NECMET

Instruction Manual

Model pH-250L (*pH/ISE/mV/ORP/Temp Meter*)

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ISO
Certified
9001

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Chapter I. Instruction

This desktop Meter (*Model pH-250L*), the latest- model is operated by AC/DC adaptor (DC 12V), a high performance model controlled by microprocessor for all measurement needs.

The model *pH-250L* is capable of storing up-to 500 points in its memory box and storing by control of the time interval of data-log automatically. And also, by using RS232C cable, it can be remotely controlled and transmitted the measured information to the printer or computer by 1 second interval.

pH-250L (pH/ISE/mV/ORP/TEMP Meter)

If a pH value is stable, a world "Stable" is displaying on the screen, therefore a user can measure the sample more accurately. And it features Auto/Manual calibration (5 Points each) And displaying pH, ISE(mg/L), mV, ORP(Relative mV), DO(mg/l), O_2, Air and temp(℃)

pH   Indicates Power of Hydrogen(H^+) (Unit pH)
          $pH = -log_{10}[H^+]$ It means a Hydrogen Ion Concentration

ISE   Indicates concentration of any given ion. (Unit mg/L)
          To measure an ion, must use proper electrode according to the type of the selected. For further information, please refer the description of each ion sensor.

mV   Indicates electromotive force of each ion. (Unit mV)

ORP   Indicates a relative potential. (Unit mV)

ATC   Indicates Automatic Temp Compensation, a temperature probe supplied by istek must be used. Temperature Compensation is automatically performed indicates present temp and in case of it is unconnected with the meter, it displays **25℃**.

Chapter II. General Functions

2.1 Instrument Setup

Rear Panel of *pH-250L*
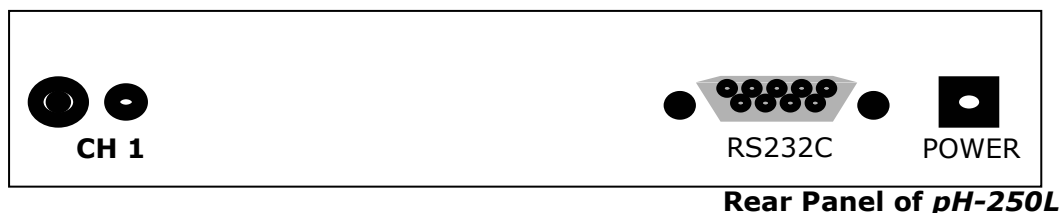
Power Source

Connect the supplied AC/DC adaptor to Power Jack of the meter.
istek supplies **AC/DC adaptor(DC 12V) adjusting to 220V.**

    With built- in Printer: 12V, 3A
    Without built-in Printer: 12V, 1A

This meter can be used in free voltages and if you would like to use this to 110V, just use a proper connector for inserting a users plug.

Sensors and ATC probe Connecting

We recommend to use electrodes which were provided by istek, Inc. for optimum working.
Put it into BNC Jack and turn it clockwise to lock into position. And Attached ATC probe to the ATC jack by sliding the connector straight on until firmly in place.

RS232C interface cable Connecting

Using this RS232C Interface cable, it is available to connect the meter with Printer (Or Computer) and user can edit or print the data easily. For further information, please refer the Chapter 4 <Data –Log> Part

2.2 Display Description

This is an initial display of *pH-250L*.

Initial display of ▣ pH-250L

```
┌─────────────────────────────────┐
│ Setup    Cal    Memory    Help  │
│                                 │
│            pH                   │
│                                 │
│  ┌─────┐   ┌─────┐   ┌─────┐    │
│  │ pH  │   │ ORP │   │ ION │    │
│  └─────┘   └─────┘   └─────┘    │
│ Message       05/08/24 15:00:32 │
│ * RS232 output  :  Computer     │
│ * Interval      :  00sec        │
└─────────────────────────────────┘
```

Display   Function
----

pH   Displays power of hydrogen ion in range of -2.000 to 19.999pH

ORP   Indicates a relative potential in range of -1999.9 ~ 1999.9mV

ION   Indicates a strength of ION in range of 0.0001 ~ 19,999mg/L

Setup   Indicates to change each selected value per measuring Item

Cal   Indicates that meter is in calibration condition

Memory   Indicates for confirming each saved data per Item

Help   Indicates to check interior simplicity manual which is saved in instruments

Message   When you select each Menu or item, this message is appeared

05/08/24   Indicate of using data of the instrument

15:00:32   Indicate of using time of the instrument

2.3 Electrode Structure

General pH Combination Electrode Structure
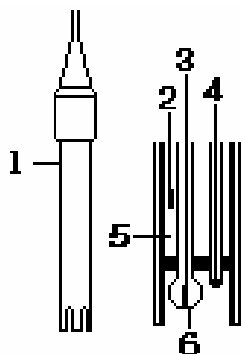
1. Electrode Body
2. Ag/AgCl or calomel electrode ; Reference Electrode
3. pH mono electrode ; Indicator electrode
4. ATC ; Temperature sensor
5. Reference Filling Solution ; Saturated KCl Solution
6. Glass Membrane: Membrane selectively responding hydrogen ION

pH Electrode Storage & Maintenance

pH Electrode Storage

Electrodes are stored in the cap of storage solution supplied by istek.
Membrane must be kept wet. If there is no storage solution, pH 4 buffer is best for the single glass electrode and saturated KCl is preferred for a calomel and Ag/AgCl reference electrode. Saturated KCl is the preferred solution for a combination electrode.
Electrode is sometimes stored in distilled water, but this method causes electrode life to decrease.

pH Electrode Maintenance (Electrode Cleaning)

If it takes long time to response or a stable data isn't obtained, can be often restored to normal performance by one of the following procedures;
Glass electrodes fail because of scratches, deterioration or accumulation of debris on the glass surface.

- Salt deposits   Recover electrode by alternately immersing it three times each in 0.1N HCl and 0.1N NaOH for approx. five minutes. If this fails, immerse tip in KCl solution for 30s. After recovery, soak in pH 7.00 buffer overnight. Rinse and soak in pH 7.00 buffer. Rinse again with distilled water before use

- Oil/Grease films   Remove oil/Grease films with detergent, and then rinse electrode with distilled water.

- Clogged Reference Junction Heat a diluted KCl solution to about $60\sim80℃$. The electrode must be stored in this solution for approx. 10 minutes, then cool electrode in not heated KCl solution.

- Protein removal   Protein coatings can be removed by soaking glass electrode in a 10% pepsin solution adjusted to pH 1 to 2.

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Chapter III Setup Functions

User connects pH sensor (Or proper ion Sensor) and ATC probe with Channel 1 for measuring.

3.1 Setup in pH mode

Initial display of ▣ pH-250L

Press [Enter] Key in pH condition in setup Mode
From here, user is able to set up 'Time', 'RS232C', 'Temp' as follows.

Picture 1

Picture 2

Picture 3

Picture 4

Common : Able to set up 'Time' & 'RS232' (Picture 2)
    a) Time : Set up or correct <Time> or <Date>
    b) RS232 : Input (or change) the Time interval of Data-Log
Temp: Used this for setting an exact Temperature, when a real temp has quite difference
    between real one, or wrong temp is displayed on a screen, user can reset it to be correct.

3.2.2 Calibrating in pH Mode (Automatic/Manual)

For getting more accurate pH value, pH sensor should be calibrated before measuring. For this istek provide pH buffer solution (pH4,7,10) each 125ml as standard accessories. It is recommended 3 point calibration (At least 2 points and one point is never accepted)

First of all, user is prepared proper buffers (pH4, pH7, pH10) for calibration.

<Auto Calibration>

Auto calibration is applied when user would like to calibrate 3 points
from **pH 2.00, 4.00, 7.00, 10.00, 12.00.**

1) pH Meter
2) pH Electrode/ATC Probe.
3) pH Calibration Buffer Solutions(commonly 4.00,7.00,10.00)
4) Stirrer, Magnetic Bar, Distilled water for rinse and 100ml Beaker

From pH initial display, press **[Move] Key** to move **Cal** Mode and press [**Enter] Key** then below display is shown. Put the pH sensor into <pH Buffer 4.00> and press [**Measure] Key**.

Setup Cal Memory Help Item		Setup Cal Memory Help Item
pH Stable Data : 0.00		pH Stable Data : 3.97
7.00	→	**3.97**
ATC 25.0'C		179.6 mV ATC 25.0'C
Message 05/08/24 15:00:32		Message 05/08/24 15:00:32
* For starting of calibration : [Measure] * Exit : [Out]		* In process of measuring

When the data is stable, press [**Memory/Out] Key** to complete first calibration with pH4.00
User can refer instruction message on bottom of window and the display is passed for second calibration automatically.

Setup Cal Memory Help Item		Setup Cal Memory Help Item
pH Stable Data : 3.97		pH Stable Data : 0.00
4.00	→	**4.00**
179.6 mV ATC 25.0'C		179.6 mV ATC 25.0'C
Message 05/08/24 15:00:32		Message 05/08/24 15:00:32
* Buffer 2 4 7 10 12 pH * Cal * OK		* For next buffer : [Measure]

After calibration, rinse the electrode with distilled water and put in the second buffer and third buffers in the same way. If user wants to calibrate 2 points only, then complete by pressing **[Memory/Out] Key** after second calibration.

When it is completed 3 point calibration (pH4,7,10), below is displayed.

```
Setup  Cal  Memory  Help  Item
pH                  Stable Data : 9.97

        10.00

-178.5 mV        ATC 25.0'C
Message          05/08/24 15:00:32
* Buffer   2   4   7   10   12  pH
* Cal              *   *   *       OK
```
→
```
Setup  Cal  Memory  Help  Item
pH                  Stable Data : 0.00

        10.00

-178.5 mV        ATC 25.0'C
Message          05/08/24 15:00:32
*For next buffer : [Measure]
*To complete 3point calibration : [Out]
```

When user complete calibration, press [**Memory/Out] Key**, a Slope value is appeared as a below. For the correct operation, the range of slope must be within 80 ~ 120%. If the slope is not within this range, calibrate again for preventing the higher error. It also makes to estimate time of exchange of electrode since can know error through slope.

```
Setup    Cal    Memory    Help
 Slope

        98.6 %

Message          05/08/24 15:00:32
*For next buffer : [Measure]
*To complete 3point calibration : [Out]
```
→
```
Setup    Cal    Memory    Help
 Slope

        98.6 %

Message          05/08/24 15:00:32
* For starting of calibration : [measure]
* Exit : [Out]
```

If user want to know 'Slope value', press [**Memory/Out] Key** in <Cal> Mode.
When the calibration is completed and moved back to pH initial display as below drawing Rinse the pH electrode with distilled water and put it in the sample which user would like to measure and press **[Measure] Key** to get a value.

\<Manual Calibration\>

When user wants calibrate special points beside pH 2.00, 4.00, 7.00, 10.00, 12.00.
User can calibrate manually. Below is described based on buffers pH 3.06, pH7.00, pH9.21.

From pH initial display, press **[Move] Key** to move **Cal mode** and press [**Enter**] **Key** then below is displayed (Picture1)

Setup	Cal	Memory	Help
pH			Stable Data : 0.00
		7.00	
			ATC 25.0'C
Message			05/08/24 15:00:32
* For starting of calibration : [Measure]			
* Exit : [Out]			

Picture 1

Setup	Cal	Memory	Help
pH			Stable Data : 3.01
		3.01	
236.6 mV			ATC 25.0'C
Message			05/08/24 15:00:32
* In Process of measuring			

Picture 2

Setup	Cal	Memory	Help	Item
pH				Stable Data : 3.01
		3.06		
236.6 mV				ATC 25.0'C
Message				05/08/24 15:00:32
* Manual calibrate mode				
* Value setting : [Up]/ [Down]				

Picture 3

From Picture 1, put into pH sensor a first buffer (pH 3.06) and press **[Measure] Key**
From above display, when 'Stable Data' is appeared, user can input proper value by using [**Up/Down**]. User complete first manual calibrating by pressing **[Memory/Out] key**

Below is progressing first buffer's calibrating (Manually).

Setup	Cal	Memory	Help	Item
pH				Stable Data : 3.01
		3.06		
236.6 mV				ATC 25.0'C
Message				05/08/24 15:00:32
* Buffer 2 4 7 10 12 pH				
* Cal * OK				

Setup	Cal	Memory	Help	Item
pH				Stable Data : 0.00
		3.06		
236.6 mV				ATC 25.0'C
Message				05/08/24 15:00:32
* For next buffer : [Measure]				

When user find the message "For next buffer" : Measure", rinse the electrode with distilled water and calibrate with second and third buffers in the same way of automatic calibration.
If user would like to calibrate just 2 points only, complete calibration by pressing [**Memory/Out**] Key.

Press [**Memory/Out**] **Key** for finding pH Slope value.

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3.2.3 Memory in pH mode

From pH initial display, press **[Move] Key** to move **Memory Mode**.

Picture 1

Picture 2

It is indicated <Measuring date>, <Time> and <Saved data> besides this, user can search a former date which was saved. If user would like to clear whole memories, press [**Memory/out] key** to move **Memory Clear Display (Picture 2)**. After memory clear, whole data and selected values in Setup Mode will be deleted completely. In case of the instrument can't sense a connected electrode or wrong time settled or wrong data memories are saved, User can try <Memory Clear>.

3.2.4 Help in pH mode

From pH initial display, press [**Move] Key** to move **Help Mode**

User can select proper language by using **[Move] Key**, and press [**Enter] Key** to see the Help Manu in detail.

3.3 Setup in ORP mode

3.3.1 Calibration in ORP Mode

From an initial display, select <ORP> by pressing [**Move] Key** & [**Memory/Out] Key**.

From this **ORP Mode** display, user can move each itemized list of Setup using **[Move] Key**
After selecting by pressing **[Enter] Key**. Refer <Setup in pH Mode ; Page 9> when you select item or change the selected value.

3.3.2 Calibration in ORP Mode

User does not need to calibrate for this ORP. So, user selects **Cal,** it is displayed message as **"No need Calibration".** In case of ORP, you could measure a sample without calibration. Sensor's condition can be checked by ORP standard solution from istek, inc.

3.3.3 Measure of Relative Millivolt in ORP Mode

Meter can measure absolute or relative millivolt. This relative millivolt value is needed when performing of potentiometric titration or preparing calibration curves. Relative Millivolt is displayed to 0.1mV resolution in the range of −1999.9 to +1999.9 mV.

In the measuring condition of mV, changed from a currently displayed value to 0 value by pressing Rel-mV key and then measures relative millivolt.

3.3.4 Memory in ORP Mode

From ORP initial display,by pressing   press **[Move] Key** to move **Memory Mode**.

It is indicated <Measuring date>, <Time> and <Saved data> besides this, user can search a former date which was saved. If user would like to clear whole memories, press [**Memory/out] key** to move **Memory Clear Display (Picture 2)**. After memory clear, whole data and selected values in Setup Mode will be deleted completely. In case of the instrument can't sense a connected electrode or wrong time settled or wrong data memories are saved, User can try <Memory Clear>.

3.3.5   Help in ORP Mode

From ORP initial display, press [**Move] Key** to move **Help Mode**

3.4   Setup in ION

From an initial display, select <ION> by pressing [**Move] Key** & [**Memory/Out] Key**.

Picture 1   **Picture 2**   **Picture 3 (Setup)**

From this **ION Mode** display, user can move to each itemized list of Setup by pressing [**Move] Key and [Enter] Key** for selecting. Refer <Setup in pH Mode ; Page 9> when user select item or change the selected value.

1) **Setup**: Able to selected proper Buffer Solution and ION.
   - **Buffer**: There are 6 kinds of Buffer Solutions (0.01/ 0.1/ 1/ 10/ 100/ 1000ppm), and user should select **2 different kinds of buffers** at least.

- **Select:** Able to select the <ION> which user would like to measure.
After selecting of proper Buffer or ION, below display is shown.

< Buffer >

Setup	Cal	Memory	Help
ION			
Buffer			

0.01	0.1	1
10	100	1000

Message	05/08/24 15:00:32

* Value setting : [Move]
* Save & Exit : [Memory]

<Select ION>

Setup	Cal	Memory	Help
Select ION			

NH_3 NH_4^+ Br^- Cd^{+2} Ca^{+2} CO_2
K^+ Cl^- Cu^{+2} CN^- F^- BF_4^-
I^- Pb^{+2} Li^+ NO_3^- NO_x ClO_4^-
Na^+ Ca^{+2}/Mg^{+2} Ag^+/S^{-2} Others

Message	05/08/24 15:00:32

* Value setting : [Move]
* Save & Exit : [Memory]

2) **Temp**: Able to input exact temperature or examine the temp sensor's condition.
3) **Common:** Able to select 'Time' and 'RS232'.

3.4.1 Calibration in ION Mode

For ION calibration, user have to select <Proper probe> and <Standard buffer> from the **Setup Mode**.

<Calibration>

For calibrating ION electrode, a preparation is as a follows.
   1) ION Meter
   2) Proper ION sensor (According as a preparation progress which was written in ION sensor's Manual, put in the sensor the standard solution for 30 minute to 2 hours. Shake the sensor regularly, an airdrops on surface of the Membrane should be removed for accurate calibrating)
   3) Ion Standard Solution (Generally 100ppm, 1000ppm)
   4) ION ISA Solution
   5) Stirrer, Magnetic Bar, 100ml Beaker, Pipette etc.

* NOTICE

   a) Measuring sample and standard solution should keep **same temp** for preventing error.
   b) 1℃ difference between a sample and standard solution brings about 2% errors.
   c) In the case of ION calibrating and measuring, user pay more attention to rinse and stirrer of the sensor. It is surely essential.

It is explained herewith up to the standard as a below.

* ION sensor: NH_3 * Standard Solution: 100ppm and 1000ppm

Select <Cal menu> in ION Mode, and then press [**Enter] Key**, then below is displayed.

After rinse of sensor with distilled water carefully and put it in the first buffer (100ppm). And stir it constantly, but not violently (It is recommended to use 'Stirrer' for getting an accurate result) and press [**Measure] Key.**

A IOM concentration is displayed by Mllivolts corresponding. When this Mllivolts is stable, press [**Memory/Out] Key for save**. It is first Calibration of ION sensor.

After this, clearly rinse again the electrode carefully and put it in a second buffer (1000ppm). Stir it constantly, but not violently and press [Measure] Key. When a mV reading value is stable, press [**Memory/Out]** Key. The below figure indicates the end of CAL2 calibration

After complete calibration, it is appeared in LCD 1) The calibrated data, 2) Time, 3) A sort of calibrate solution etc. Now Rinse the electrode with distilled water and put it in sample and press [**Measure] Key** for measuring it.

3.3.4 Memory in ION Mode

From ION initial display, by pressing   press **[Move] Key** to move **Memory Mode**.

```
┌─────────────────────────────────┐   ┌─────────────────────────────────┐
│ Setup   Cal   Memory   Help     │   │ Setup    Cal   Memory    Help   │
├─────────────────────────────────┤   ├─────────────────────────────────┤
│                   Number [001]  │   │ Clear                           │
│                                 │   │                                 │
│ Date & Time : 05/08/24 15:00    │   │  ┌───────┐      ┌───────┐       │
│ ORP −203.7mV        Temp 25.0'C │   │  │ YES   │      │ NO    │       │
│                                 │   │  └───────┘      └───────┘       │
│                                 │   │      16 KByte Memory            │
├──────────────┬──────────────────┤   ├──────────────┬──────────────────┤
│ Message      │ 05/08/24 15:00:32│   │ Message      │ 05/08/24 15:00:32│
├──────────────┴──────────────────┤   ├──────────────┴──────────────────┤
│ * Number change : [Up] / [Down] │   │ * Value setting : [Up]/[Down]   │
│ * Exit : [Out]                  │   │ * Select  : [Enter]             │
└─────────────────────────────────┘   └─────────────────────────────────┘
```

It is indicated <Measuring date>, <Time> and <Saved data> besides this, user can search a former date which was saved. If user would like to clear whole memories, press [**Memory/out] key** to move **Memory Clear Display (Picture 2)**. After memory clear, whole data and selected values in Setup Mode will be deleted completely. In case of the instrument can't sense a connected electrode or wrong time settled or wrong data memories are saved, User can try <Memory Clear>.

3.4.5   Help in ORP Mode

From ION initial display, press [**Move] Key** to move **Help Mode**

Chapter IV Data-Logging

4.1 Data-logging in Memory

The measured data is stored by pressing [**Memory**] **Key** manually.
If user would like to print the data which is stored in meter, search data stored in instrument by using [**up/down**] **Key**.

<Data –log in pH Mode>
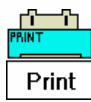
```
Setup  Cal  Memory  Help  Item
                  Number [001]

Date & Time  :  05/08/24  15:00
pH    7.00               Temp  25.0°C



Message            05/08/24 15:00:32
* Number change : [Up] / [Down]
* Exit : [Out]
```

4.2 Data-Logging to Printer & Computer

From each Mode, press [Setup Menu] -> [Common Menu]-> [RS232 Menu]
And below is displayed.

```
Setup    Cal    Memory    Help
Common
RS232

     Interval            ┌───┐
   Min │ Sec             │PRINT│
   00  │  00             └───┘
                         Print

Message            05/08/24 15:00:32
* Value setting : [Up]/ [Down]
* Save & Exit : [Memory]
```

By using **[Move] Key**, user can move to section of Interval and select 'Printer' or 'Com(PC)'.
When user selected each condition, then the date will be printed at the appointed intervals.
Also it is printed whenever user press [Print] Key regardless of setting conditions.

When user wants to receive the data with regular interval in computer, there are 2 different ways. At first, user gets it via Hyper Terminal at the appointed intervals. Second is via SDIS software which is provided by istek, Inc.(OPTION), user can receive and edit the data in Excel program easily. And also make a relative graph with the data or other many functions it has.

Chapter VI Troubleshooting & Error Description

MALFUNCTION	POSSIBLE CAUSE	REMEDY
No display	No power to meter	Press Power key. Check that the adaptor is correctly plugged.
Error occurred in Cal mode – Reading Out of Range	Electrode failure Out of Range for Buffer	Check that meter is correctly connected with electrode and ATC probe.
	When trying to exit after calibrating only 1 point, error message (Err) appears.	Press Reset key or continue calibration.
Error occurred in measure mode	Out of measuring range of pH	Check that meter is correctly connected with electrode and ATC probe. Check Calibration Slope

If the cause can't know, clear memory(data) to eliminate all data.
Refer to Clear Memory(data) of Setup Functions.

* When using Ion Selective Electrodes, refer to ISE manual.

※ If the problem persists, please contact istek, Inc Product Service Department.
 (Tel : 82-2-2108-8400, E-mail : istek@istek.co.kr)

Chapter VII Specifications

Moldel		pH-250L
pH	Range Resolution Relative Accuracy	-2.000 to 19.999 0.001/0.01/0.1 ±0.002
Millivolt (ORP)	Range Resolution Relative Accuracy	±1999.9 mV 0.1 mV ±0.1 mV
Concentration (ISE)	Range Resolution Relative Accuracy	0.00001 to19999 ± one least significant ±0.25% of reading
Temperature	Range Resolution Relative Accuracy	-10 to 110℃ 0.1℃ ±0.4℃
pH Calibration		Auto(5points) / Manual (5points)
Data Logging		500 Points
Slope		80 ~ 120%
Temperature Compensation		Auto
Calibration		Auto
Input		BNC , ATC , Power, RS232C
Output		RS232C (Computer)/ Built- In Printer
Power		AC/DC Power Adaptor
Standard Accessories		Combination pH Electrode/ ATC Probe, AC/DC Adaptor, Instruction Manual, Buffer Solution Set (4,7,10 125ml)
Optional Accessories		ORP, ION electrode(Filling , Standard, ISA Solution) pH Storage, pH Filling Solution, SDIS Program, RS232C Cable, Luxury Third Arm Stand

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* ISE Specifications

ISE Specification is simply described.
The details refer to catalog or contact istek.

ISE	Sensing Type	Measurement Range		Slope	pH Range	Temp(℃) Range	Response Time	Reference Electrode & Filling solution
		Molar(M)	mg/L(ppm)					
NH_3	GS	$1.0\sim5\times10^{-7}$	$17,000\sim0.01$	56 ± 3	above11	$0\sim50$	20	$N/A, NH_4Cl$
NH_4^+	PM	$1.0\sim5\times10^{-6}$	$18,000\sim0.1$	56 ± 2	$4\sim10$	$0\sim50$	30	$Dbl, NaCl$
Br^-	SSM	$1.0\sim5\times10^{-6}$	$79,900\sim0.4$	57 ± 2	$0\sim14$	$0\sim80$	20	Dbl, KNO_3
Cd^{+2}	SSM	$0.1\sim1\times10^{-7}$	$11,200\sim0.01$	27 ± 2	$2\sim12$	$0\sim80$	20	Dbl, KNO_3
Ca^{+2}	PM	$1.0\sim5\times10^{-6}$	$40,000\sim0.2$	27 ± 2	$3\sim10$	$0\sim50$	30	Sgl, KCl
CO_2	GS	$0.01\sim1\times10^{-4}$	$440\sim4.4$	56 ± 3	$4.8\sim5.2$	$0\sim50$	20	$N/A, NaHCO_3$
Cl^-	SSM	$1.0\sim5\times10^{-5}$	$35,500\sim1.8$	56 ± 2	$2\sim12$	$0\sim80$	20	Dbl, KNO_3
Cu^{+2}	SSM	$0.1\sim1\times10^{-8}$	$6,350\sim0.0006$	27 ± 2	$2\sim12$	$0\sim80$	20	Dbl, KNO_3
CN^-	SSM	$0.01\sim5\times10^{-6}$	$260\sim0.1$	57 ± 2	$11\sim13$	$0\sim80$	20	Dbl, KNO_3
F^-	SSM	$Sat'd\sim1\times10^{-6}$	$Sat'd\sim0.02$	57 ± 2	$5\sim8$	$0\sim80$	20	Sgl, KCl
BF_4^-	PM	$1.0\sim7\times10^{-6}$	$10,8,00\sim0.1(B)$	56 ± 2	$2.5\sim11$	$0\sim50$	30	$Dbl, (NH_4)_2SO_4$
I^-	SSM	$1.0\sim5\times10^{-8}$	$127,000\sim0.006$	57 ± 2	$0\sim14$	$0\sim80$	20	Dbl, KNO_3
Pb^{+2}	SSM	$0.1\sim1\times10^{-6}$	$20,700\sim0.2$	25 ± 2	$3\sim8$	$0\sim80$	20	Dbl, KNO_3
Li^+	PM	$1.0\sim1\times10^{-5}$	$6,900\sim0.7$	56 ± 2	$5\sim10$	$0\sim50$	30	$Dbl, (NH_4)_2SO_4$
NO_3^-	PM	$1.0\sim7\times10^{-6}$	$62,000\sim0.5$	56 ± 2	$2.5\sim11$	$0\sim50$	30	$Dbl, (NH_4)_2SO_4$
NO_X	GS	$5\times10^{-3}\sim5\times10^{-6}$	$220\sim0.2$	56 ± 3	$1.1\sim1.7$	$0\sim50$	30	$N/A, NaNO_3$
ClO_4^-	PM	$1.0\sim7\times10^{-6}$	$98,000\sim0.7$	56 ± 2	$2.5\sim11$	$0\sim50$	30	$Dbl, (NH_4)_2SO_4$
K^+	PM	$1.0\sim1\times10^{-6}$	$39,000\sim0.04$	56 ± 2	$2\sim12$	$0\sim50$	30	$Dbl, NaCl$
Ag^+ / S^{-2}	SSM	$1.0\sim1\times10^{-7}$	$107,900\sim0.01$	57 ± 2	$2\sim12$	$0\sim80$	20	Dbl, KNO_3
		$1.0\sim1\times10^{-7}$	$32,100\sim0.003$	27 ± 2	$2\sim12$	$0\sim80$	20	Dbl, KNO_3
Na^+	PM	$1.0\sim1\times10^{-5}$	$23,000\sim0.2$	55 ± 2	$5\sim10$	$0\sim50$	30	Dbl, NH_4Cl
X^+/X^-	SSM	$5\times10^{-2}\sim1\times10^{-6}$	$12,000\sim1.0$	Titration	$2\sim12$	$0\sim50$	30	Sgl, KCL
Ca^{+2} / Mg^{+2}	PM	$1.0\sim1\times10^{-5}$	$40,000\sim0.4(Ca)$	26 ± 3	$5\sim10$	$0\sim50$	30	Sgl, KCl

* Sensing Type ;   GS(Gas Sensing),   PM(Polymer Membrane),
                   SSM(Solid State Membrane)

* Response Time ;   Indicates response time.

* Reference electrode   ; N/A (No Reference Electrode),
                        Dbl (Double Junction Reference Electrode),
                        Sgl (Single Junction Reference Electrode)

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영원한 우리땅, 독도
Dokdo forever
belongs to Korea

Chapter X. Ordering Information

※ Other items contact istek.
For further information on other accessories, please feel free to contact istek at any time.

A. Standard

* Combination pH Electrode/ATC Probe

* AC/DC Power Adaptor

* Buffer Solutions (pH4.00, 7.00, 10.00) 125ml

* Instruction Manual

B. Option

* pH, ORP, ION Electrode Set

* Luxury Third-Arm Stand

* Electrode Storage Solution 475ml

* Electrode Filling Solution 125ml

* Buffer Solutions (pH4.00, 7.00, 10.00) 475ml

* RS232C Interface Cable

* SDIS Program

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E-mail : istek@istek.co.kr

CERTIFICATE OF WARRANTY

* We guarantee as following,

1. This product has been passed our strict inspection process.
   (It comes under the meters with the exception of an electrode)

2. Defects occurring within 2years from delivery date shall be remedied free of charge at our works when it has been used in a normal situation. (But we can make a user pay for mending charge in the case of trouble caused by a careless user.)

3. We will repair the good with fee about problems caused by user's mistake even if warranty period has not been over.

4. Please present this form with the good when you want to repair it.

5. Please keep this certificate with care because this sheet will not be reissued.

Product name		**Warranty period**
Model name		
Serial number		
Manufacturing month/year		**2 years**

Date.   .   , 2005

Authorized signature