change in concentration of the related ions in the solution during titration.

In this form, an endpoint is determined by an Automatic Intersection Detection.

The electric conductivity sensor does not guarantee conductivity values as the sensor is designed to quickly respond to a change of the conductivity at the time of titration. Just for your information, measurement errors of $\pm 10\%$, $\pm 20\%$ and $\pm 30\%$ are seen at around 1000uS/cm, 10000uS/cm and 100uS/cm, respectively.



CELL3 T3 :Conductivity cell terminal :This is not necessary when K-321 conductivity cell is going to be used. (This terminal is for connecting temperature compensation electrode when a conductivity detection sensor without built-in thermistor for temperature compensation is used. Temperature compensation electrode use T-111.)

[Note] Be careful not to use both electrodes at the same time, that is, an electrode for conductivity with built-in thermistor for temperature compensation and an electrode for temperature compensation. <Preparation for measurement>

- 1) Fix the conductivity cell onto the electrode holder.
- 2) Insert the cable from conductivity cell into CELL3 terminal of CMT- preamplifier.
- 3) Here you set up a configuration for the preamplifier. Press [MENU/HOME] on the main screen. Select "4.Calibration" and press [ENTER].
- 4) Select "Cal." of "Ch.3" and press [ENTER].



5) Set up parameters for calibration.

[Cell constant] - when standard solution is not used

Enter the cell constant that has been validated in the plant at the time of shipment (labeled on the cell cap) or the constant validated with a reference of known conductivity.

Select "Cell Co." for calibration mode, and press [ENTER].

Enter the "Cell Constant" labeled on the cell or the constant of which conductivity is known, and press [ENTER].

[Calibration] Mode < DEDUCCA > Cell Constant [1.0000] [Calibration] ▼ Calib.Mode

Select [Calibration], and press [ENTER].

When the constant displayed on the right agrees with the cell constant of the sensor, press [ENTER].

[Calibration] Cell Constant [1.0000] >> [1.0000] [1.0000]
Execute

b) [Calibration with a reference solution]

The conductivity cell changes its cell constant as time goes by. When precision is required in measurement, you need to calibrate with conductivity standard solution, specified in JIS or of which conductivity is known (usually potassium chloride is used). See the Section "Conductivity standard solutions" for how to prepare standard solution and the conductivity at varying temperatures.

Set the calibration mode to "Std. Sol.", and press [ENTER].

Enter the conductivity of the standard solution at time of calibration for "Con.Of Std. Sol.", and press [ENTER].

Select "Sample Range" to the standard range, and press [ENTER]. (Select 10000μ S for more than 1000μ S standard conductivity, and 1000μ S or 10000μ S for more than 100μ S)

Select [Calibration], and press [ENTER].



Dip the conductivity sensor in the standard solution. When the conductivity on the right and left on display match, press [ENTER].



6) Press [ENTER].



When dipping the electric conductivity sensor in a solution, make sure to allow 5mm or more between the sensor head and the bottom of a beaker. **Note** Measurement will not be performed properly when the sensor is obstructed.

<How to titrate>

1) Parameter setup on the measuring unit

For conductivity titration, select "Intermit" titration mode and set "Form" to "Full," and perform measurement up to maximum titration volume. Set Channel, Unit (Channel/Unit) to "Ch3/ μ S" as titration parameter. (Select sample range to measurement range)

2) Operations

Dip the conductivity cell in sample solution and press [START/STOP] to start titration.

When dipping the electric conductivity sensor in a solution, make sure to allow 5mm or more between the sensor head and the bottom of a beaker. **Note** Measurement will not be performed properly when the sensor is obstructed.

<Conductivity standard solution>

Preparation for conductivity standard solution can be made according to JIS K0130 General rules for electric conductivity measuring method as described below. Also, see the appendix for conductivity at varying temperature.

%Preparation of conductivity standard solution (JIS K0130 General rules for electric conductivity measuring method)

Dry potassium chloride (KCl) at 500 C for 4 hours, and dissolve 0.74552g KCl in 1000.00g pure water of which conductivity is less than 0.2mS/m at 25 C. Store the solution in a polyethylene or hard glass bottle after sealed.

Temperature	Conductivity	Conductivity		
(°C)	(mS/m)	(µS/cm)		
0	77.292	772.92		
5	89.096	890.96		
10	101.395	1013.95		
15	114.145	1141.45		
18	121.993	1219.93		
20	127.303	1273.03		
25	140.823	1408.23		
30	154.663	1546.63		
35	168.779	1687.79		
40	183.127	1831.27		
45	197.662	1976.62		
50	212.343	2123.43		

Conductivity of standard solution

4-1-4.Preamplifier for pH dual input (TET)

pH-calibration values should be individually stored on each detector.

<Part description>



G3:Port for Glass electrode R3:Port for Reference electrode T3:Port for Temperature compensation electrode

< Preparation for measurement >

- 1) Mount the glass combination electrode (or glass electrode and reference electrode) and temperature compensation electrode onto the electrode holder.
- 2) Plug each electrode cable terminal into Detector 3 of TET- preamplifier.
- 3) Press "4. Calibration" for MENU to calibrate the preamplifier.

About the calibration method, see the chapter "3-3. Calibration of preamplifier (pH calibreation".

4-2. Changing the method parameters in progress

The maximum titration volume and the stirrer speed can be changed while a titration is in progress.

- 1) Press [MENU/HOME] while a titration is in progress.
- Select "3. Method" and press [ENTER]. Select the method you are currently using, and press [ENTER].
- [MENU] 1.Manual Operation 2.Data File **3.Method** 4.Calibration 5.Data Copy 6.Changer 7.History
- Change "Max. Volume" and/or "Stir. Speed." Move the cursor to "Exit" and press [ENTER].
- 4) Press [MENU/HOME].





The changed values will be reflected in the method parameters you are currently using for measurement.

4-3. Using Method Creating Software

Methods and pH tables can be created on your PC and be copied to the AT-710. They can also be copied from the titrator to your PC to make modifications there and then be copied to the AT-710 again. If you read measurement conditions in the CD-ROM into the titrator, you will also be able to set up necessary conditions (control, calculations, etc.) for measurement.

4-3-1.Basic Operation

<Preparation>

- 1) Set the supplied CD-ROM and a USB flash drive to your PC.
- Copy the "ParameterWin.exe" file in the CD-ROM to the root folder of the USB flash drive.



Use this software after copying it to a USB flash drive.

Note

Copies can be made to more than one USB flash drive for your more convenient use.

<Operation>

- 1) Double-click "ParameterWin.exe" in your USB flash drive to run "ParameterWin."
- 2) Click "Open" to load the file.
- 3) Choose method parameter which you wish to edit from the tree chart and enter values into each item.
- 4) After entering necessary parameter, press "Save" button to save it.



Parameter is saved to a USB memory with which the software is activated. The folder of "AT-710" will be created to the root directory of the USB flash drive (shown on "Drive:" of the ParameterWin) when you have saved for the first time.

- 5) Ouit the software to load parameter into AT-710.
- 6) Remove a USB memory from PC and insert it into AT-710.
- 7) Follow the steps below to load the parameters:

Copying a "Method" : MENU \rightarrow 5.Data Copy \rightarrow 2.Method Data Copying a "pH Table": MENU \rightarrow 5.Data Copy \rightarrow 3.pH Table

See "3. Method" of AT-710 Function Description for details of parameters. See "5. Saving data to USB Flash Drive" of AT-710 Function Description for how Note to save to a USB flash drive.
Ŧ

<Copying methods created on your PC to AT-710 one by one>

- 1) Press [MENU/HOME], select "5.Data Copy" with [1] $[\downarrow]$ and press [ENTER].
- 2) Select "2.Method Data" and press [ENTER].

- 3) Select "1.Select Data" and press [ENTER].
- 4) Select "USB" on "Read."

- 5) Select method No. of the USB.
- 6) Select "AT-710" on "Write."







[Select Data] Read: < [MSR > < 1 > METHOD-01	
4	
Write: <at-710> <1> METHOD-01</at-710>	



[Method Data] 1.Select Data 2.All Data [Exit]

1.Manual Operation 2.Data File 3.Method 4.Calibration 5.Meta Coes

[MENU]

6.Changer 7.History

responsibility.

4. Others

7) Select method No. to which you wish to copy.

8) Insert USB flash drive into USB connector.

- Move the cursor to [Execute] with [↑] [↓],and press [ENTER].
- 10) Select [Yes] with [↑] [↓], and press [ENTER] to save date. Move the cursor to [Exit] and press [ENTER].
 - FAT16- and FAT32-formatted USB flash drives can be used with the AT-710. No warranty is given, however, that any such USB flash drive works on the equipment. Remove USB only after saving data is complete.
 - When data reading is underway, all buttons stop functioning.
 - Never remove it halfway. Otherwise, it may be broken.
- **Note** Save the USB flash drive previously or print necessary conditions, otherwise the present setting condition is overwritten once load. There is no guarantee of data stored in USB flash memory regardless of any failure source. Make sure to backup data routinely as necessary with your
 - Selecting "AT-710" both on "Read" and "Write" enables you to copy methods within the AT-710.



Data Copy

Are you sure?

[Yes] [No]



: Data] 〈 US METHOD·

elect

<Copying pH Tables created on your PC to AT-710>

- 1) Press [MENU/HOME], select "5.Data Copy" with [1] [MENU] $[\downarrow]$ and press [ENTER].
- 2) Select "3.pH Table" and press [ENTER].
- 3) Select "USB \rightarrow AT-710" with [\leftarrow] [\rightarrow] and press [ENTER].
- 4) Insert USB flash drive into USB connector.

6) Select [Yes] with $[\uparrow] [\downarrow]$, and press [ENTER] to

5) Move the cursor to [Execute] with $[\uparrow] [\downarrow]$, and

save date. Move the cursor to [Exit] and press [ENTER].











[Exit]

.Manual Operation .Data File

ethod

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Data Сору] .Result Data .<u>Method D</u>ata Tahle

вH

press [ENTER].

FAT16- and FAT32-formatted USB flash drives can be used with the AT-700. No warranty is given, however, that any such USB flash drive works on the equipment.
 Remove USB only after saving data is complete.
 When data reading is underway, all buttons stop functioning.
 Never remove it halfway. Otherwise, it may be broken.
 Save the USB flash drive previously or print necessary conditions, otherwise the present setting condition is overwritten once load.
 There is no guarantee of data stored in USB flash memory regardless of any failure source. Make sure to backup data routinely as necessary with your responsibility.

4-3-2. Using measurement conditions in CD-ROM

Read measurement conditions in CD-ROM and edit on ParameterWin.

- Double-click "ParameterWin.exe" in your USB flash drive to run "ParameterWin." When you use it for the first time, click [Save] once. The folder of "AT-710" will then be created to the root directory of the USB flash drive (shown on "Drive:" of the ParameterWin).
- 2) Select the necessary method parameters from AT-710-Software of the provided CD-ROM. Refer to the following pages for the overview of the method parameters. Copy the files of Comment and Metho01 to Method20 (21 files in total) in the selected file to the AT-710-Parameter folder of the USB flash drive described in above 1).

x.)		$\langle \rangle$		
Parameter → ↓ • AT-700 • Parameter •		Parameter	eter_Petroleum_ASTI	
Commer Commer Commer Commer Commer Commer Commer Method(Commer Method(Metho	11 Method 14 12 Method 15 13 Method 16 14 Method 17 15 Method 18 16 Method 20 17 Method 20 18 pHTable01 19 pHTable02 10 pHTable03 11 pHTable04		Comment Method01 Method02 Method03 Method05 Method05 Method07 Method08 Method09 Method09 Method10 Method11 Method12	Method 13 Method 14 Method 15 Method 16 Method 17 Method 18 Method 18 Method 19 Method 20 pHTable 01 pHTable 01 pHTable 03 pHTable 04 pHTable 05

 Click "Open" of "ParameterWin" to load the file.

If you click "Method List," you can check the overview of the read method parameters.

- Choose method parameter which you wish to edit from the tree chart and enter values into each item.
- 5) After entering necessary parameter, press "Save" button to save it.

Method 12 pHTable05

 Method 12 pHTable05

 Method 12
 PHTable05

 Control
 Contro

Parameter is saved to a USB memory with which the software is activated.

- 6) Quit the software to load parameter into AT-710.
- 7) Remove a USB memory from PC and insert it into AT-710.
- 8) Follow the steps below to load the parameters:

Copying a "Method" : MENU \rightarrow 5.Data Copy \rightarrow 2.Method Data

See "3. Method" of AT-710 Function Description for details of parameters.

Note

CD-ROM storage method contents

The following methods are stored in the Software folder of attached CD-ROM.

No.	Method Name	Titration contents (summary)
1	ASTMD664	Acid number of petroleum products (EP Stop method)
2	ASTMD2896	Base number of petroleum products (Perchloric acid titration)
3	ASTMD4739	Base number of petroleum products (Hydrochloric acid titration)
		(EP Stop method)
4	ASTMD664L	Acid number of petroleum products (Level Stop method)
5	ASTMD4739L	Base number of petroleum products (Hydrochloric acid titration)
		(Level Stop method)

Petroleum product (Folder name: Parameter_Petroleum_ASTM)

Acidity of FOOD (Folder name: Parameter_FOOD_Acid)

No.	Method Name	Titration contents (summary)
1	CitricAcid	Acidity (Citric Acid) of titrant for 0.1mol/L NaOH
2	AceticAcid	Acidity (Acetic Acid) of titrant for 0.1mol/L NaOH
3	MalicAcid	Acidity (Malic Acid) of titrant for 0.1mol/L NaOH
4	TartariAcid	Acidity (Tartaric Acid) of titrant for 0.1mol/L NaOH
5	FactorNaOH	Factor of titrant 0.1mol/L NaOH

Salinity of FOOD (Folder name: Parameter_FOOD_Salinity)

Method Name	Titration contents (summary)
Salt H	High salinity of titrant for 0.1mol/L AgNO ₃
Salt L	Low salinity of titrant for 0.05mol/L AgNO ₃
Factor H	Factor of titrant for 0.1mol/L AgNO ₃
Factor L	Factor of titrant for 0.05mol/L AgNO ₃
Blank	Blank test
	Salt H Salt L Factor H Factor L

Total acid and Amino acid of sake wine (Folder name: Parameter_FOOD_Total Acid)

No.	Method Name	Titration contents (summary)
1	Acid	Total acid of sake wine + pH8.2 adjust Titration (1st Method)
2	Amino Acid	Add formalin + Amino acid of sake wine (2nd Method)
3	Factor	Factor of titrant 0.1mol/L NaOH
4	pH Adjust	pH8.2 adjust Titration

5. Function Tools 5-1. Function

Menu window is a convenient tool to practice exciting features of the unit. To start with, let us learn about Menu window itself.

- 1) Press [MENU/HOME].
- 2) Select.

[MENU]	Å.
1.Manual Operation	
2.Data File	
3.Method	
4.Calibration	
5.Data Copy	
6.Changer	
7.History	Ţ

Menu has the following items.

Item	Description
1. Manual Operation	Enables you to operate burette manually. This is to fill reagents, to purge burette or to manually dose fixed amount of reagents.
2. Data File	Shows and prints out titration results. Also conducts recalculation and statistic calculation.
3. Method	Edits methods to be used in titration.
4. Calibration	Calibrates preamplifier. Present calibration information can also be checked.
5. Data Copy	Saves measurement results in a USB flash drive. Also transfers data to edit methods on PC.
6. Changer	Sets up CHA-700 when connected.
7. History	Reviews check records or calibration records.
8. Sample	Sets up sample-related parameters.
9. Blank List	Sets up blank value.
10. Factor List	Sets up factor value for titration reagent.
11. Setup	Sets up system-related settings.



For details of menu, refer to the separate Function Description.

6. Maintenance

6-1. Daily Maintenance

In order to maintain the system in good conditions for a long period of time, it is important to observe the following instructions.

6-1-1. Check the instrument

Make sure the instrument is not dirty nor stained by visual check. If any dirt is found, wipe it off with clean gauze. Do not use solvent but use water only.

6-1-2. Check the electrode

Make sure the electrode is not dirty, stained or short of inner solution. Replace the electrode if it is broken. If dirty, wipe it off with tissue paper. Fill the inner solution if it is not enough.

6-1-3. Check the cable

Make sure by visual check all the cables including power cord, various cables and electrode lead to see if any dent or bent is found. Replace the cable if it is dent or bent.

6-1-4. Check the connectors

Make sure the connectors are not dusty or rusted. If dusty clean it by a vacuum cleaner. If rusted, repair is necessary.

6-1-5. Check any leaking

Make sure there is no leaking from the nozzle, tube lines, switching valve or unions. If any leaking is found, tighten the unions. If it does not improve, replace with new one.

6-1-6.Check burette performance

Press [MENU/HOME] on main screen. Select "1. Manual Operation" and press [ENTER]. Select "UP" and press [ENTER] to check to see if the piston burette operates properly. Do the same thing with "DOWN" and "Purge" as well. If it does not work properly, correct it by referring to "7. Troubleshooting."

6-1-7.**Check the nozzle**

Check the nozzle to see any damage or clogging. If it is broken, replace it with new one. If it is clogged, remove the clogging article by a thin wire or with hot water.

6-1-8.Preamplifier

Calibrate the preamplifier if necessary. (See "3-3. Calibration of preamplifiers (pH calibration).")

6-1-9.Replacement of Zeolite (molecular sieves)

Detach the Desiccant tube from the reagent bottle. Replace the molecular sieves with Zeolite sold under 5A.



If the nozzle chip slips from the desiccant tube when replacing the zeolite, ensure that you return the nozzle chip in the tube with its trenches downward as shown above.

6-1-10. How to clean the propeller stirrer

Remove the tip of propeller stirrer and clean the tip of propeller stirrer and the propeller respectively.



6-1-11. How to clean the burette and how to replace the reagent

<Drain the reagent>

- 1) Remove the tip of the tube inserted in the reagent bottle (hereinafter: the tip of the tube).
- 2) Ensure the titration nozzle is in a beaker.
- 3) Press [MENU/HOME]. Select "1. Manual Operation" and press [ENTER]. Select [Manual] and press [ENTER].
- 4) Set "Burette No." to the number of the burette you wish to clean. Set "Purge Type" to "to Nozzle."
- 5) Move the cursor to [Purge] and press [ENTER] to drain the reagent in the burette cylinder to a beaker. After the reagent comes out of the tube, press [ENTER] to stop it again.



<Clean>

- 6) Prepare the solvent (pure water or ethanol) in a beaker. Insert the tip of the tube into a beaker to prevent it from splashing reagent.
- 7) Move the cursor to [Purge] and press [ENTER] to fill the solvent in the burette cylinder and drain it to a beaker from titration nozzle. Repeat this operation several times to replace inside of the burette to the solvent.
- 8) Remove the tip of the tube from the solvent, move the cursor to [Purge] and press [ENTER] to drain the solvent. After the solvent comes out of the tube, press [ENTER] to again.

<Fill the solvent>

- 9) Prepare the reagent to fill and insert the tip of the tube into the reagent bottle.
- 10) Move the cursor to [Purge] and press [ENTER] to suck the reagent, and press [ENTER] again after filling the reagent.
- 11) Remove the tip of the tube from the reagent bottle. Move the cursor to [Purge] and press [ENTER] to come out the reagent. After the reagent comes out of the tube, press [ENTER] again.
- 12) Set the reagent to fill again, and move the cursor to [Purge] and press [ENTER] to suck the reagent, and press [ENTER] again after filling the reagent.

When next setting reagent that gives an influence to solvent, follow "6-2-3. How to remove and assemble the burette unit" to remove piston burette and clean/dry cylinder, tube, piston head and switching valve after procedure 8).

6-2. Other Maintenance

6-2-1.Storage of the instrument

Store the instrument, if it is not going to be operated for a long period of time in a place where there is no direct sunlight or under no vibration, and the place is dry, not humid. It is recommended to pack it in the carton box in which the instrument was first delivered.

Keep the rinsed electrodes detached from the titrator.

6-2-2.Cleaning the electrode

Glass electrode and reference electrode have to be rinsed with pure water at least three times and then wiped with clean filter paper or absorbent cotton. If it is stained, rinse with 0.1mol/L-hydrochloric acid, detergent water or other solvent in a short time, and then rinse well with pure water. In case an electrode is not in use for a long period, dip it in pure water and only use it when it reaches equilibrium. If any foreign article exists in junction of a reference electrode, it may cause abnormal potential reading. In this case clean the junction part with pure water. If you use an electrode of other makes than KEM, refer to the manual of its manufacturer.

After the electrode is rinsed, clean its tip with pure water and ten wipe it with clean filter paper or absorbent cotton. Connect the glass electrode, reference electrode and temperature compensation electrode to the preamplifier, and dip the electrode in pH7 standard solution. Slowly move a beaker with standard solution in it so that equilibrium can be reached faster.



6-2-3.How to remove and assemble the burette unit

When drying completely in the cylinder or replacing the cylinder, disassemble the burette unit.

Remove each part according to the following procedure.

<How to remove the burette unit>

- 1) Turn on the equipment.
- 2) Follow "6-1-11 How to clean the burette and how to replace the reagent" to remove solution in the cylinder.
- 3) Follow "3-13. Replacing burette unit" to remove the tube.

<How to remove the glass cylinder>

1) Turn the burette upside down with the tubing attached, and screw the piston removing tool into the piston drive rod.





- 2) Push the piston head into the cylinder to remove the remaining reagent from the burette.
- 3) Pull out the glass cylinder and the piston head together from the switching valve.





<How to remove the piston head>

- 1) Pull out the piston head from the glass cylinder.
- 2) Remove the piston removing tool from the piston head.
- 3) Remove the guide.





When piston head and glass cylinder are washed, care should be taken not to cause wound or dent at their surface, otherwise it might cause a leak.

Do not hold the glass cylinder too tight. Doing so may break the glass.

<How to remove the switching valve>

You will need to remove the switching valve when the piston head alone is pulled out while removing the glass cylinder. Turn the lever counterclockwise. Hold the lower part to prevent the glass cylinder from falling down, and then take away the switching valve and the packing from the burette cover.



Be reminded that the glass cylinder goes out from the opposite side of the switching valve once the switching valve is removed from the burette cover.



<How to replace the switching valve>

- 1) Attach the burette packing to the burette cover.
- 2) Attach the packing to the switching valve. Attach the packing for 5mL and 10mL as shown in the figure.
- 3) Screw the switch cock of 2) into the burette cover clockwise.



<How to remove the piston head>

- 1) Install the guide to the groove side of glass cylinder.
- 2) Screw the piston removing tool into the piston drive rod

Do not tighten piston removing tool too much otherwise it cannot be loosed. **Note**

3) Push the piston head to the glass cylinder with opposite operation of removing.





Take utmost care not to damage the piston head, and insert the head by keeping the piston screw in parallel with the burette wall. Do not hold the glass cylinder too tight. Doing so may break the glass.

<How to install the switching valve>

- 1) Remove the extraction rod from the glass cylinder installed the piston head.
- 2) Push the glass cylinder and the piston head to the head holder together.



< Fitting the burette unit>

Refer to "3-13. Replacing burette unit" to attach the burette unit.

6-2-4.Replacement of piston head

The piston head is subject to wear due to abrasion during the course of an extended period of use, thus causing eventual leak. If it leaks, replace it with a new head (both the cylinder and the piston head). It is time to replace it if the reagent permeates down to the level indicated in the figure below after a few cycles of movement with the burette cleaned up, dried and refilled with reagent.



Operate to remove the glass cylinder up to $\lceil 6-2-3 \rceil$. How to remove and assemble the burette unit_<How to remove the glass cylinder>.

Replace the guide to the new glass cylinder, and assemble according to since $\lceil 6-2-3$. How to remove and assemble the burette unit \rfloor < How to remove the glass cylinder>.

<Replacement of piston head for Auto dispenser>

1) Rotate the piston screw to remove it from the old piston head. Rotate the screw adapter, too, to remove it from the piston head.

Insert a pair of tweezers or something similar into these holes to rotate the adapter



2) Attach the screw adapter to the new piston head before screwing the piston screw there.



3) Push the new piston head into the burette.



Take utmost care not to damage the piston head, and insert the head by keeping the piston screw in parallel with the burette wall.

6-2-5. Change switching valve

Replace the switching value if it leaks due to crystallization or after use for an extended period of time.

Replace the guide to the new glass cylinder, and assemble according to since $\lceil 6-2-3$. How to remove and assemble the burette unit \rfloor < How to remove the glass cylinder>.

- 1) Operate to remove the Burette unit up to $\lceil 6-2-3 \rceil$. How to remove and assemble the burette unit \rfloor
How to remove the burette unit>.
- 2) Remove the tube.
- 3) Operate to remove the switching valve up to ^{[6-2-3.} How to remove and assemble the burette unit_] <How to remove the switching valve>.
- 4) Refer to <How to install the switching valve> of "How to remove and assemble the burette unit" to attach the switching valve.
- 5) Reconnect the tube lines.



6-2-6.Replace titration nozzle

- 1) Detach the Degassing tube and the nozzle union.
- 2) Pull out nozzle from the nozzle union.
- 3) Squeeze a new nozzle into the nozzle union.
- 4) Attach the nozzle union and Degassing tube again.





6-2-7.Replace tube

Replace the tube if it is bent or leaks in the connection portion.



The assembly of tube end is as shown below.



<The assembly of titration nozzle>



6-2-8.Replacing the clock battery

If the clock does not function correctly, the inside battery needs to be replaced with new one.



Open the battery cover on the bottom of the main unit with a slotted screwdriver. Replace the old battery with a new one (CR2032).



The plus and the negative pole of the battery be connected definitely.



Follow your national, regional and local regulations for disposal of batteries.

7. Troubleshooting

7-1. Error messages and remedies

<Error messages on AT-710>

Error message	Probable causes	Countermeasures
Parameter Error	• Selected a burette No. which was not available with the burette connected, and started a titration.	 Change "Burette No." of the titration parameter of the method you are using or the "Pre Dose" parameter to the burette No. you wish to use. Connect the burette of the burette No. of the titration parameter or the Pre Dose parameter you are going to use.
	 Selected a unit which was not available with the preamplifier connected, and started a titration. 	•Select an appropriate "Channel/Unit."
Electrode Error	• Different setups between method and smart electrode.	•Check if electrode type of method you are using and setup of smart electrode type are same.
Elec. Alarm day	• Expiration of smart electrode.	 Replace smart electrode you are using and initialize. (Setup-Smarat Electrode-1.Initialize) If you wish to continue to use the same electrode, change alarm setup. (Setup-Smarat Electrode-2.Alarm) Then turn on power again.
Electrodes are mismatiched.	• Preamp set up by smart electrode and preamp of instrument are different.	Initialize with the present instrument.
Please, Smart Electrode initialize.	Failure occurs in information written in smart electrode.	 Initialize. (Setup-Smarat Electrode-1.Initialize) Contact your local dealer when recurring

7. Troubleshooting

Error message	Probable causes	Countermeasures
Smart Electrode Error!!	 Failure in writing into memory after calibration of smart electrode. Failure in initialization of smart electrode. 	<start measurement="" of=""> Check if electrode type of method you are using and setup of smart electrode type are same. Turn off power and check insertion of connector of smart electrode cable. Then turn on power again. <calibration, initialization=""></calibration,> Turn off power and check insertion of connector of smart electrode cable. Then turn on power again. <calibration, initialization=""></calibration,> Turn off power and check insertion of connector of smart electrode cable. Then turn on power again. Message of "Please, check Smart Electrode." will appear. Then check smart electrode. (Setup-Smarat Electrode-3.Check) Contact your local distributor if "NG" appears when checking smart electrode. When "OK" with smart electrode check, perform calibration or initialization once again. Contact your local dealer when recurring. </start>
Please,confirm the connection of the Smart Electrode	Content of smart electrode cannot be read correctly.	 Turn off power and check insertion of connector of smart electrode cable. Then turn on power again. Initialize when recurring. (Setup-Smarat electrode- 1.Initialize) Contact your local distributor when recurring.

Error message	Probable causes	Countermeasures	
	Burette unit not connected.	•Attach burette unit. Then press [Start/Stop] button to reset error.	
Burette EBU Err	•Valve of burette unit not on initial position.	 Refer to "7-3. When valve of switching valve stops at irregular positions" for what to do. 	
Burette Err03	•Valve drive motor does not stop within 10 seconds. (time out for valve)	 Cock is fixed and does not operate. Refer to "7-3. When valve of switching valve stops at irregular positions" for what to do. Valve monitor sensor may be defective. (Contact your local dealer) 	
Burette Err06	•Burette error.	 Malfunction of burette memory possible. Contact your local dealer. 	
Burette Err07	• Volume correction error.	•Enter correct value in parameter of volume correction.	
Burette Err08	RFID board error.	 Malfunction of RFID board of smart burette possible. Contact your local dealer. 	

<Error related to burette performance>

<Error messages on CHA-700 (appear on the display of AT-710)>

Error message	Probable causes	Countermeasures
Err No Changer	•The multiple sample changer does not finish the event within a given time.	 Check that the power source of the multiple sample changer becomes "On." Check on the connecting cable to see if it is disconnected. If the error message appears again, contact your local dealer.
RinseErr.	•Unable to rinse due to estimation of no beaker on original position.	 Place beaker on original position. Then press [ENTER]. When beaker is on original position, make sure that beaker pushes beaker sensor.

7. Troubleshooting

<pre><error (appear="" ai-710)="" cha-700="" display="" messages="" of="" on="" the=""></error></pre>		
Error message	Probable causes	Countermeasures
Error4	Operation of pressing [START/STOP] at error state.	Turn on CHA-700 and AT-710 again to cancel error.
Error5	Updown move of table not finishing within sixty (60) seconds.	Turn on CHA-700 and AT-710 again to cancel error. Press [↑] or [↓] on manual operation of AT-710 to move up/down the table. If the error message appears again, contact your local dealer.
Error6	Operation of rotating arm not finishing within the period below: (Step rotation: 21 seconds (6 samples),36 seconds (11 samples))	Turn on CHA-700 and AT-710 again to cancel error. Press [\leftarrow] or [\rightarrow] on manual operation of AT-710 to operate the arm. If the error message appears again, contact your local dealer.
Error7	Position of rotating arm outside the movement range	Turn on CHA-700 and AT-710 again to cancel error. Press [\leftarrow] or [\rightarrow] on manual operation of AT-710 to operate the arm. If the error message appears again, contact your local dealer.
Error8	Updown move of table unable to be done due to no table.	Check conditions of equipment. Turn on CHA-700 and AT-710 again to cancel error. Press [↑] or [↓] on manual operation of AT-710 to move up/down the table. If the error message appears again, contact your local dealer.

<Error messages on CHA-700 (appear on the display of AT-710)>

7-2. Clogging of titration nozzle or switching valve

Some reagents may be crystallized as the time goes by, and such crystallization may cause clogging or stains inside titration nozzle or switching valve. Follow the below steps for cleaning:

< When titration nozzle (diffusion proof nozzle) is clogged >

- 1) Remove the titration nozzle.
- 2) Dissolve the reagent by dipping it in the solvent. (An ultrasonic cleaning is effective.)
- 3) Then, rinse well by pure water.
- 4) Connect the titration nozzle to the tube.
- 5) Fill titration reagent up to the tip of nozzle.



A diffusion type titration nozzle may be clogged easily. Fill the nozzle pocket with pure water to keep its tip from being dried.

< When the switching valve is clogged or stained >

1) Remove all the connecting including titration nozzle, burette, and the tube. If reagent flows out, wipe it off with waste cloth.



- 2) Fill the cock with solvent to dissolve the reagent using a dripping pipette.
- 3) Suck out the fluid in the switching valve with a dropping pipette or the like, followed by cleaning the valve with waste or the like.
- 4) Repeat step 2) and 3) if necessary.
- 5) Reassemble all the connections.



If a reagent bottle is left unused for more than a week, make sure to check any crystallization in it. If any should be found, perform cleaning as above. Dispensing without cleaning may cause leaking.

7-3. When valve of switching valve stops at irregular positions

When the switching valve clogs or is fixed, the valve may stop at an irregular position or become unable to operate (Burette Err03). In this case, refer to "7-2.Clogging of titration nozzle or switching valve" and rinse the switching valve. Then turn on the instrument while pressing [\uparrow] and [ENTER] keys at a time. The lever of the burette unit will start to operate.

7-4. Piston burette does not work properly



START NO Reagent level OK? YES Add reagent. NO Tube in reagent bottle OK? YES Adjust PTFE tube length. NO Pipe joints OK? (Note 1) YES Replace tube joint. NO Piston OK? (Note 2) YES Replace piston head. NO Switching valve OK? YES Replace switching valve. NO Reagent bottle position OK? Position the reagent bottle to YES Minimize height difference between bottle and burette. Is viscosity of titration YES solution high? NO Set sucking speed of Setup-Other slow. Contact your local dealer. END

7-5. Air bubbles are trapped in the piston burette

(Note 1) Refer to "6-2-6. Replace tube" in this manual. (Note 2) Refer to "6-2-4. Replacement of piston head" in this manual.

7-6. Titration is not controlled properly



- (Note 1)Potential level does not vary due to loose contact by broken cable. Replace the cable.
- (Note 2) Configuration of Burette No. and Channel No. are wrong.
- (Note 3) Unstable potential may be caused by deteriorated electrode or clogged liquid junction. If the junction in electrode is clogged, replace the electrode to a combination of pH glass electrode (H-171) and sleeve type (R-173).

If potential is unstable even after the electrode is replaced or changed to new one, the preamplifier may be malfunctioning. Contact your local dealer in such a situation.

(Note 4) Send the measurement data in PDF format to your distributor so that the manufacturer can investigate the problem.

7-7. Endpoint is not detected by EP Stop or Full titration

When the inflection points can be seen visually:



(Note 1) Titration direction setup for titration parameter is wrong.

- (Note 2) For a small amount of titration volume to reach the inflection point, try blank mode of Auto intermit or Intermit titration. Use of 5mL burette will increase precision.
- (Note 3)To reduce the amount of data, start titration after fixed dosed. When the amount of data exceeds 256, the data will not be sampled without detecting the endpoint.
- (Note 4) Send the measurement data in PDF format to your distributor.

7-8. Erroneous endpoint is detected in Full or EP Stop titration

1) When the electrodes noise is found to be EP due to unstable potential in non-aqueous titration



(Note 1) Send the measurement data in PDF format to your distributor.

7. Troubleshooting

2) When reaction is so slow that it takes more than 10 seconds until potential stabilizes after dosing titrant. Use Auto Intermit or Intermit titration mode.



(Note 1) Send the measurement data in PDF format to your distributor.

3) When potential changes sharply so that an endpoint is picked up abruptly.



(Note 1) Send the measurement data in PDF format to your distributor.

4) When endpoint is detected right after start of titration.



(Note 1) Send the measurement data in PDF format to your distributor.

7. Troubleshooting



5) When endpoint is detected while potential angle is constant on titration curve.





6) When endpoint is not detected unless over-titrated (2 - 5mL).

(Note 1) Send the measurement data in PDF format to your distributor.
8. Others

8-1. Parts list

The supplied parts, consumable parts and optional components are shown in the following lists, and you can obtain any of these parts at your dealer or from sales representative.

Parts



MS-710A



EBU-710-20B



Part Number	Part Name	Remarks
12-05643-05	Cylinder with Piston Head(5mL)	
12-0 5643-10	Cylinder with Piston Head (10mL)	
12-05645-05	Switching valve(with O-ring) (5mL)	
12-05645-10	Switching valve(with O-ring) (10mL)	
20-09825	Packing (5mL)	
20-09826	Packing (10mL)	
20-08715	Cylinder for Auto Dispenser(50mL)	For Auto dispenser
20-04058-01	Piston Head(50mL)	For Auto dispenser

8-2. Options

Various convenient peripherals are available as shown below. These options can be purchased from KEM. Contact your local dealer or sales representative



Option

Part Number	Part Name	Remarks		
12-03613-10	Multiple Sample Changer(6samples)			
12-03613-11	Multiple Sample Changer(11samples)			
12-00166-00	Thermo Sensor for Titration Solution			
12-02028-01	Dot Matrix Printer (AC 120V)	for AC 110-120V w/ Connecting Cable IDP-100		
12-02028-02	Dot Matrix Printer (AC 230V)	for AC 220-240V w/ Connecting Cable IDP-100		
12-02618-01	Thermal Printer for Europe (AC 200-240V)	for AC 200-240V w/ Connecting Cable DP-600		
12-02618-02	Thermal Printer for U.K. (AC 220-240V)	for AC 220-240V w/ Connecting Cable DP-600		
12-02618-03	Thermal Printer for U.S.A. (AC 100-120V)	for AC 100-120V w/ Connecting Cable DP-600		
12-02618-04	Thermal Printer for China (AC 200-240V)	for AC 200-240V w/ Connecting Cable DP-600		
12-03507	AT-Win Titration Software	Connecting Cable (MiniDIN8P-DSUB9PM) required.		
12-03265	SOFT-CAP Data Acquisition Software	Connecting cable required.		
12-02012	RS-232C Connecting Cable (9P-9P) 2m	To connect with SOFT-CAP. Connecting Cable (MiniDIN8P-DSUB9PM) required.		
64-00625	Connecting Cable (MiniDIN8P-DSUB9PM)160mm			
12-03506	Tview6 Analysis Software for Titration Results			
12-05641-05	EBU-710-05B Burette Unit(5mL)			
12-05641-10	EBU-710-10B Burette Unit(10mL)			
12-05641-20	EBU-710-20B Burette Unit(20mL)			
12-05640-05	Additional Burette (5mL)	With EBU-710-05B Burette Unit(5mL)		
12-05640-10	Additional Burette (10mL)	With EBU-710-10B Burette Unit(10mL)		
12-05640-20	Additional Burette (20mL)	With EBU-710-20B Burette Unit(20mL)		
12-04591	Auto Dispenser (50mL)			
12-02009	APB-600-AT Automatic Piston Burette			
12-02010	APB-610 Automatic Piston Burette			

Part Number	Part Name	Remarks
20-07471	Protect Cover	for the screen protection from
20-0/4/1		an alkaline solution
12-03645-01	Connection Tube2×3 L=980 PFA (for Bottle)	
20-03997-00	Brown Cover for Degassing Tube	for precipitation titration
66-00059-00	Square Bottle(Brown) 1L	
20-04051-00	Nozzle FEPφ3×2-0.5 L=85	
12-05193	PP 70mLCup (20pcs/set)	for Microquantity titration
20-09079	Propeller(for Microquantity)	for Microquantity titration
12-00277-00	Thermo Sensor	for Microquantity titration
12-00110-00	Photometric Sensor	for Photometric titration
64-01018	Connection Cable (MiniDIN8P-8P) 1.5m	for Photometric titration
12-00112-00	Interference Filter (530nm)	for Photometric titration
12-00112-01	Interference Filter (630nm)	for Photometric titration
12-00112-02	Interference Filter (650nm)	for Photometric titration
20-07257	Shutter	for Photometric titration
12-03840	Twin Platinum Electrode (M-511)	for Polarization titration
12-01762	Conductivity Cell (K-321)	for Conductometric titration
SCU-118	SCU-118 Sealed Cell Unit	
MTA-118-1	MTA-118-1 Micro Titration Cell	
	Unit(1mL)	
MTA-118-5	MTA-118-5 Micro Titration Cell	
	Unit(5mL)	
MTA-118-50	MTA-118-50 Micro Titration Cell	
	Unit(50mL)	
12-00661-12	Stirrer Rotor L=35 (5pcs/set)	

Part Number	Part Name	Remarks	
64-00726-31	Connection Cable BNC 90cm		
64-00726-33	Connecting Cable pin 90cm		
64-00726-41	Connection Cable BNC 210cm		
64-00726-43	Connecting Cable pin 210cm		
12-05647	Smart Electrode Cable BNC, 90cm		
12-05647-01	Smart Electrode Cable pin, 90cm		
12-05647-02	Smart Electrode Cable BNC, 210cm		
12-05647-03	Smart Electrode Cable pin, 210cm		
12-00911	Internal Solution for Reference Electrode(KCl)	3.3mol/L	
12-00911-01	Internal Solution for Mercury Sulfate 250mL (K_2SO_4)	for precipitation titration	
12-00911-02	Internal Solution for Electrode	1mol/L /	
12 00911 02	250mL(KNO ₃)	for precipitation titration	
61-00081-00	Internal Solution(LiCl in CH ₃ COOH)	1mol/L /	
		for non-aqueous titration	
61-00081-01	Internal Solution(LiCl in EtOH)	1mol/L /	
01 00001 01		for non-aqueous titration	

Option(**Electrode Cable**, **Internal Solution**)

8-3. Specification

Specification	Contents		
	1) Potential :-2000mV to +2000mV		
Detection range	2) pH :-20.00 to 20.00pH		
	3) Temperature :0 to 100°C		
Titration mode	Auto Titration, Auto Intermit, Intermit, Stat		
Method	20 (Max 2 methods can be linked)		
Titration	Potentiometric (acid/base, redox, precipitation), Photometric, Polarization, Conductivity		
Titration form	Full titration (Auto EP detection), EP Stop, Level Stop		
Special application	Measurement of electrode potential (pH, potential), Acid dissociation constant (pKa)		
Display	White LED-backlit LCD		
On-screen display	 Potential, titration volume/ Measurement Results/ Titration conditions / Parameters Japanese / English / Mandarin Chinese / Korean / Russian / Spanish 		
Calculation	Concentration Statistics (mean, SD, RSD) / Auto input of blank and factor		
Data storage	50 samples		
	Registration of operator / Record of check results / Record of electrode		
GLP support	calibration / Verification of burette capacity /Management of conduction time		
	20mL glass burette with brown cover (Standard)		
Burette capacity	Optional burette units: 10mL, 5mL, or 1mL		
	50mL burette(Auto dispenser) ± 0.5mL		
	20mL burette: ±0.02mL, repeatability ±0.01mL		
Burette accuracy	10mL burette: ±0.015mL, repeatability ±0.005mL		
,	5mL burette: ± 0.01 mL, repeatability ± 0.003 mL		
	1mL burette: ± 0.005 mL, repeatability ± 0.001 mL		
	1) STD : pH (mV) and mV, 2 inputs (Standard)		
	2) PTA : pH (mV), mV and photometric, 3 inputs		
Ducenculificu	3) POT : pH (mV), mV and polar, 3 inputs		
Preamplifier	4) CMT : pH (mV), mV and conductivity, 3 inputs (factory setting		
	required)		
	5) TET : pH (mV) 2 ways and mV, 3 inputs (factory setting required)		
	RS-232C ×2: for Dot matrix printer/Electronic balance,		
	Data Acquisition Software (SOFT-CAP)		
	USB ×1: for USB flash drive, Thermal printer, Keyboard,		
External I/O	Barcode reader, Foot switch		
	SS-BUS ×1: for Multiple sample changer, APB		
	ELE. ×1: for Smart electrode		
	Input terminal for temperature sensor to correct reagent volume, sensor		
	Pt100, temperature reading accuracy: ±0.5°C (burette 1 only)		
	Automatic piston burette : Can control max 10 burette drives		
Expandability	(Including two built-in burette drives)		
	Multiple sample changer : CHA-700		
Ambient conditions	Temperature :5 to 35°C		
	Humidity :85%RH or below (no condensation)		
Power supply	DC24V 1.9A(Main unit) AC100-240V±10% 50Hz/60Hz(AC Adapter)		
	DC7V 1.6A(Printer) AC100V±10% 50Hz/60Hz(AC Adapter)		

8. Others

Specification	Contents		
Power consumption	Main unit	Approx. 20W	
	Printer	Approx. 7W	
	Titration unit	: 141(W) × 29	$6(D) \times 367(H)$ mm (not incl. tubing)
Dimensions	Stirrer(MS-710A)	: 107(W) × 20	06(D) × 331(H) mm
	Printer	: 106(W) × 18	80(D) × 88(H) mm
	Titration unit	: Approx. 4.0k	kg
Weight	Stirrer(MS-710A)	: Approx. 2kg	
	Printer	: Approx. 0.4k	kg
Conformity standard	CE marking EM	: EN61326 LVD : EN610	10-1 RE Directive
	Burette unit EBU	CC Part15 FCC ID:2AB	SVEBU01

8-4. International standards

List of supported standards

	Standard	Country
ASTM D94-07	Standard Test Methods for Saponification Number of Petroleum Products	U.S.A.
ASTM D 664-11a	Standard Test Method for Base Number of Petroleum Products by Potentiometric Perchloric Acid Titration	U.S.A.
ASTM D974-12	Standard Test Method for Acid and Base Number by Color-Indicator Titration	U.S.A.
ASTM D1159-07	Standard Test Method for Bromine Numbers of Petroleum Distillates and Commerical Aliphatic Olefins by Electrometirc Titration	U.S.A.
ASTM D1832-04	Standard Test Method for Peroxide Number of Petroleum Wax	U.S.A.
ASTM D2710-09	Standard Test Method for Bromine Index of Petroleum Hydrocarbons by Electrometric Titration	U.S.A.
ASTM D 2896-11	Standard Test Method for Water in Crude Oils by Coulometric Karl Fischer Titration	U.S.A.
ASTM D 3227-04 a	Standard Test Method for (Thiol Mercaptan) Sulfur in Gasoline, Kerosine, Aviation Turbine, and Distillate Fuels (Potentiometric Method)	U.S.A.
ASTM D3242-11	Standard Test Method for Acidity in Aviation Turbine Fuel	U.S.A.
ASTM D3339-11	Standard Test Method for Acid Number of Petroleum Products by Semi-Micro Color Indicator Titration	U.S.A.
ASTM D 4739-11	Standard Test Method for Base Number Determination by Potentiometric Titration	U.S.A.
ASTM D4929-07	Standard Test Methods for Water in Crude Oils by Coulometric Karl Fischer Titration	U.S.A.
ASTM D 6470-99	Standard Test Method for Salt in Crude Oils (Potentiometric Method)	U.S.A.
ASTM D 1067-11	Standard Test Methods for Acidity or Alkalinity of Water	U.S.A.
ASTM D1121-11	Standard Test Method for Reserve Alkalinity of Engine Coolants and Antirusts	U.S.A.
ASTM D1126-12	Standard Test Method for Hardness in Water	U.S.A.
ASTM D 1426-08	Standard Test Methods for Ammonia Nitrogen In Water	U.S.A.
ASTM D4251-89	Standard Test Method for Active Matter in Anionic Surfactants by Potentiometric Titration	U.S.A.

	Standard	Country
ASTM D 4658-09	Standard Test Method for Sulfide Ion in Water	U.S.A.
ASTM D5776-07e1	Standard Test Method for Bromine Index of Aromatic Hydrocarbons by Electrometric Titration	U.S.A.
ASTM E1899-08	Standard Test Method for Hydroxyl Groups Using Reaction with p-Toluenesulfonyl Isocyanate (TSI) and Potentiometric Titration with Tetrabutylammonium Hydroxide	U.S.A.
ISO 3771		International
ISO 6619		International

9. Warranty and After-sales Service

1. Warranty Period

Three (3) years from the date of receipt of this product or the date of installation by KEM service personnel or by authorized personnel.

2. Warranty Details, After-sales Service

This product passed the strict inspections of KEM and, except for consumables, KEM warrants this product, under normal use, for three (3) years from the date of receipt of this product or the date of installation by KEM service personnel or by authorized personnel. (Parts and consumables will be supplied for at least seven (7) years after discontinuation of this product.)

Should an initial failure occur during the warranty period, KEM will decide whether to replace the product or to correct defects.

This product can be repaired at user's site by KEM service personnel or by authorized personnel. Note that secondhand or pre-owned products are not covered by warranty.

3. Exclusion

Warranty shall be void where:

- any part is replaced or any repair or remodeling is performed by unauthorized personnel;
- unauthorized service parts, spare parts and/or consumables are used;
- the user does not follow the instructions for installation, correct use, maintenance and/or storage, resulting in malfunction;
- the user does not follow the ranges and/or conditions stated in the product brochure, flyer or specifications;
- periodic checks and/or maintenance is not performed;
- breakage and/or malfunction is caused by careless handling such as, but not limited to, exposing to or submerging in water, or dropping down;
- breakage and/or malfunction is caused by excessive force applied to glassware or plastics;
- malfunction or leakage is caused by sample properties (corrosively, solid materials, etc.);
- malfunction is caused by any device, part and/or chemical other than those supplied by KEM;
- overuse has led to fatigue or wear of parts;
- items are consumables or wearing parts;
- this product has been moved or transported to another place once accepted and installed;
- breakage and/or malfunction is caused by conditions beyond control of KEM including, but not limited to Acts
 of God such as fire, earthquake, lightning strike, flood, etc.;
- parts including, but not limited to the touch screen LCD, are broken due to improper or inadequate handling such as spilling chemicals;
- items are consumables, accessories or wearing parts, or parts which are in direct contact with samples and/or reagents and are considered consumables due to normal wear.

KEM is also unable to offer warranty and related services of repairs and maintenance checks of any kind once specifications, capability, features and/or functions of this product as well as its parts are changed, altered or remodeled by unauthorized personnel.

4. Disclaimer

KEM is not held liable, during or after the warranty period, regardless of whether loss or damage is caused by any event beyond control of KEM, or it is the user's opportunity loss and/or lost earnings caused by failure or malfunction of KEM products, or with or without predictability of KEM, for loss or damage resulting from a particular reason, secondary loss or damage, accident compensation, damage to products other than those supplied by KEM, and any other incidental compensation.

KEM is also not held liable for physical and/or economic loss or damage resulting from the use of KEM products, or loss of stored data during repair or servicing of such product.