



Laboratory equipment co.,limited

## REBAR LOCATION AND CORROSION MEASURING SYSTEM GX50B

# PRODUCT MANUAL



## C-TECH LABORATORY EQUIPMENT CO., LTD

📍 Building C28, Hegu Technology Industrial Park, Development Zone, Zhuozhou, Hebei, China

☎ +86-312-3868016/3852880

📠 +86-312-3868882

🌐 [www.testmould.com](http://www.testmould.com)


SINCE 2006


## CONTENTS


<b>PREFERCE</b> .....	<b>1</b>
STARTING UP .....	1
<b>PART ONE REBAR LOCATION</b> .....	<b>2</b>
I. INSTRUMENT .....	2
II. TEST .....	3
III. INSTRUMENT OPERATION .....	5
IV. TEST SKILLS .....	21
<b>PART TWO REBAR CORROSION MEASURING</b> .....	<b>23</b>
I. OVERVIEW .....	23
II. INSTRUMENT OPERATION .....	25



### **C-TECH LABORATORY EQUIPMENT CO., LTD**


 Building C28, Hegu Technology Industrial Park, Development Zone,  
Zhuozhou, Hebei, China

 +86-312-3868016/3852880

 +86-312-3868882

## Preface

### Starting up

Press the  button on the instrument panel, and the power is on. The instrument is started. The Startup Interface is shown in Diagram 2-1.

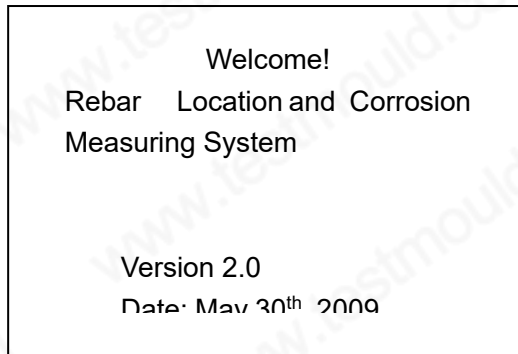



Diagram 1 Startup Interface

Press  to enter function selection. User can select Rebar Location or Rebar Corrosion measuring module.

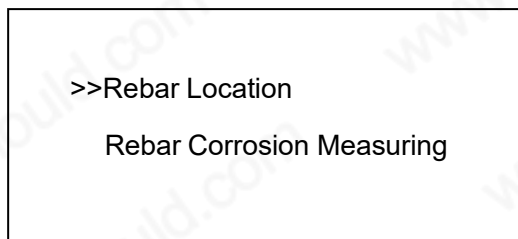




Diagram 2 module selection



### C-TECH LABORATORY EQUIPMENT CO., LTD

 Building C28, Hegu Technology Industrial Park, Development Zone,  
Zhuozhou, Hebei, China

 +86-312-3868016/3852880

 +86-312-3868882

# Part One Rebar Location

## I. Instrument

### 1. Component



1-1 Instrument Component

Instrument consists of main unit, signal cable, probe.

### 2. Technical Data

Applicable steel-bar diameter	φ6mm~φ50mm		
Tested range of concrete cover thickness	Low range: 6mm ~ 90mm; High range: 7mm~190mm		
Permissible error		Low range	High range
	±1	6~59	7~79
	±2	60~69	80~119
	±4	70~90	120~190
Tested range of steel-bar diameter	φ6mm~φ50mm		
permissible error of Steel-bar diameter	±1 grade		
Applicable environmental	Temperature: -10°C~+40°C; Dampness: <90%RH EMI: no Strong electromagnetic field		
Power supply	6 dry cells, work more than 30 times		



## C-TECH LABORATORY EQUIPMENT CO., LTD

📍 Building C28, Hegu Technology Industrial Park, Development Zone, Zhuozhou, Hebei, China

☎ +86-312-3868016/3852880

📠 +86-312-3868882

## II. Test

The rebar composes of main reinforce and the stirrups (beam, pillar etc.) or grid mode (board and wall etc.) in concrete. And usually, the embedded position of rebar in concrete cannot be predetermined. Therefore, in order to improve test efficiency and precision, certain principle shall be followed. On the basis of abundant practical test experience, we concluded a rebar detection method applicable to GW-50+ rebar position tester.

### Step 1 acquisition of data

If you can get the design and construction data of the component to be tested, you can know the approximate position, direction and diameter of the rebar in the component. Set the rebar diameter parameter of the instrument according to the design value in the data. In case the above data are not available, set the rebar diameter as the default value, then detect the rebar diameter and protection layer thickness by **grid scanning** or **section scanning** and **diameter measurement** function.

### Step 2 determination of test area

Select an area on the component to be measured as the test area as required. The area with a smooth surface is preferred so that test precision can be improved.

### Step 3 determination of direction of rebar

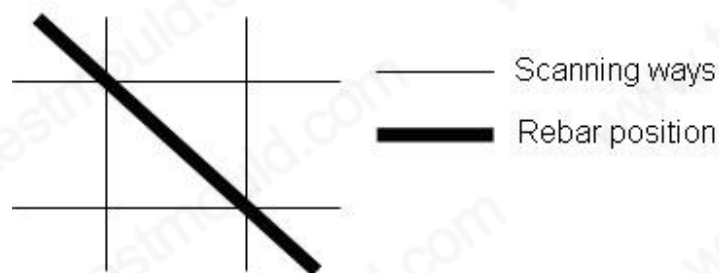


Figure 2-1

Determine the direction of the rebar according to the design data or experience. If you can't, you should scan multiple points in two orthogonal directions to determine the position of the rebar, as shown in the figure.

### Step 4 determination of position of main rebar (or upper layer rebar)



## C-TECH LABORATORY EQUIPMENT CO., LTD

📍 Building C28, Hegu Technology Industrial Park, Development Zone, Zhuozhou, Hebei, China

☎ +86-312-3868016/3852880

📠 +86-312-3868882



Select a starting point and scan along the main rebar vertical direction (for beam and column etc.) or upper layer rebar vertical direction (for plate and wall etc. with grid type rebar) to determine the position of the main rebar or the upper layer rebar. Then shift horizontally for a certain distance and scan once again. As shown in figure 2-2 below, connect the scanning points with straight lines. Note: if the scanning line is just above the stirrup or lower layer rebar, as shown in figure 2-3, the rebar may not be located, or the determined location of rebar is not accurate, which is manifested in the large deviation between determined locations of rebar in repeated scanning. At this time, the scan line should be translated twice the length of the diameter of the rebar and scan again.

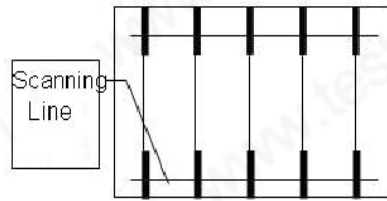


Figure 2-2

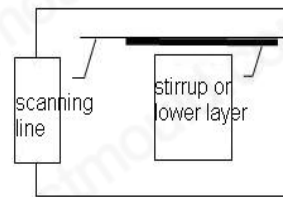


Figure 2-3

#### Step 5 determination of position of stirrup (or lower layer rebar)

Scan along the stirrup (or lower layer rebar) vertical direction in the middle of two determined rebars to determine the position of the stirrup (or the lower layer rebar). Then scan the middle of another two rebars. As shown in figure 2-4, connect the scanning points with straight lines.

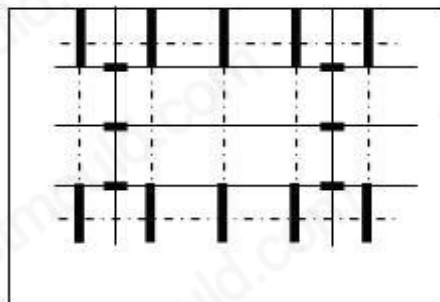


Figure 2-4

#### Step 6 detection of thickness of protection layer and rebar diameter

In case the diameter of the rebar is already known, detect the thickness of the protection layer: select the **Cover depth** function of the instrument, **set serial number and diameter parameter**, scan along the main rebar (upper layer rebar) vertical direction in the middle of two stirrups (lower layer rebar)



#### C-TECH LABORATORY EQUIPMENT CO., LTD

📍 Building C28, Hegu Technology Industrial Park, Development Zone, Zhuozhou, Hebei, China

☎ +86-312-3868016/3852880

📠 +86-312-3868882






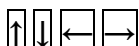

to determine the thickness of the protection layer of the main rebar (upper layer rebar); scan along the stirrup (lower layer rebar) vertical direction in the middle of two main rebars (upper layer rebar) to detect the thickness of the protection layer of the stirrup (lower layer rebar). Be noted that the related grid rebar status needs to be set.

**In case the diameter of the rebar is unknown, detect the thickness of the protection layer and diameter of the rebar:** Select the diameter measurement function of the instrument, set serial number and scan along the main rebar (upper layer rebar) vertical direction in the middle of two stirrup (lower layer rebar) with the probe parallel to the rebar to determine the exact position of the subject main rebar (upper layer rebar). Then put the probe parallelly right above the rebar to be measured and detect the diameter of the rebar and the depth of the protection layer of this point. Scan along the stirrup (lower layer rebar) vertical direction in the middle of two main rebars (upper layer rebar) to determine the exact position of the subject stirrup (lower layer rebar). Then put the probe parallelly right above the rebar to be measured and set the related grid rebar status to detect the diameter of the rebar and the thickness of the protection layer of this point.

### III. Instrument Operation

Description of keys of the instrument is shown in table 4.1.


Table 3.1


Key	Function description
 key	To function as the switch of the power of the instrument
 key	To be used to confirm parameter setting and to confirm reset of probe
 key	To store the detected value
 key	To return to the previous picture or cancel the current operation
 key	To switch between the first nominal range and the second nominal range
	The direction keys are used respectively for auxiliary functions like menu selection, digit plus or minus, cursor movement etc.  is used for switching on or off backlight when it is not used for other purpose.


#### 1. Starting up



### C-TECH LABORATORY EQUIPMENT CO., LTD

 Building C28, Hegu Technology Industrial Park, Development Zone, Zhuozhou, Hebei, China

 +86-312-3868016/3852880

 +86-312-3868882


Press the  key on the panel of the instrument, and the instrument is energized and starts operation. The splash screen is as shown in figure 3-1 below.






Figure 3-1 the splash screen

## 2. Function selection screen

At the splash screen, press any key to enter the function selection screen as shown in figure 3-2.



Figure 3-2 the function selection screen

The functions on the function selection interface include cover depth, rebar diam, rebar scanning, transmission, view and deletion and date setting. Use  and  key to select related function and then press  key to enter the related function screen.


## 3. Cover depth


The cover depth screen is as shown in figure 3-3 below.



### C-TECH LABORATORY EQUIPMENT CO., LTD

 Building C28, Hegu Technology Industrial Park, Development Zone, Zhuozhou, Hebei, China

 +86-312-3868016/3852880

 +86-312-3868882



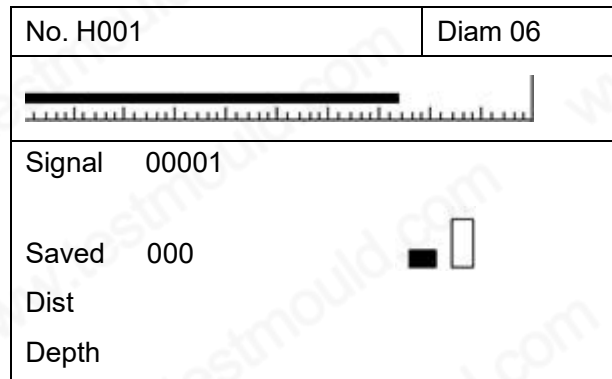


Figure 3-3 Cover depth measurement interface

The Cover depth measurement interface is divided into two sections: project information area and measurement area. The measurement process is as shown in figure 3-4.

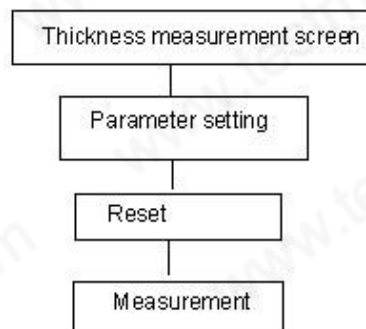


Figure 3-4 thickness measurement process

### Parameter setting

The project parameters for thickness measurement include serial number and diameter. The definition of the parameters is as follows:

- ✧ **No.:** The first character is fixed as H, to represent thickness measurement data. The user can set the other characters by keys.
- ✧ **Diam:** At the initial test of the instrument, the default value is 16mm. The user can use keys to set it up. If measurement is already done with data stored, the default value for next time measurement is the previously set value.

Press and to move the cursor. Press and to adjust the value at the cursor. Press key to confirm the setting and enter reset status. Press key to return to the previous interface.



### C-TECH LABORATORY EQUIPMENT CO., LTD

Building C28, Hegu Technology Industrial Park, Development Zone, Zhuozhou, Hebei, China

+86-312-3868016/3852880





+86-312-3868882

## Reset

After setting of parameters, press **OK** key to confirm the setting and then reset the probe. At the moment, the probe should be placed in air, away from metal (at least 0.5m), free from strong magnetic field disturbance, and at the same time, "wait!" is displayed on the screen. When "wait!" disappears, it indicates that the probe is reset and measurement can start.

## Thickness measurement

After resetting, determine the direction of the rebar and start thickness measurement. The definition of the parameters in the measurement area is as follows:


- ✧ **Signal**: the current signal value of the probe.
- ✧ **Saved**: the quantity of stored thickness values of the protection layer is displayed on the right side.
- ✧ **Dist**: the current straight-line distance from the probe to the rebar.
- ✧ **Depth**: the protection layer thickness of the rebar to be measured is displayed on the right side.
- ✧   : the first nominal range used for less protection layer thickness.
- ✧   : the second nominal range used for larger protection layer thickness.


During measurement, the length of the black scroll bar above the signal value indicates the tendency of the probe approaching the right above of the rebar. The increasing of the black scroll bar means that the probe is approaching the right above of the rebar, while decreasing of the bar indicates the probe is getting away from the right above position. When the probe scans by the right above position of the rebar, the instrument will give audible alarm, and at the same time, the thickness of the protection layer of the rebar to be measured is displayed on the right of the **Cover depth** in big font. At the moment, the **Save** key can be pressed to store data. The value on the right side of **saved** automatically adds 1, which indicates complete of storage and measurement of this project number can be continued.


During measurement, how to find the right above position of the rebar?



### C-TECH LABORATORY EQUIPMENT CO., LTD

 Building C28, Hegu Technology Industrial Park, Development Zone, Zhuozhou, Hebei, China

 +86-312-3868016/3852880

 +86-312-3868882

First roughly scan the area. Upon hearing alarm, move back the probe horizontally. As the horizontal movement of the probe for the first time is too fast, it is possible that some data are missed. Therefore, upon hearing alarm and moving back the probe, try to slow it down. And at the moment of the second time sound alarm, the data on the right of the **signal** will have changes. Repeat this process until the value on the right of the **signal** reaches maximum value and the black scroll bar becomes the longest. At this moment, the center of the probe is exactly on the above of the rebar.

The following operations can be carried out during measurement:

- ①. Press **ESC** key to return to project information setting.
- ②. Press **OK** key for probe resetting.
- ③. Press **Chng** key to switch between the first nominal range and the second nominal range. After switching, the **OK** key must be pressed for probe resetting. Otherwise the measurement result will be incorrect.

**Note:** if the thickness of the protection layer exceeds the lower limit of the nominal range,  $\leq XX$  will be shown on the screen. When the protection layer thickness measured using the first nominal range is  $>50\text{mm}$ , it can be switched to the second nominal range for measurement to improve precision.

#### 4. Diam

The diameter measurement interface is as shown in figure 3-5.

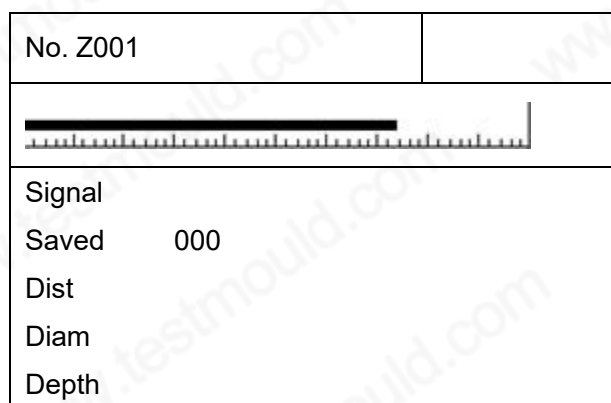


Figure 3-5 the diameter measurement interface

The diameter measurement interface is divided into two sections: project information area and measurement area. The measurement process is as shown in figure 3-6.



#### C-TECH LABORATORY EQUIPMENT CO., LTD

📍 Building C28, Hegu Technology Industrial Park, Development Zone, Zhuozhou, Hebei, China

☎ +86-312-3868016/3852880

📠 +86-312-3868882

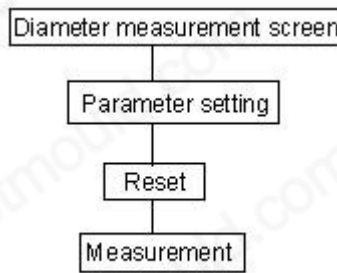


Figure 3-6 diameter measurement process

### Parameter setting

The project parameter for diameter measurement includes serial number. The definition of the parameter is as follows:

- ✧ **No.:** The first character is fixed as Z, to represent diameter measurement data. The user can set the other characters by keys.

Press and to move the cursor. Press and to adjust the value at the cursor. Press key to confirm the setting and enter reset status. Press key to return to the previous screen.

### Reset

After setting of parameters, press OK key to confirm the setting and then reset the probe. At the moment, the probe should be placed in air, away from metal (at least 0.5m), free from strong magnetic field disturbance, and at the same time, "wait!" is displayed on the screen. When "wait!" disappears, it indicates that the probe is reset and measurement can start.

### Diameter measurement

After resetting, determine the direction of the rebar and start diameter measurement. The definition of the parameters in the measurement area is as follows:

- ✧ **Signal:** the current signal value of the probe.
- ✧ **Saved:** the quantity of stored thickness values of the protection layer is displayed on the right side.
- ✧ **Dist:** the straight-line distance from the probe to the rebar.



### C-TECH LABORATORY EQUIPMENT CO., LTD

Building C28, Hegu Technology Industrial Park, Development Zone, Zhuozhou, Hebei, China

+86-312-3868016/3852880

+86-312-3868882



- ✧ **Diam**: the diameter of the rebar to be measured is shown on the right side.
- ✧ **Depth**: the thickness of the protection layer of the rebar to be measured is shown on the right side.

During measurement, the length of the black scroll bar above the signal value indicates the tendency of the probe approaching the right above of the rebar. The increasing of the black scroll bar means that the probe is approaching the right above of the rebar, while decreasing of the bar indicates the probe is getting away from the right above position.

#### During measurement, how to find the right above position of the rebar?

First roughly scan the area. Upon hearing alarm, move back the probe horizontally. As the horizontal movement of the probe for the first time is too fast, it is possible that some data are missed. Therefore, upon hearing alarm and moving back the probe, try to slow it down. And at the moment of the second time sound alarm, the data on the right of the **signal** will have changes. Repeat this process until the value on the right of the **signal** reaches maximum value and the black scroll bar becomes the longest. At this moment, the center of the probe is exactly on the above of the rebar.

After finding out the right above position of the rebar, press **Chng** key and wait a moment, and then the diameter and the protection layer thickness will be measured out and displayed in big font on the right side of **Diam** and **Depth**. At the moment, the **Save** key can be pressed to store data. The value on the right side of **Saved** automatically adds 1, which indicates that the quantity of the project information is already stored and measurement of this project number can be continued.

#### The following operations can be carried out during measurement:

- ①. Press **ESC** key to return to project information setting.
- ②. Press **OK** key for probe resetting.

**Note:** if the protection layer thickness is less than the minimum measurable thickness value of the protection layer, the rebar diameter will be shown as "too thin"; if the protection layer thickness is larger than the maximum measurable thickness value of the protection layer, the rebar diameter will be shown as "too thick", and the diameter cannot be measured under this condition.

#### 5. Rebar scanning (note: scanning type rebar meter have this function)



#### C-TECH LABORATORY EQUIPMENT CO., LTD

📍 Building C28, Hegu Technology Industrial Park, Development Zone, Zhuozhou, Hebei, China

☎ +86-312-3868016/3852880

📠 +86-312-3868882



Before utilizing the rebar scanning function, connect the scanning trolley first, and assemble the probe with the trolley (insert the probe into the trolley). Rebar scanning includes grid scanning and section scanning. As shown in figure 3-7, select using  $\uparrow$  and  $\downarrow$  and then press  $\text{OK}$  key to enter into the related measurement screen.

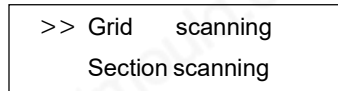


Figure 3-7 rebar scanning screen

### Grid scanning

The grid scanning screen is as shown in figure 3-8.

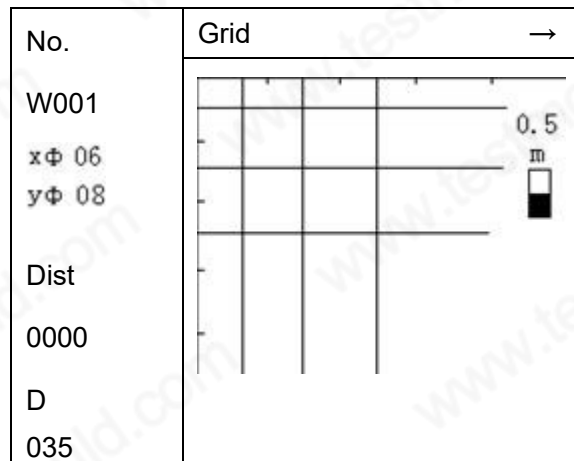


Figure 3-8 grid scanning

The grid scanning screen is divided into two sections: project information area and measurement area. The measurement process is as shown below.

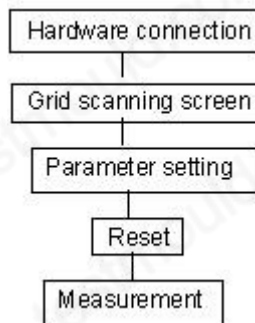


Figure 3-9 grid scanning process



### C-TECH LABORATORY EQUIPMENT CO., LTD

Building C28, Hegu Technology Industrial Park, Development Zone, Zhuozhou, Hebei, China







+86-312-3868016/3852880

+86-312-3868882


### 1) Parameter setting

The project parameters of grid scanning include serial number, rebar diameter  $X\phi$  in X direction and  $y\phi$  in y direction. The definition of the parameters is as follows:

- ✧ **No.** Fix the first character to be W to represent grid scanning data. The user can set the other characters by keys.
- ✧  **$x\phi$** : the rebar diameter in x direction. The user can set it up using keys.
- ✧  **$y\phi$** : the rebar diameter in y direction. The user can set it up using keys.



Press  and  to move the cursor. Press  and  to adjust the value at the cursor. Press  key to confirm the setting and enter reset status. Press  key to return to the previous screen.

### 2) Reset

After setting of parameters, press  key to confirm the setting and reset the probe. At the moment, the probe should be placed in air, away from metal (at least 0.5m), free from strong magnetic field disturbance, and at the same time, "wait!" is displayed on the screen. When "wait!" disappears, it indicates that the probe is reset and measurement can start.

### 3) Grid test


After resetting, determine the direction of the rebar and start grid test. The definition of the parameters in the test area is as follows:


- ✧ **Dist**: the value below is the horizontal distance of the probe relative to the zero point. The unit is mm.
- ✧ **Depth**: the value below is the protection layer thickness of the current rebar.
- ✧ **Direction**: the trolley scanning direction is shown on the right. Determine the direction of the rebar as per design data or experience. If it cannot be determined, refer to **rebar detection method** to determine the rebar position.
- ✧  : the first nominal range.
- ✧  : the second nominal range.



#### C-TECH LABORATORY EQUIPMENT CO., LTD

 Building C28, Hegu Technology Industrial Park, Development Zone, Zhuozhou, Hebei, China

 +86-312-3868016/3852880

 +86-312-3868882

During detection, the positive direction of the trolley is the side with one wheel and plug. During detection, the trolley is only allowed to move forward in the positive direction. While the trolley moves forward, the value below **Distance** is increasing.

#### Step 1: longitudinal bar scanning

As per  $\rightarrow$  in **Direction** display, first test the longitudinal bar of the grid. The crosspoint of the transverse bar and the longitudinal bar should be avoided to prevent influence by the transverse bar. Hold and move the trolley horizontally from the left to the right (in the extension direction of the vertical longitudinal bar, the movement speed should not be more than 20mm/s). On the screen, a black block is shown moving horizontally from the left to the right. Audible alarm indicates that there is rebar under the probe and the rebar is shown on the screen as a straight line vertical to the X axis. At the same time, the protection layer thickness is displayed under **Thickness**. Continue to move the trolley forward. When the horizontal distance that the trolley has travelled is  $\geq 0.5\text{m}$ , the scanning range automatically increases by 0.5m, maximum to 10.0mX10.0m.

#### Step 2: transverse bar scanning

Upon completion of scanning of longitudinal bar, press  $\downarrow$  key and direction changed to be  $\downarrow$ . Then the transverse bar of the grid can be tested. Also, the crosspoint of the transverse bar and the longitudinal bar should be avoided to prevent influence by the longitudinal bar. Hold and move the trolley from up to down (pay attention to the direction of the trolley), and there is also a black block on the screen moving from up to down. When there is audible alarm, the detected rebar is shown on the screen as a straight line vertical to X axis. At the same time, the protection layer thickness is displayed under **Depth**. Continue to move the trolley down. When it is moved to the scanning boundary, there will be continuous alarm. Press **Saved** key to store the data.

The following operations can be carried out during measurement:

- ①. Press **OK** key for probe resetting.
- ②. Press **Chng** key to switch between the first nominal range (  $\blacksquare$  ) and the second nominal range (  $\blacksquare$  ). After switching, the **OK** key must be pressed for probe resetting. Otherwise the measurement result will be incorrect.
- ③. When the **Direction** is  $\rightarrow$ , press  $\downarrow$  key and the direction is changed to be  $\downarrow$ . Then test the transverse bar of the grid.



### C-TECH LABORATORY EQUIPMENT CO., LTD

Building C28, Hegu Technology Industrial Park, Development Zone, Zhuozhou, Hebei, China

+86-312-3868016/3852880

+86-312-3868882

- ④. Press **Saved** key to store the data (only when the **Direction** is ↓).

**Note:** in case of scanning without boundary, the regulation that the moving forward speed of the trolley should not be more than 20mm/s must be strictly followed. Otherwise there may be missed out bars or disorderly display.

### Section scanning

Section scanning is used for detection of multiple parallel rebars. The section scanning interface is as shown in figure 3-10.

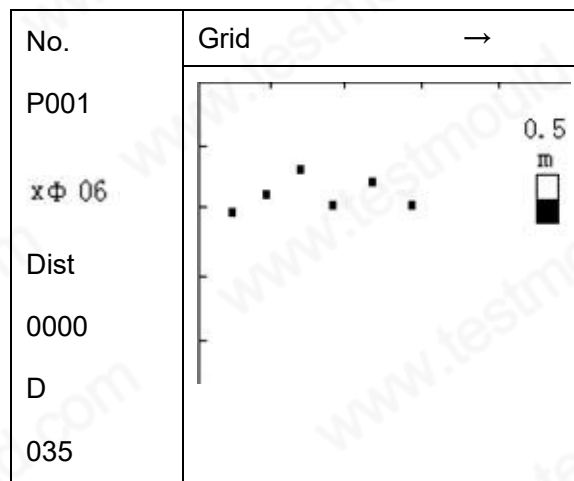


Figure 3-10 section detection

The section scanning interface is divided into project information area and measurement area. The measurement process is as follows:

#### Hardware connection

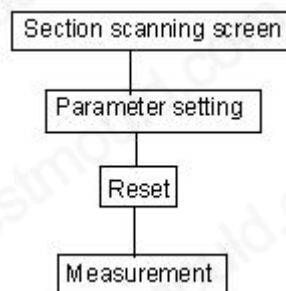


Figure 3-11 section scanning process

- 1) Parameter setup



The project parameters of section scanning include serial number and rebar diameter  $x\phi$  in X direction. The definition of the parameters is as follows:

- ✧ **No.:** Fix the first character to be P to represent grid scanning data. The user can set the other characters by keys.
- ✧  **$x\phi$ :** the rebar diameter in x direction. The user can set it up using keys.



Press  $\leftarrow$  and  $\rightarrow$  to move the cursor. Press  $\uparrow$  and  $\downarrow$  to adjust the value at the cursor. Press **OK** key to confirm the setting and enter reset status. Press **ESC** key to return to the previous screen.

## 2) Reset

After setting of parameters, press **OK** key to confirm the setting and reset the probe. At the moment, the probe should be placed in air, away from metal (at least 0.5m), free from strong magnetic field disturbance, and at the same time, "wait!" is displayed on the screen. When "wait!" disappears, it indicates that the probe is reset and measurement can start.

## 3) Section test

After resetting, determine the direction of the rebar and start section test. The definition of the parameters in the test area is as follows:


- ✧ **Dist:** the value below is the horizontal distance of the probe relative to the zero point. The unit is mm.
- ✧ **Depth:** the value below is the protection layer thickness of the current rebar.
- ✧ **Direction:** the trolley scanning direction is shown on the right. Determine the direction of the rebar as per design data or experience. If it cannot be determined, refer to **rebar detection method** to determine the rebar position and direction.
- ✧  : the first nominal range.
- ✧  : the second nominal range.


During the test, hold and move the trolley horizontally from the left to the right (in the parallel direction of the probe to the rebar). The movement speed should not be more than 20mm/s. (On the screen, a black block is shown moving horizontally from the left to the right). Audible alarm indicates



### C-TECH LABORATORY EQUIPMENT CO., LTD

 Building C28, Hegu Technology Industrial Park, Development Zone, Zhuozhou, Hebei, China



 +86-312-3868016/3852880

 +86-312-3868882



that there is rebar under the probe and the rebar is shown on the screen as a black block. At the same time, the protection layer thickness is displayed under **Depth**. Continue to move the trolley forward. When the horizontal distance that the trolley has travelled is  $\geq 0.5\text{m}$ , the scanning range automatically increases by 0.5m, maximum to 10.0mX10.0m.

The following operations can be carried out during measurement:

- ①. Press **OK** key for probe resetting.
- ②. Press **Chng** key to switch between the first nominal range (  ) and the second nominal range (  ). After switching, the **OK** key must be pressed for probe resetting. Otherwise the measurement result will be incorrect.
- ③. Press **ESC** key to store the data.

**Note:** in case of scanning without boundary, the regulation that the moving forward speed of the trolley should not be more than 20mm/s must be strictly followed. Otherwise there may be missed out bars or disorderly display.

## 6. Data transmission

The USB transmission interface is as shown in figure 4-12. Press **OK** key for transmission, and **ESC** key to return to function selection interface. During transmission, Data being transmitted is displayed as shown in figure 4-13. When transmission is completed, Transmission completes will be displayed as shown in figure 4-14. Then press any key to return to the function selection screen.

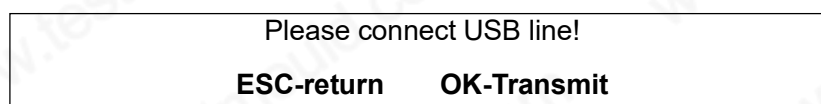


Figure 4-12 USB transmission screen

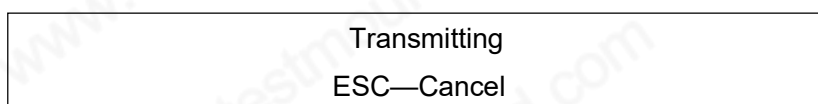


Figure 4-13 USB transmission screen

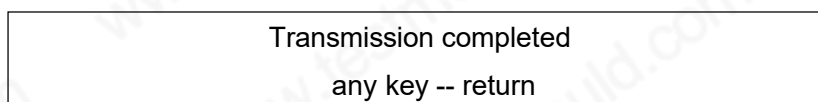




Figure 4-14 completion screen



### C-TECH LABORATORY EQUIPMENT CO., LTD

 Building C28, Hegu Technology Industrial Park, Development Zone, Zhuozhou, Hebei, China

 +86-312-3868016/3852880






 +86-312-3868882

## 7. Data view

There are 4 types of data. The thickness data, diameter measurement data, grid scanning data and section scanning data are respectively as shown in figure 4-15, 4-16, 4-17 and 4-18. On the left, it is project number area, and on the right, it is the data area of the selected project.

### There are 4 types of data:

- ✧ HXXX: the rebar diameter is already known, and the protection layer thickness is to be measured.
- ✧ ZXXX: the rebar diameter is unknown, the diameter as well as the protection layer thickness are to be measured.
- ✧ WXXX: data of grid scanning.
- ✧ PXXX: data of section scanning.

In case there is black arrow at the bottom of the number area and at the right bottom of the data area, it indicates that there are multiple pages of data. Press  and  to select various projects in the project number area. The data area on the right is the data of the selected project. Press  and  to view the project data. There is no arrow if there is not more than one page of numbers and data. Press  key to return to the function selection interface.

### Thickness data

The view interface is as shown in figure 4-15. The **Known diameter** is the set diameter as per design data. The data below are the protection layer data of the project.


No.	Data (mm)		
	2019-03-09		
>H001	diam: 16		
H002			
Z003	032	033	032
Z004	033	033	030
P005	031	032	033
P006	030	031	033
P006	031	032	033
W007	031	032	033
W007	030	031	033
W008	031	032	033


Figure 4-15 thickness data



### C-TECH LABORATORY EQUIPMENT CO., LTD

 Building C28, Hegu Technology Industrial Park, Development Zone, Zhuozhou, Hebei, China

 +86-312-3868016/3852880

 +86-312-3868882

### Diameter data

The view interface is as shown in figure 4-16. The stored rebar diameter and protection layer thickness data of the project are shown in the right side data area. The rebar diameter and the protection layer thickness are corresponding to each other as shown by their geometrical positions, i.e. the first value in the N<sup>th</sup> row of the **Depth** data column corresponds to the first value in the N<sup>th</sup> row of **Diam** data column. The second value of the same row is also corresponding.

No.	Data (mm)			
	2019-03-09			
	Depth		Diam	
H001				
H002				
>Z003	032	033	10	10
Z004	033	033	12	08
P005	031	032	10	08
P006	030	031	10	10
P006	031	032	12	08
W007	031	032	10	10
W008	030	031	12	08
▼	031	032	10	08

Figure 4-16 diameter data

### Grid scanning data

The view interface is as shown in figure 4-17. The stored rebar diameter, protection layer thickness and distance of rebar relative to zero point data of the project are shown in the right side data area. **NO.** shows the serial number of the detected rebar. **XΦ06** indicates the diameter of the preset longitudinal rebar of the project, corresponding to the data below. The first row is the protection layer thickness of the measured longitudinal rebar, and the second row is the distance relative to the zero point. **YΦ08** is the diameter of the preset horizontal rebar of the project, corresponding to the data below. The first row is the protection layer thickness of the measured horizontal rebar, and the second row is the distance relative to the zero point.



### C-TECH LABORATORY EQUIPMENT CO., LTD

📍 Building C28, Hegu Technology Industrial Park, Development Zone, Zhuozhou, Hebei, China

☎ +86-312-3868016/3852880

📠 +86-312-3868882

No.	Data (mm)		
	2019-03-09		
	NO.	xΦ 06	yΦ 08
H001			
H002			
Z003	001	022	022
Z004		0020	0028
P005	002	035	022
P006		0073	0079
>W007	003	022	022
W008 ▼		0126	0170
	004	022	022
		0126	0126 ▶

Figure 4-17 grid data

### Section scanning data

The view interface is as shown in figure 4-18. The rebar serial number, protection layer thickness and distance of rebar relative to zero point data of the project are shown in the right side data area. Below **NO.** it shows the serial number of the detected rebar. Data below **H/06** indicate the protection layer thickness with known rebar diameter (06mm). Data below **Dx** indicate the horizontal distance of the rebar relative to the zero point.

No.	Data (mm)		
	2019-03-09		
	NO.	H/06	Dx
H001			
H002			
Z003	001	022	0028
Z004	002	035	0079
>P005	003	022	0170
P006	004	022	0126
W007	005	035	0200
W008	006	022	0250
	007	022	0260 ▶

Figure 4-18 section data

## 8. Deletion of data

The data deletion interface is as shown in figure 4-19. Press OK key to delete all data. When the data are fully deleted, it automatically returns to the function selection interface. Press **Return** key to return to the function selection interface without cancellation of data.



### C-TECH LABORATORY EQUIPMENT CO., LTD

📍 Building C28, Hegu Technology Industrial Park, Development Zone, Zhuozhou, Hebei, China

☎ +86-312-3868016/3852880

📠 +86-312-3868882



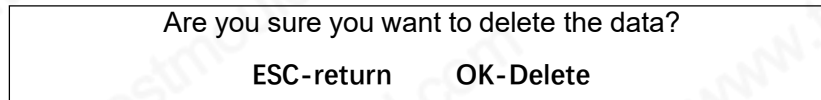



Figure 4-19 data deletion screen

**Note:** all data cannot be recovered after deletion. Use this function with caution.

## 9. Shutdown

Press  key to shut down the instrument.

**Note:** in order to reduce the impact to the screen, the instrument can only be restarted after 30 seconds after shutdown.


## IV. Test Skills


- ✧ Each time when the instrument enters test status (Depth, diam and rebar scanning), the system automatically re-calibrates the probe. At this moment, the probe should be taken to be in the air, away from magnet conducting media like metal etc.
- ✧ The test surface should be as smooth as possible to improve precision so as to avoid wrong determination.
- ✧ During detection, try to move the probe with even speed. Avoid moving the probe in reverse direction before finding any rebar, i.e. to avoid reciprocating movement of the probe before finding out rebar. Otherwise it is easy to get wrong determination.
- ✧ The movement speed of the probe should not be more than 20mm/s. Otherwise there might be big detection error or even missing of rebar.
- ✧ In case of long time continuous operation, in order to improve the detection precision, take the probe out to be in the air, away from the rebar in every 5 minutes. Press the confirmation key to reset once to eliminate all kinds of error (if you have doubts about the detection results, you can reset and detect again later).
- ✧ When detecting the protection layer thickness with already known rebar diameter, i.e. utilizing the thickness measurement function, in order to ensure precision of the detection, the user shall set rebar diameter value as per the actual rebar diameter. As rebars with different diameters



### C-TECH LABORATORY EQUIPMENT CO., LTD

 Building C28, Hegu Technology Industrial Park, Development Zone, Zhuozhou, Hebei, China

 +86-312-3868016/3852880

 +86-312-3868882



have different response to the probe, there will be difference in the detection result using different rebar diameter set values to test the same rebar.

- ✧ The toggle key can be used to switch between the first nominal range and the second nominal range to improve measurement precision of the protection layer thickness. After switching, the confirmation key must be pressed to reset.
- ✧ Pay attention to the direction of the scanning trolley. Prevent the trolley from moving in the reverse direction. Otherwise there might be wrong determination.
- ✧ Value determination

When the protection layer thickness is larger than a certain value, the probe detection signal will become weak. In order to reduce the chance of wrong determination, general programs do not automatically determine the rebar position. The user needs to judge the rebar position as per the rule of changes of the current value. This way of determination is called value determination. Observe the two-digit small font value on the right side of the screen. When the value decreases, it indicates that the probe is getting near the rebar gradually. Continue to move the probe, and when the value starts to increase, it means that the probe is getting away from the rebar. Move the probe slowly back and forth at nearby position in the reverse direction, and when the value becomes minimum and the signal value gets maximum, that indicates the precise position of the rebar.



### **C-TECH LABORATORY EQUIPMENT CO., LTD**

📍 Building C28, Hegu Technology Industrial Park, Development Zone,  
Zhuozhou, Hebei, China

☎ +86-312-3868016/3852880

📞 +86-312-3868882

# Part Two Rebar Corrosion Measuring

## I. Overview

### 1. Brief Introduction

Steel corrosion in structural concrete has a direct impact on the safety and durability of the structure by reducing the adhesion between steel and concrete and causing damage like concrete expansion and spalling, etc. Therefore, detection of steel corrosion is quite necessary in identification and reliability diagnosis of the completed structure. The Steel Corrosion Meter is an instrument for nondestructive measurement of steel corrosion in concrete by means of electrochemical detecting method. There are various functions such as corrosion measurement, data analysis, save and output of results. It is portable, accurate, convenient and intelligentalized.

### 2. Detecting Principles

Electrochemical detecting method is applied to determine the corrosion penetration and rate of steel by electrochemical property test of the corrosion system in the concrete. Due to the electrochemical nature of steel corrosion, this method has proven to be the major steel corrosion detection method which explores the essence of the problem. It features in high detection speed, high sensitivity, consecutive tracking and in situ measurement.

In the detecting process, take the steel for half a battery pack, and connect it with proper reference electrode (copper, cupric sulfate or others) into a full cell system. The concrete is the electrolyte. The potenzialwert of the reference electrode is relatively constant, whereas the corrosion potential varies a lot in the steel, which is dependent on the degree of corrosion. Thus the change in electric potential of the full cell system occurs. In reality, the corrosion of steel is detected by means of the electric potential in various points of the steel.

Two measurement methods: potential method and gradient method, with potential electrode and gradient electrode respectively.



## C-TECH LABORATORY EQUIPMENT CO., LTD

📍 Building C28, Hegu Technology Industrial Park, Development Zone,  
Zhuozhou, Hebei, China

☎ +86-312-3868016/3852880

📠 +86-312-3868882

### 3. Instrument Composition



Diagram 1-1 Instrument Composition

From top to bottom: host, joint lever, cupric sulfate reference electrode, metal electrode.

The instrument is composed of host, extension line, metal electrode, cupric sulfate reference electrode and joint lever, etc. (shown in Diagram 1-1)

### 4. Main technical parameters

- ①. Measuring Potential:  $\pm 999\text{mV}$ ;
- ②. Test accuracy:  $\pm 1\text{mV}$ ;
- ③. Measuring Space: 1-100 cm (adjustable)
- ④. Data storage capacity: 5400 test areas/11000 test point data
- ⑤. Test area:  $8100\text{ m}^2$
- ⑥. Environment Requirement:

Ambient Temperature:  $0^{\circ}\text{C} \sim +40^{\circ}\text{C}$ , to avoid direct exposure to the sun for a long time.

Relative Humidity:  $<90\%RH$ ;

Electromagnetic Interference: no strong alternating electromagnetic field

### 5. Preparation before use



#### C-TECH LABORATORY EQUIPMENT CO., LTD

📍 Building C28, Hegu Technology Industrial Park, Development Zone, Zhuozhou, Hebei, China

☎ +86-312-3868016/3852880

📠 +86-312-3868882

- ①. Fill the potential/gradient electrode with saturated copper sulfate liquid. Distilled water is best, a few solid particles of copper sulfate can be seen in the electrode;
- ②. When the boot interface shows that the battery is low, please replace the battery. Be careful not to reverse the battery polarity.

## 6. Tips

- ①. Avoid water penetration and high temperature(>50°C).
- ②. After each use, pour out the liquid in the potential/gradient electrode, clean it with clean water, and then wipe it with a cotton cloth or absorbent cotton.
- ③. Avoid approaching extremely strong magnetic field, such as large-scale electromagnet and transformers, etc.
- ④. Take out the battery if the instrument is idle for long, in order to avoid damage to the circuit caused by battery leakage.
- ⑤. Never open the instrument case without permission, otherwise please bear your own consequences.

## II. Instrument Operation

The button instruction is shown in Table 2.1






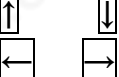

Buttons	Function
	Switch on/off the power
	Confirm an operation or start the test in Test Interface
	Save measuring value
	Return to the previous interface or cancel operation
	Make shift between displays of parameters and icons in the Test Interface
	Respectively used for menu selection, number change, cursor movement and other auxiliary functions. ← is also used to switch on or off the background light


Table 2.1 Button Instruction



### C-TECH LABORATORY EQUIPMENT CO., LTD

 Building C28, Hegu Technology Industrial Park, Development Zone, Zhuozhou, Hebei, China

 +86-312-3868016/3852880

 +86-312-3868882

## 1. Function Interface

Press any button (except **Chng** button) on the Startup Interface to enter Function Interface, as is shown in Diagram 2-2.

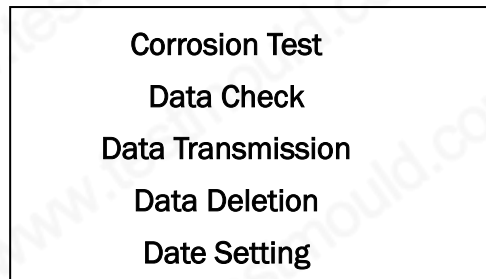


Diagram 2-2 Function Interface

On the Function Interface, there are items such as Corrosion Test, Data Check, Data Transmission, Data Deletion and Date Setting. Press the **↑**/**↓** buttons and select functions. Then press **OK** button and enter correspondent interface.

## 2. Corrosion Test

The Corrosion Test Interface is shown in Diagram 2-3. It is composed of two parts: Engineering Information Area and Test Area.

Test District	X=	Y=
0001	0000	mV Direction→
Potential	+ + + +	
Space		
X20		
Y20		
Temperature		
+30°C		


Diagram 2-3 Corrosion Test Interface


In Engineering Information Area, users can set the parameters. The related information changes with the test type setting change, after setting, press the OK button. For potential test, the icon is shown



### C-TECH LABORATORY EQUIPMENT CO., LTD

 Building C28, Hegu Technology Industrial Park, Development Zone, Zhuozhou, Hebei, China

 +86-312-3868016/3852880

 +86-312-3868882



in Diagram 2-4; for gradient test, the icon is shown in Diagram 2-5.

Test Area	X=	Y=
0001	0000	mV Direction→
Potential	+ + + +	
>0		
≤0		
≤-50		
≤-100		
≤-150		
≤-200		
≤-250		
≤-300		
≤-350		
≤-400		

Diagram 2-4 Icon for Potential

Test Area	X=	Y=
0001	0000	mV Direction→
Gradient	+ + + +	
≥0		
≥50		
≥75		
≥100		
≥125		
≥150		
≥175		
≥200		
≥225		
≥250		

Diagram 2-5 Icon for Gradient

The corrosion test procedure is shown in Diagram 2-6.



**C-TECH LABORATORY EQUIPMENT CO., LTD**

📍 Building C28, Hegu Technology Industrial Park, Development Zone, Zhuozhou, Hebei, China

☎ +86-312-3868016/3852880

📠 +86-312-3868882

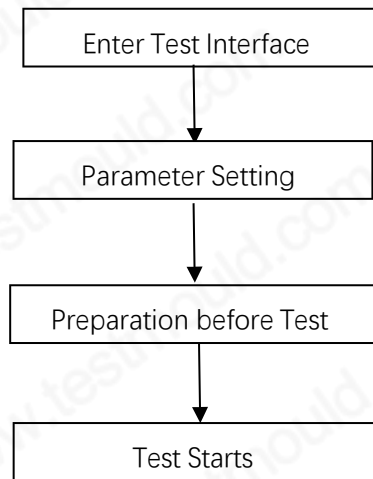






Diagram 2-6 Test Procedure

### Parameter Setting

In corrosion test, the engineering parameters cover test area, test mode selection, space and temperature.

- A. Test Area: set by keyboard, 4 digits together, signified by numbers between 0-9 and letters between A-Z.
- B. Potential/Gradient: shift between potential test and gradient test.
- C. Space: set by keyboard, between 0-99.
- D. Temperature: automatically detect the ambient temperature and display it in the lower area.

Operation: Press   buttons to move the cursor;   buttons to adjust the number where the cursor is located; OK button to confirm the setting and start the test; ESC button to return to the previous interface; If the test area remains the same, press OK button to continue testing the data following the original component.

### Preparation before Test


- A. Arrangement of the Test Point and Test Area


Find the steel and mark the location and trend with chalk. The crossing point of the steel is the test point, as is shown in Diagram 2-7.



### C-TECH LABORATORY EQUIPMENT CO., LTD

 Building C28, Hegu Technology Industrial Park, Development Zone, Zhuozhou, Hebei, China

 +86-312-3868016/3852880

 +86-312-3868882

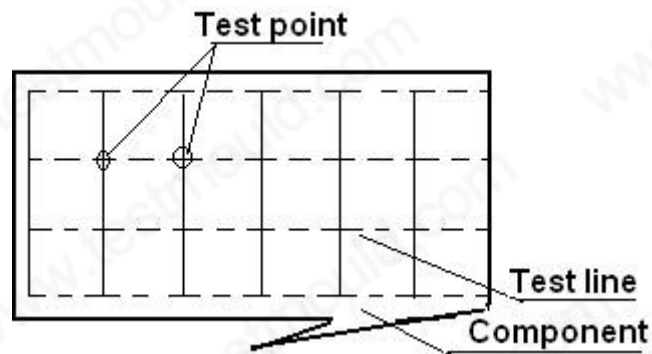


Diagram 2-7 Arrangement of Test Area and Test Point

B. Moisten the tested structure with a little amount of mixed liquid of domestic detergent and pure water. This can strengthen the infiltration of wetting agent and reduce the time required by moistening the structure.

C. Instrument Connection

For potential test, chisel some concrete to expose the steel and remove the corrosion layer. Clamp the metal electrode to the steel. A black signal wire is used to connect the metal electrode and the black socket of the corrosion meter. At the same time, a red signal wire is used to connect the potential electrode and the red socket of the corrosion meter.

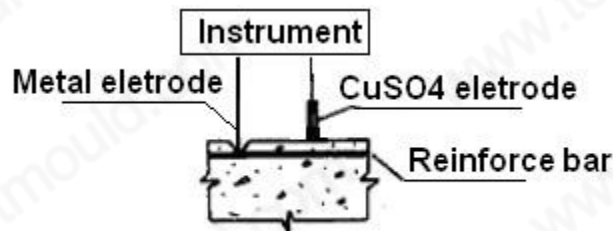


Diagram 2-8 Potential Test of the Steel Corrosion Meter

From left to right: metal electrode, test main engine, cupric sulfate electrode, steel.

For gradient test, there is no need to chisel the concrete. Connect the two potential electrodes with joint lever with dot pitch of 20 cm. The arrangement of the test area and test point is shown in Diagram 2-7. And the test is shown in Diagram 2-9.

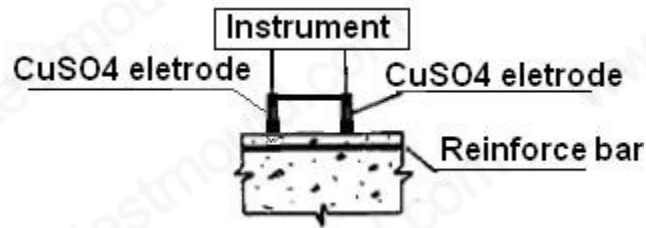


Diagram 2-9 Gradient Test of the Steel Corrosion Meter

From left to right: cupric sulfate electrode, test main engine, cupric sulfate electrode, steel.

### Corrosion Test

Once the preparation is over, test will start. The Current Test Point Parameter Area is as follows:

- ①. X: location in X direction of the current test point
- ②. Y: location in Y direction of the current test point
- ③. Electric voltage of the current test point
- ④. Direction: current test direction

The test procedure is as follows:

- ①. Press **OK** button, and enter Test Interface. X stands for the horizontal direction, while Y stands for vertical direction. The icon “+” stands for the location of the current test point.
- ②. Put the potential electrode in the test point in the test area, and the measured potential will be displayed in the Current Test Point Parameter Area. When the potential remains constant, press the **SAVE** button and complete the test of the point.
- ③. The direction buttons change the test direction. The new direction is displayed in the Current Test Point Parameter Area.
- ④. When all the test points in the test area are completed, move on to next test area. Press the ESC button, and set the parameter again.

### 3. Data Check






#### C-TECH LABORATORY EQUIPMENT CO., LTD

📍 Building C28, Hegu Technology Industrial Park, Development Zone, Zhuozhou, Hebei, China





☎ +86-312-3868016/3852880

📠 +86-312-3868882

Data Check Interface is shown in Diagram 2-10. On the left is the Completed Area, while on the right is the Test Area Information. Press the   buttons, and select different test areas. The arrow points to the current selected component. In Test Area Information, information such as test date, ambient temperature, test mode, measuring space and test point numbers are displayed. Press the  button and return to Function Interface.

Test Area	Test Area Information
>0000	Date: May 23 <sup>rd</sup> , 2019
0001	Ambient Temperature: +24°C
	Test Mode: Potential
	Measuring Space: X20
	Y20
	Test Point Numbers: 00006

Diagram 2-10 Data Check Interface

Press the OK button and enter the current selected test area for data browse. The Browsing Interface is the same as the Test Interface 2-3. Press the   buttons to change the test point in Y direction. Press the   buttons to change the test point in X direction. If there is data in this test point, the current potential is displayed. Press the ESC button and return to 2-10 interface and select the browsed test areas again.

#### 4. Data Transmission

The USB Transmission Interface is shown in Diagram 2-11. Press the OK button and transmit the data; Press the ESC button and return to Function Interface. In the process of transmission, "In transmitting" is displayed, as is shown in Diagram 2-12; When the transmission is over, "Transmission is over" is displayed, as is shown in Diagram 2-13. Then press any button to return to Function Interface.

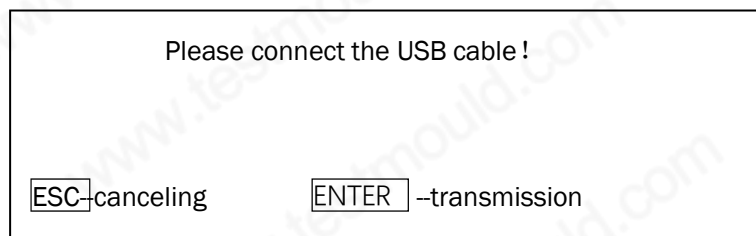




Diagram 2-11 USB Transmission Interface



#### C-TECH LABORATORY EQUIPMENT CO., LTD

 Building C28, Hegu Technology Industrial Park, Development Zone, Zhuozhou, Hebei, China

 +86-312-3868016/3852880


 +86-312-3868882





Diagram 2-12 Data Transmission Interface



Diagram 2-13 Transmission Over Interface

## 5. Data Deletion

The Data Deletion Interface is shown in Diagram 2-14. Press the **OK** button and delete all the data. When it is over, "Deletion is over." is displayed. Press the **ESC** button to cancel the deletion and return to the Function Interface.

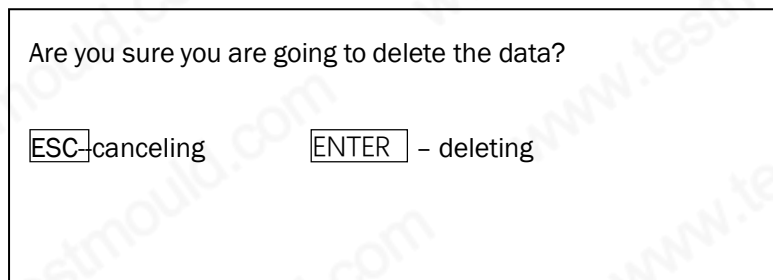
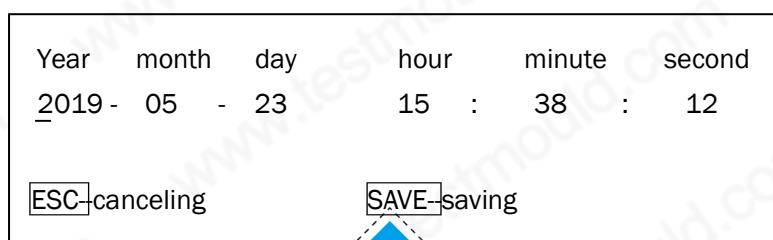


Diagram 2-14 Data Deletion Interface

**Note:** All the data can't be restored after being deleted. Please use this function with caution.

## 6. Date Setting

The Date Setting Interface is shown in Diagram 2-15.









### C-TECH LABORATORY EQUIPMENT CO., LTD

📍 Building C28, Hegu Technology Industrial Park, Development Zone, Zhuozhou, Hebei, China


☎ +86-312-3868016/3852880

📠 +86-312-3868882

Diagram 2-15 Date Setting Interface

Press the   buttons and move the cursor; Press the   buttons to revise the number. After the revision, press the  button to return without saving; press the  button to save the setting and return.


## 7. Power off


Press the  button to switch off the instrument.



### **C-TECH LABORATORY EQUIPMENT CO., LTD**

 Building C28, Hegu Technology Industrial Park, Development Zone,  
Zhuozhou, Hebei, China

 +86-312-3868016/3852880

 +86-312-3868882



**Laboratory equipment co.,limited**

CIVIL ENGINEERING TESTING EQUIPMENT MANUFACTURER