

DIGITAL CONDUCTIVITY METER

Model Series: Sigma 2008C

OPERATING INSTRUCTIONS



Xiamen Tianyan Instrument Co., Ltd

CONTENTS

1. APPLICATION FIELDS.....	1
2. CHARACTERISTICS OF THE INSTRUMENT.....	1
3. TECHNICAL PARAMETERS.....	2
4. PRODUCT COMPONENTS.....	3
5. OPERATING INSTRUCTIONS.....	4
5.1 Keyboard instructions.....	4
5.2 Operation methods.....	4
5.2.1 Turn on / Turn off.....	4
5.2.2 Measuring.....	5
5.2.3 Calibration (CAL).....	6
5.2.4 Function Selection.....	7
5.2.4.1 Menu.....	7
5.2.4.2 Time setting.....	8
5.2.4.3 Calibration standard-block setting.....	9
5.2.4.4 Unit Selection.....	10
5.2.4.5 Selection of Data Storage.....	10
5.2.4.6 Data Query.....	11
5.2.4.7 Backlight (BKL) Choose.....	12
5.2.4.8 Language Selection.....	12
5.2.4.9 Data Uploading.....	13
5.2.5 How to Charge the Battery.....	13
6. POINTS FOR ATTENTION AND MAINTENANCE.....	14
7. Notice To Users.....	14
APPEDIX1: TABLE OF CONDUCTIVITY VALUE FOR COMMON MATERIAL AND TEMPERATURE COEFFICIENT.....	15
APPEDIX2: CONTACTS.....	16

Here are portable and digital style Eddy Conductivity Meters of series of Sigma 2008 C. These products are the patent ones from our Company. The technical performance stands at the leading position in China. These are the only ones being able to replace similar products from abroad. This kind of Digital Conductivity Meters are designed with eddy detection method. These products may be used for distinguishing, grading and so forth detecting, on conductivity with non-ferromagnetic metal. These are commonly used in industries of metallurgy, machinery, electric power, aviation, aerospace, nuclear, military, etc.

1. APPLICATION FIELDS

- Detecting and measuring the value of conductivity, resistance on nonferrous metal material..
- Examine heat-treating state during manufacturing, as well as inspecting over-heated damage during service (such as: airplane).
- Detect grades of materials
- Metal classification
- Detect the density of powder-metallurgical parts

2. CHARACTERISTICS OF THE INSTRUMENT

- Advantages are: beautiful appearance, easy to carry about and grasp, it's convenient for calibration and bring about during going-out.
- Measuring range covers all nonferrous metal materials, 0.51~112%IACS or 0.3~65MS/m (with Sigma 2008C).
- Excellent design of temperature compensation and calibration style of the instrument enables the operation to be easier and more reliable.
- It is equipped with built-in data memory, enough to store 16000 groups of measured data and important measuring parameters. It is connected to a computer for forming a complete report.
- This instrument is excellent designed of lift-off compensation to ensure the precision of measurement.
- There are two kinds of measuring units (MS/m or %IACS) for convenient selection. It is easy to switch to resistivity reading directly on the measurement interface.
- It displays simultaneously the measured result, the measuring frequency, the measuring time and so forth important parameters.

- It is properly designed with back-light illumination for reading measured data in poor-light environment.
- There are three kinds of language for user's selection: Simplified Chinese Characters, Complex Form Chinese Characters and English..

3. TECHNICAL PARAMETERS

Models of product Items	Sigma 2008C	Sigma 2008C1
Working Freq.	60kHz	60kHz
Measurement range for conductivity	0.51%IACS~112%IACS, or 0.3 MS/m~65 MS/m ,or resistivity 0.0154~3.3333Ω·mm ² /m	7.76%IACS~112%IACS, or 4.5 MS/m~65 MS/m ,or resistivity 0.0154~0.2222Ω·mm ² /m
Resolving power	0.01%IACS(when when<51%IACS); 0.1%IACS(from 51%IACS to 112%IACS)	
Measuring precision	±0.5% (at temp. 20 ⁰ C); ±1% (temp range, from 0 ⁰ C to 40 ⁰ C)	
Lift-off effect	Compensation 0.1mm	
Function of auto compensation	Measured result of conductivity, adjusting to value at temp. 20 ⁰ C automatically	
Normal working environment	Temp. from 0 ⁰ C to +50 ⁰ C; relative humidity, from 0 to 95%	
Display	Medium size screen, displaying conductivity, frequency, time	
Power supply	Equipped with best performance lithium ion rechargeable battery	
Sensor	One sensor of diameter ϕ14mm, working freq. 60kHz..	
Reading memory	It is available to store up to 16000 groups of measured data.	
Communication with PC machine	RS232 serial interface (There is no serial interface for models C1)	
Weight of the host machine	The weight is 0.3kg (including batteries)	
Dimensions of the host machine	170mmx88mmx50mm	
Shell of instrument	Impact-resistance, Engineering plastic shell, Anti-electric-power rubber shell.	

Package and protection	High impact-resistance, portable box, inside of it there are instrument, sensors, communication cable (for model C), operation manual, conductivity standard-blocks, recharger, [U-disk (or optical disk)] (for model C).
Accessories	2 pieces of standard conductivity blocks, You can purchase more blocks if you wish.

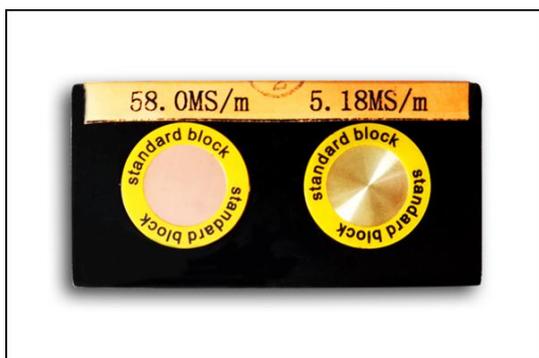
4. PRODUCT COMPONENTS



1. Host machine of conductivity meter



2. Detecting sensors



3. Conductivity standard blocks



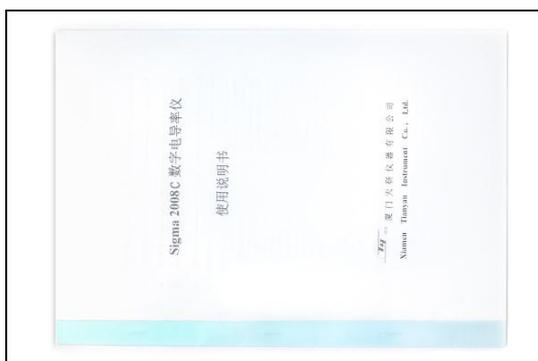
4. U-disk (for Sigma 2008 C1)



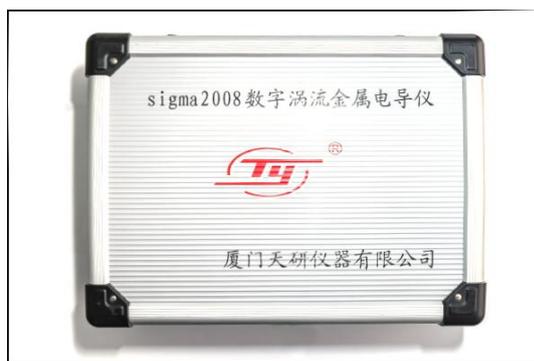
5. Battery recharger



6. RS 232 communication serial interface
(for Sigma 2008 C)



7. Operation manual



8. Portable protective box

5. OPERATING INSTRUCTIONS

5.1 Keyboard instructions

5.1.1 “MEAS”: key for fast measurement

5.1.2 “CAL”: key for fast calibration

5.1.3 “SET”: key for function setting

5.1.4 “OK”: key for confirmation

5.1.5 “ON/OFF”: key for turn on/ turn off

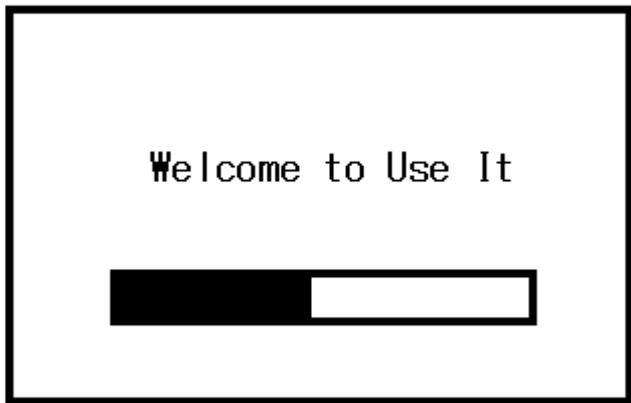
5.1.6 “↑” : Key for increasing or moving up

5.1.7 “↓” : Key for decreasing or moving down

5.2 Operation methods

5.2.1 Turn on / Turn off

5.2.1.1 In turn-off condition, press the key “ON / Off” for 2 seconds, the instrument is turned on, and the welcome interface appears on the screen, as shown in the following figure.

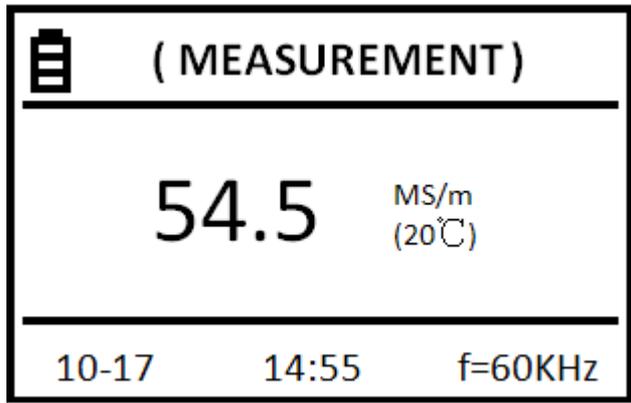


5.2.1.2 You can press measurement key “MEAS”to go into the interface corresponding directly,or go into the measurement interface automatically after finishing the welcome interface.

5.2.1.3 In turn-on condition, press the key “ $\frac{ON}{OFF}$ ”for about 2 seconds, this instrument is turned off and current setting information is stored.

5.2.2 Measuring

5.2.2.1 It will show the measuring interface on the screen by pressing "MEAS" key directly under the the welcome, calibration or setting interface.



Instructions:

- a. The word (measurement) at the upper side on the screen indicates the function of this interface. “  ” indicates the current residual energy of the battery.
- b. The big typeface digits in the middle row indicate the conductivity value of the tested sample at +20°C. MS/m or %IACS is the measurement unit of the conductivity. (How to set the measurement unit, please read the instructions at 5.2.4.7 and 5.2.2.3 concerning keys “  ” and “  ”) .
- c. At the lower part on the screen, □□—□□ indicates the date you make the measurement. □□ : □□ indicates time o’clock and minute. f = □□□KHz indicates working frequency of the sensor.

5.2.2.2 During measuring interface, when you put flatly the sensor (in the air >5cm above the sample) onto the tested sample surface vertically for a period of 2 seconds, the instrument will give out a prompt sound. The conductivity measurement is completed and the measured data will be held automatically till the next measuring procedure begins.

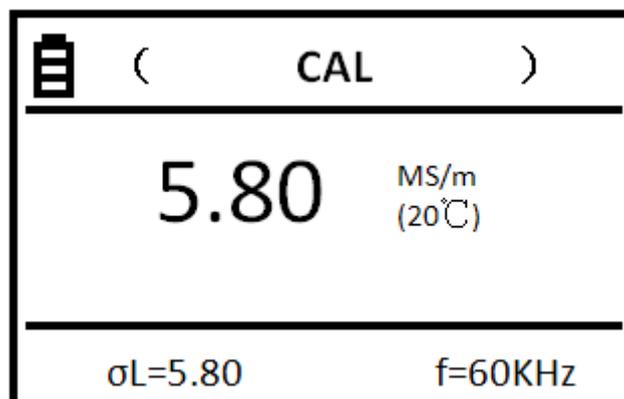
5.2.2.3 During measurement interface, if you want to know measured data value in other measurement unit quickly, you may press keys “ \uparrow ” or “ \downarrow ”. Every key-pressing, it switches to another measurement unit automatically (measurement units are: MS/m, %IACS, $\Omega \cdot \text{mm}^2/\text{m}$). Turning on after off condition, or returning to the measurement interface from other interface, the measurement unit returns to originally set unit.

Notes: ① During measuring, if the instrument is at input protection condition (such as there appears a value of not-measured data on the instrument, it does not renew a measured reading), you need to click on the measurement re-set key, so it returns to the normal measuring state.

② When you use the instrument of measuring range of 4.5~65MS/m (such as model Sigma2008C1), if the sample with the value smaller than 4.5 MS/m, this instrument will flashes prompt of 4.5 MS/m.

5.2.3 Calibration (CAL)

5.2.3.1 When on measuring or setting main interface, press the calibration key “CAL”, there appears calibration interface, as shown in the following figure.



Instructions:

- At the upper part on the screen, “CAL” means the function of this interface.
- In the middle part on the screen, it shows the conductivity value of the tested calibration standard-block. Its meaning is the same as the instruction b of measurement interface.
- At the lowest part on the screen, there appears the high value σ_H or the low value σ_L of the conductivity value of the standard-block.. Meanings of other symbols are the same as those of instruction c in the measurement interface.

5.2.3.2 While getting into the calibration interface, firstly, this instrument carries out calibrating the low value standard-block (at the lower part on the screen, it shows the setting value σ_L for the low value standard-

block). Put the sensor flatly onto the surface of the low value standard-block vertically. It measures out the conductivity value.

- a. When the measured value is equal to the set value σ_L , you don't need to calibrate the low value. Put the sensor back to the air, and press the key "OK". This instrument is ready for high value standard-block calibration.
- b. When the measured value is not equal to the set value, keep the sensor touching the standard-block, press the key "OK". The instrument carries out calibration automatically.. After calibrating, the instrument gives out a prompt sound.
- c. Measure the calibration standard-block once more. If the error is more than 0.3%, calibrate it again following step b, till the measured value meets our requirement. Put the sensor back to the air and press the key "OK" to get ready for calibrating the high value standard-block.

5.2.3.3 Calibrating high value standard-block (at the lower part on the screen, it shows the set value σ_H for the high value standard-block).

- a. Put the sensor onto the standard-block. Press the key "OK". The instrument gets into calibration automatically. After completing calibration, the instrument gives out a prompt sound.
- b. Measure the standard calibration block once more. If the error is more than 0.3%, calibrate it again following step a, till the measured value meets our requirement. Put the sensor back to the air and press the key "OK", the instrument quits from the calibration interface.

5.2.3.4 On the mid-way of calibration, if you press the measuring key "MEAS" or the setting key "SET", the instrument quits from the current calibration interface and the calibrated readings become invalid. The instrument returns to the relevant interface.

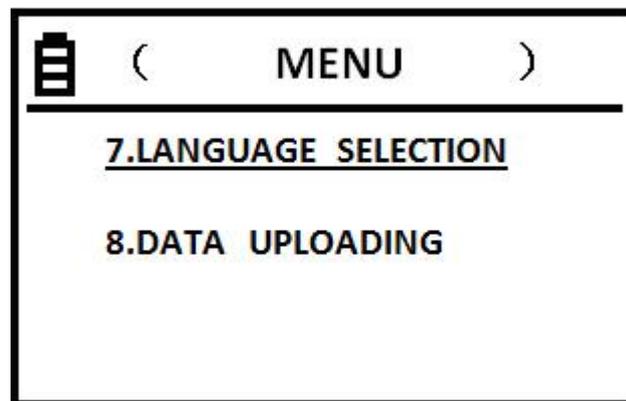
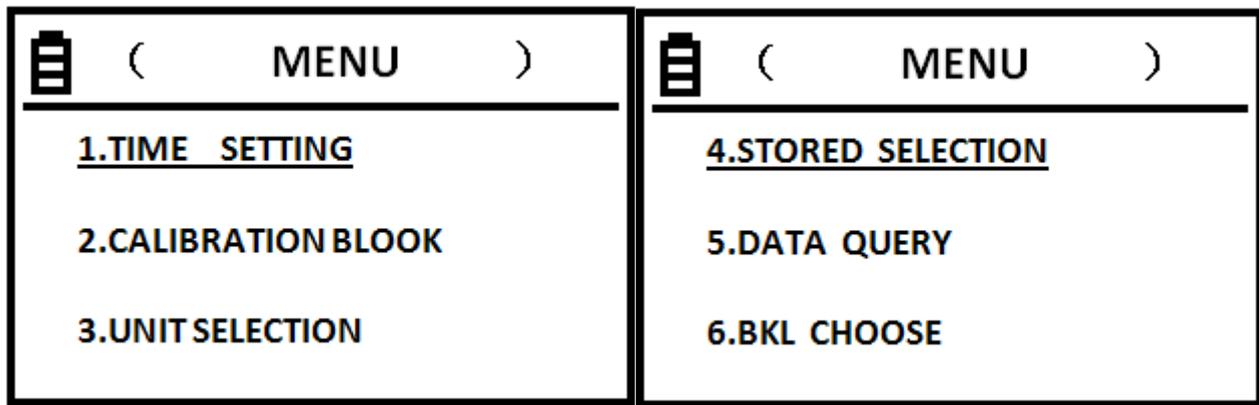
5.2.3.5 Additional instructions for the instrument calibration.

- a. Calibration principles: This instrument is calibrated at two points, such as high-value standard-block (σ_H) and low value standard-block (σ_L).
- b. The selecting rules for the standard-blocks: The value σ_H of the high value standard-block is commonly selected larger than the conductivity value of the tested material. The value σ_L of the low value standard-block is commonly selected smaller than the conductivity value of the tested material.

5.2.4 Function Selection

5.2.4.1 Menu

When at any interface, press the setting key "SET" directly; there appears setting main interface on the screen, shown in the following figure.

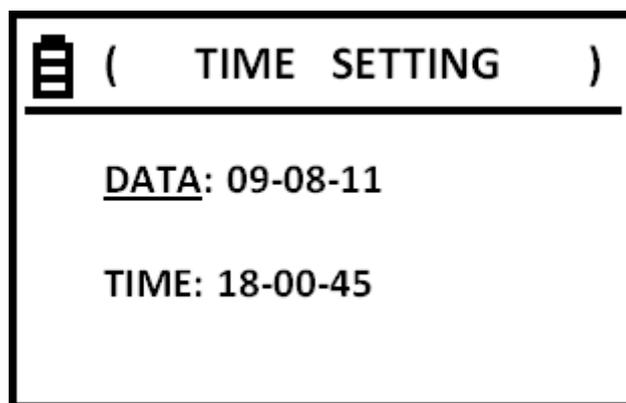


Instructions:

- a. There are 8 setting items on the screen. The user may press the upward key “ \uparrow ” or the downward key “ \downarrow ” to select one item, and press the key “OK” to get into that set item.
- b. While getting into that item setting, press the setting key “SET” or press the measuring key “MEAS”, the instrument returns to the relevant main interface.
- c. During at the setting main interface, if you press the measuring key “MEAS” or the calibrating key “CAL”, the instrument quits and returns to the relevant main interface.

Notes: ① There is no “DATA UPLOARDING” item for instrument of Sigma 2008C1.

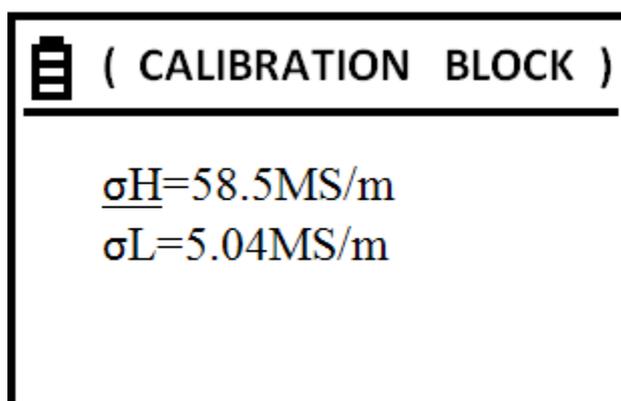
5.2.4.2 Time setting



Instructions:

- a. Press the upward key “ \uparrow ” or the downward key “ \downarrow ” to move the cursor to the selected item DATE or TIME. Then, press the confirmation key “OK”. Move the cursor to the first group of digits of the selected item, then use the upward key “ \uparrow ” or the downward key “ \downarrow ” to revise the value, then press key “OK” to store the first group of digits. Move the cursor to the second group of digits, the rest may be deduced by analogy, till completing the revision of the third group of digits, then press key “OK” to store the third group of digits and the instrument quits from this item. Move the cursor to the next item TIME. If the instrument quits from TIME item, it will return to the setting main interface.
- b. Digits in the first group of DATE may be set as “00-99” for year. Digits in the second group may be set as “00-12” for month. Digits in the third group may be set as “00-31” for day.
- c. Digits in the first group of TIME may be set as “00-24” for o’clock. Digits in the second group and the third group may be set as “00-60” for minute and second.
- d. While the cursor points on digits, and if you press the upward key “ \uparrow ” or the downward key “ \downarrow ”, you can revise the digits quickly.

5.2.4.3 Calibration standard-block setting

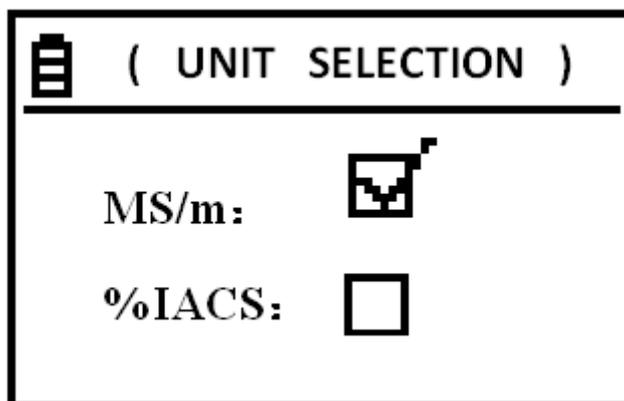


Instructions:

- a. The numerical values on the right side of σ_H , σ_L may be set as conductivity value of the high value standard-block and low value standard-block at 20⁰C for usage of calibration of this instrument. As for the measurement unit MS/m or %IACS, please read item of UNIT SELECTION at 5.2.4.8,

- b. Press the upward key “ \uparrow ” or the downward key “ \downarrow ” and move the cursor to the item to be revised. Press the confirmation key “OK” and move the cursor into the numerical value location, then move the upward key “ \uparrow ” or the downward key “ \downarrow ” to revise the numerical value. After completing, press the confirmation key “OK” to store data and the cursor moves to the next item automatically. The rest may be deduced by analogy.. Then, press the confirmation key “OK”, the instrument quits and returns to the setting main interface.
- c. The setting range for σ_H and σ_L is “0.46—64.0 MS/m or 0.8—111.0%IACS”.
- d. For Model Sigma2008C1, the numerical value of setting range for σ_H and σ_L is 4.50—64.0MS/m or 7.70—110.0%IACS.
- e. The setting value σ_H of the high value standard-block should be larger than value σ_L of the low value block.
- f. When the cursor points to the numerical value row, and if you press the upward key “ \uparrow ” or the downward key “ \downarrow ”, you can revise numerical value quickly

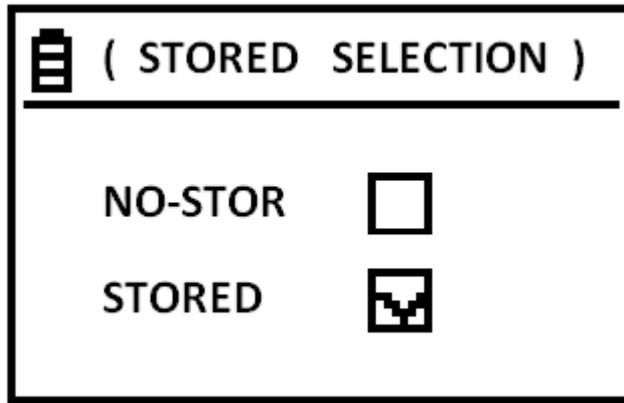
5.2.4.4 Unit Selection:



Instructions:

- a. After you select one of these measurement units, the conductivity value in any interface is in this unit. And, the conductivity value will be conversed automatically according to the conversion formula.
- b. Press the upward key “ \uparrow ” or the downward key “ \downarrow ” to move the cursor to the selected item (mark \surd in the box), press the confirmation key “OK”(the instrument keeps on the selected item till next selection), the instrument returns to the setting main interface.

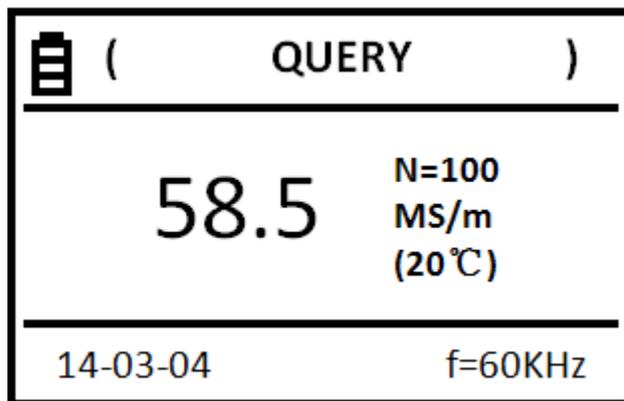
5.2.4.5 Selection of Data Storage



Instructions:

- a. Setting of this interface will perform saving or not saving your measured data. If you set it on saving function, every measured valid data will be saved automatically, then there appears quick flashing of N=XXX in the middle row of the interface.
- b. You can save 16000 groups of data in this instrument. When there are 16000 groups of data saved inside, there will appear prompt word “FULL”. Then, the user should clear out data in the memory, so the user can save data continuously. (For method of clearing out saved data, please read Instruction c of **Data Query** at 5.2.4.6).
- c. The method of selection is just the same as Instruction b of “**Unit Selection**” at 5.2.4.4.

5.2.4.6 Data Query

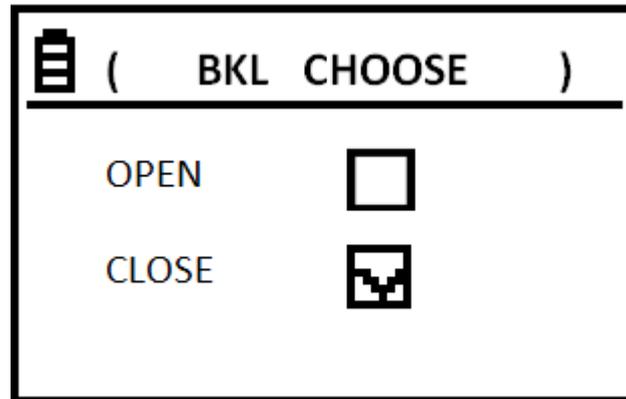


Instructions:

- a. You can check the measured data stored in this instrument before (there are 16000 groups in all).
- b. In the middle on the screen, the English letter N indicates the storage serial number of these data on this page. The order of the serial number is arranged from the smaller one to the larger one. That is, the data measured currently is numbered as the first group automatically. The data measured last time will be renewed as the second group. The rest may be deduced by analogy. There are 16000 groups in all.
- c. After getting into Query interface, there appears firstly the page where the stored number is 1. Press the upward key “ \uparrow ” or the downward key “ \downarrow ”, you can query the former group or the later group of those stored data. After querying, press the confirmation key “OK”, this instrument quits and returns to the setting main interface.

- d. How to delete stored data: On some data query page, press the deleting key “

5.2.4.7 Backlight (BKL) Choose



Instructions:

- When you select “**OPEN**”, the backlight of the liquid crystal screen switches to “**OPEN**”. Otherwise, it is “**CLOSE**”.
- The method of selection is just the same as Instruction b of **Unit Selection** at 5.2.4.4.

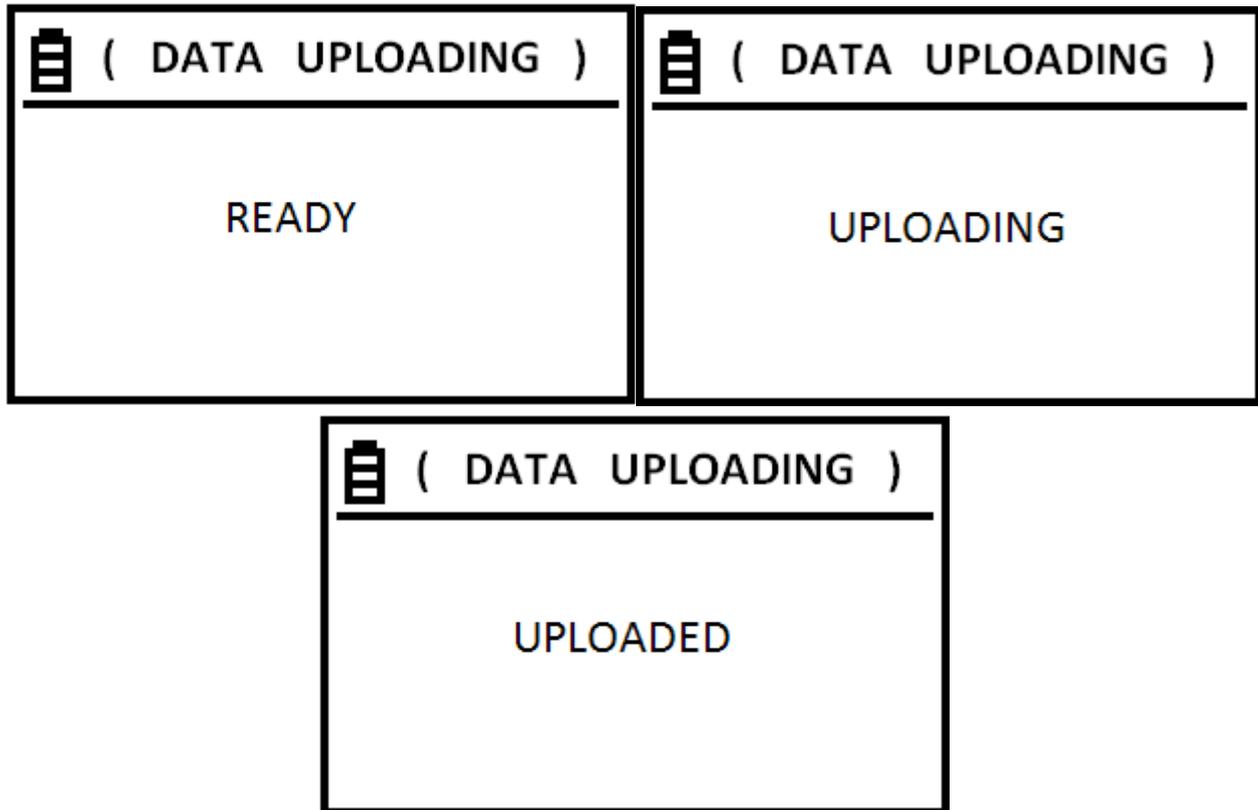
5.2.4.8 Language Selection



Instructions: Press the upward key “

12

5.2.4.9 Data Uploading



Instructions:

- This function is for uploading stored measured-data to the upper position PC machine.
- Uploading begins from page 1 of stored data to the last page.
- While getting into uploading function, there appears firstly the prompt term "**READY**" on the screen. At this time, the user can carry out all preparing work for uploading. When the confirmation key "**OK**" is pressed, the instrument begins to upload data, there appears the prompt term "**UPLOADING**".
- After uploading, there appears the prompt term "**UPLOADED**" on the screen. Press the confirmation key "**OK**", the instrument quits and returns to the setting main interface.
- Instruction for driving the upper-position PC machine, please refer to the U-disk (or optical disk) accompanying with this instrument.

Note: There is no such function for models of Sigma 2008C1.

5.2.5 How to Charge the Battery

5.2.5.1 This instrument is equipped with a lithium-ion battery of 1600mA/h originally.

5.2.5.2. When the residue indicating-bar shows the residue is lower than 1/3 on the battery indicating-pattern, and the instrument gives out two prompt sounds continuously every 30 seconds, this reminds you to charge the battery.

5.2.5.3 Method for charging: Plug the accompanying special charging adapter into the socket of the mains AC 220V or 110V. Then, plug the DC plug of the adapter into the DC jack on the instrument. At this time, the indicator on the adapter lights red. It means that the battery is in charging situation. When the indicator turns to green, it means that the battery is full. You need to wait for more than 10 minutes to continue charging. Then you pull out the DC plug from the battery and AC plug from the power supply.

6. POINTS FOR ATTENTION AND MAINTENANCE.

- 6.1 During calibration or measurement, you need to keep the sensor touching the sample surface vertically and smoothly, putting down or picking up gently, handling with even strength.
- 6.2 It is no good to hold the sensor with your hand for a long time. If you hold the sensor for a long time, it will cause the temperature value to increase and it will affect the measurement precision.
- 6.3 It is necessary to keep the block, the sample, the instrument and the sensor to work at stable environment temperature as much as possible.
- 6.4 It is suggested to use and store the instrument and the standard-blocks under conditions without disturbing from corrosion, shaking, and electro-magnetic field.
- 6.5 Measuring work should be carried out in the condition of normal temperature 0~40⁰C..
- 6.6 Measuring work should be carried out on the place far from heating radiator, electric fan, heating stove, without direct sun-shining.
- 6.7 It is strictly forbidden to touch the end of the sensor, the block, the tested part of the sample with your fingers.
- 6.8 If there is any grease or dirt on the block, the sample, the end of the sensor, you should clean it timely.
- 6.9 You should prevent the instrument, the sensor from shaking, collision. The surface of the standard-block is strictly forbidden to be scratched.
- 6.10 If the end of the sensor is worn seriously, you need to get a new sensor to ensure measuring precision.

7. Notice To Users

- 7.1 This instrument is guaranteed to keep in good repair for one year.
- 7.2 Our company or authorized institution will not repair the instrument freely in the following cases: but we would offer paid service.
 - 7.2.1 The product has trouble or is damaged because the user does not operate the product such as connecting, operating, as well as maintaining, following the Operation Manual,
 - 7.2.2 Overdue the warranty period.

7.2.3 The number on the warranty card is not coincident with the number on the product itself.

7.2.4 The host machine or component has been disassembled or repaired by someone who is not the professional servicer of our company or authorized by our company.

7.2.5 Components not within warranty-range (such as the detecting sensor, rechargeable batteries, the shell, keyboard, linking wire or cable).

7.2.6 The product is damaged due to unexpected reason or human behavior.

7.2.7 The product has trouble or is damaged due to irresistible factors, such as earthquake, fire disaster, et

APPEDIX1: TABLE OF CONDUCTIVITY VALUE FOR COMMON MATERIAL AND TEMPERATURE COEFFICIENT

METAL	CONDUCTIVITY (20℃)		TEMP. COEFFICIENT (20℃)
	%IACS	MS/m	
Copper	100	58	0.0038
Aluminum	29~61	17~35.4	0.0040
Gold	70.7	41	0.0034
Silver	108	62.5	0.0038
Brass (H90)	43.10	25	0.0018
Aluminum bronze	9	5.2	~0.0008
Titanium	3.6	2.08	0.0040
Lead	7.8	4.5	0.0039
Zinc	30	17.4	0.0037
Nickel	22	12.8	0.0060
Magnesium	38	22	0.0040
Nickel silver	8.6	5	0.00068
Titanium alloy	1.02	0.59	0.0002
Tungsten	31.46	18.25	0.0052
Platinum	17.24	10	0.000374
Constantan	3.92	2.27	0.000005
Manganin copper	4.1	2.38	0.000005

APPEDIX2: CONTACTS

Name: Xiamen Tianyan instrument co.,Ltd.

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Sales telephone: 0592-3195306, 0592-3195308

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