sisco

Rebar Detector

Content

1. Overview

1.1 Introduction

Rebar Detector for existing reinforced concrete works and new reinforced concrete structure construction quality inspection: determine the location of the rebar, rebar distribution, known diameter detection of the thickness of the protective layer of concrete, unknown diameter at the same time to detect the diameter of the rebar and the thickness of the protective layer of concrete, path scanning function. In addition, the Rebar Detector can detect the location of magnetic and conductive bodies in non-magnetic and non-conductive media, such as: cables, plumbing pipes inside the wall. The Rebar Detector is a kind of intelligent NDT equipment with automatic detection, data storage and output functions.

1.2 Main functions

1. Measuring the protective layer thickness of rebar (known diameter).
2. Determine the location, direction and distribution of steel bars.
3. Measure the protective layer of rebar and estimate the diameter of rebar.
4. Storing, viewing and transmitting the testing data.

1.3 Main technical indicators

Table 1.1 Main technical specifications of rebar scanning

Item		Indicator
Applicable range of steel bar (mm)		Φ6～φ50
Range of protective layer thickness (mm)		Small range：6～90 Large range：7～200
Communication Mode		USB transmission interface
Storage capacity		200,000 rebar measurement points
Probe	Volume (mm)	110×55×28
	Weight (Kg)	0.25
Trolley	Volume (mm)	128×97×64
	Weight (Kg)	0.3

Table 1.2 Range range for different rebar diameters

Measuring range / Reinforcement diameter (mm)	Small range (mm)	Large range (mm)
φ6～φ8	7～70	10～100
φ10～φ18	8～80	15～126
φ20～φ32	9～90	20～200

Table 1.3 Tolerance ranges for different thicknesses

Measuring range / Tolerance range		Small range (mm)	Large range (mm)
±1		6～59	7～79
±2		60～69	80～119
±4		70～90	120～200
Telescopic rod	Volume (mm)	φ40×525（1.8m）	
	Weight（Kg）	0.4	

Table 1.4 Main parameters of the instrument

Item	Indicator
Screen	800× 480
Power supply	Built-in high-capacity lithium battery
Working time	≥12H
Operation mode	Silicon button
Volume of the whole machine (mm)	219×56×139
Weight (Kg)	0.64 (including lithium battery)

1.4 Precautions

Please read this manual carefully before use in order to use the product better and fully understand the use of the instrument, software and precautions.

1. Working environment requirements
   - Ambient Temperature: -10℃～+42
   - Relative humidity: <90%RH
   - Electromagnetic interference: no strong alternating electromagnetic fields
   - Shall not be used for a long time in direct sunlight or sun exposure, otherwise it may lead to the instrument can not work properly, etc.
   - Anti-corrosion: When used in a humid, dusty, corrosive gas environment, necessary protective measures should be taken.
2. Storage environmental requirements
   - Ambient Temperature: -20℃～+50
   - Relative humidity: <90%RH
   - When not in use, please place the product in the instrument box, placed in a ventilated, cool, dry room temperature environment; if not in use for a long time, it should be recharged once a month or so and power on to check.
3. Avoid water ingress.
4. Anti-magnetism: Avoid using it in a strong magnetic environment, such as near a large electromagnet or transformer.
5. Anti-shock: In the process of using and handling, it should be prevented from violent vibration and shock.

2. Instrument introduction

The Rebar Detector mainly contains host, charger, USB cable and other accessories.

2.1 Host

The appearance of the Rebar Detector is shown in Figure 2.1.

Figure 2.1 The appearance of the main unit

Friendly reminder: There may be differences between the actual instrument and the schematic diagram, please refer to the real thing.

2.1.1 Key Description

There are 9 keys on the keyboard, ⏻ is used for the power switch of the instrument; Confirmation key is used to determine the operation in the parameter setting and auto-calibration of the instrument; Memory key is used to store the said detection value;

Return key is used to return to the previous screen in the operation; Function key is used to adjust the backlight brightness; "←", "↑", "↓" keys ←", "↑", "→", "↓" keys are used to select the menu, increase or decrease the number, move the cursor and other auxiliary functions in the operation.

☞ Friendly reminder: individual keys have different functions in different interfaces, see the introduction.

3. Measurement method

3.1 Power on

Press the dashboard key ⏻, the meter starts and begins to work. The startup interface is shown in Figure 3.1.

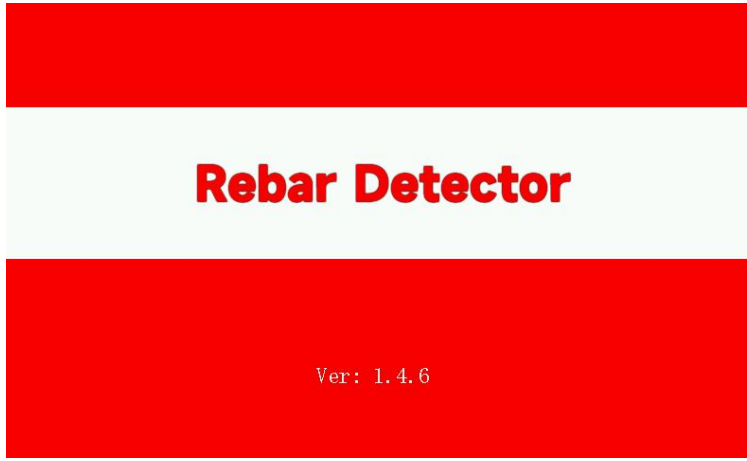

Figure 3.1 Start-up interface

3.2 Function interface

After starting the instrument, it enters the rebar scanning function page, as shown in Figure 3.2.

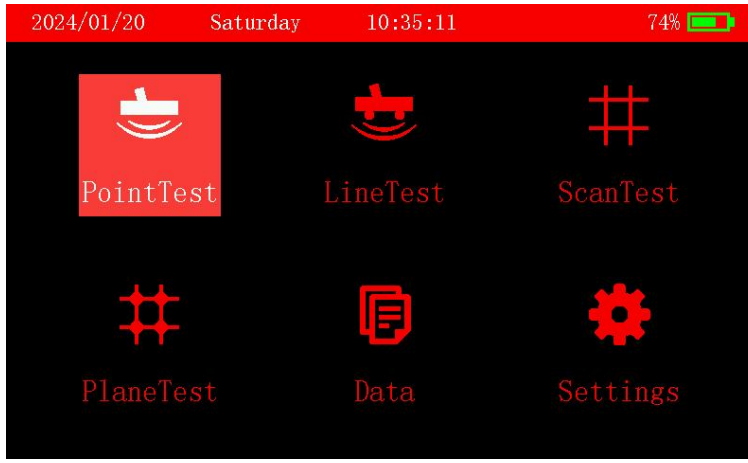

Figure 3.2 Rebar Scanning Function Interface

3.2.1 Determination of rebar position and protective layer thickness

1. In the "single-point test" interface, press the up and down keys to select "thickness test" or "diameter test", press the confirmation key to enter the corresponding setting interface, as shown in Figure 3.3 and Figure 3.4.

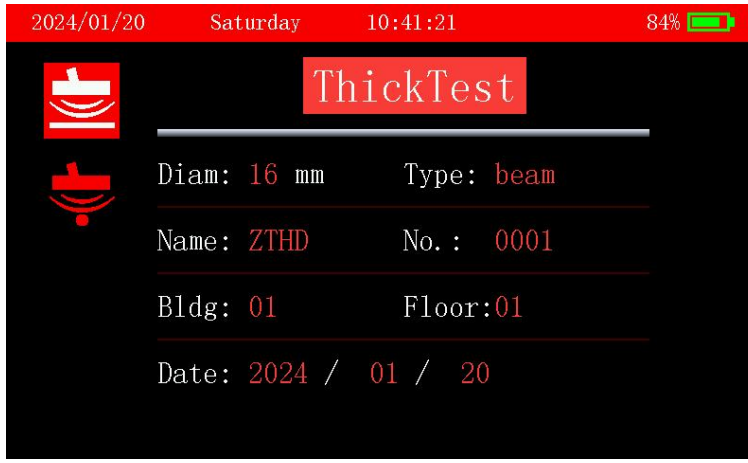

Figure 3.3 Thickness Test Setting Interface

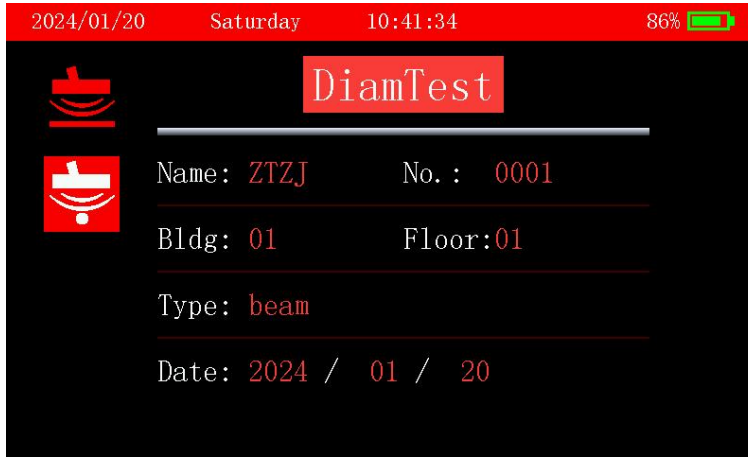

Figure 3.4 Diameter Test Setting Interface

2. In the "thickness test" interface, enter the component number, diameter specifications, press the confirmation key to enter the test. After entering, press the confirmation key for signal reset.

☞ Friendly reminder: signal reset probe to half-air, away from

the ferromagnetic medium. 3.

3. Probe moving direction

Place the probe along the long axis of the rebar on the concrete surface and move it along the vertical direction of the rebar. Figure 3.5

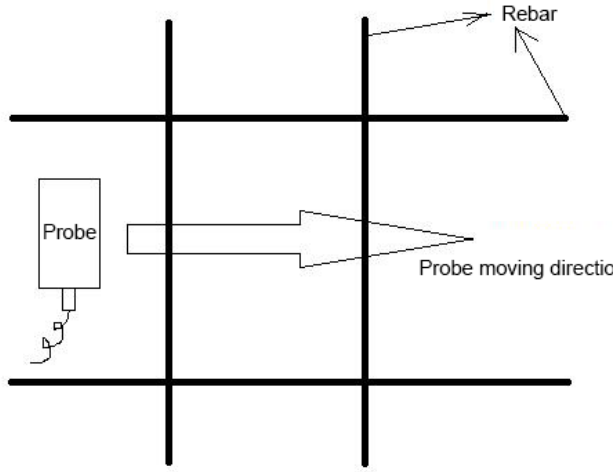

Figure 3.5 Schematic diagram of probe movement

3. Detection of protective layer thickness

When detecting the protective layer thickness of the main bar (upper bar), place the probe in the middle of the two hoops (or lower bar), and place the long axis of the probe along the direction of the main bar (or upper bar) and move it perpendicular to the direction of the rebar. After passing through the rebar, the protective layer thickness of the rebar is displayed. When the Rebar Detector passes over the rebar, the movement of the probe is slowed down, the test is repeated and recorded (or the memory button is pressed) to save the test values. The

protective layer test is then performed on the next rebar.

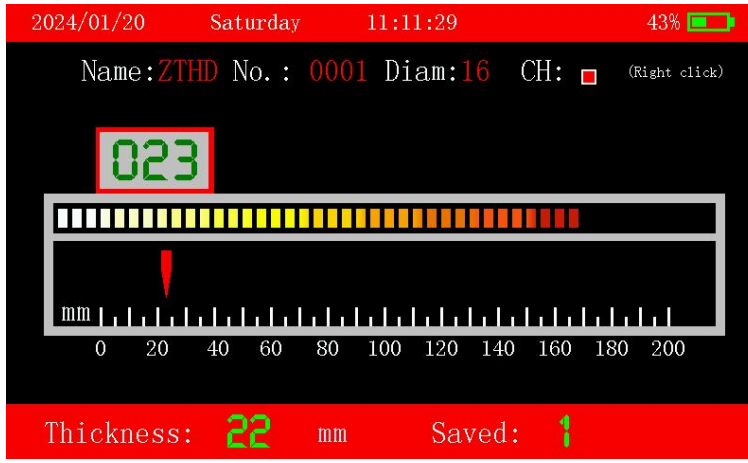

Figure 3.6 Single point test - thickness test

3.2.2 Protective layer thickness and rebar spacing single line test

1. Connect the scanning trolley and enter the interface of "single line test"; as shown in Figure 3.7.

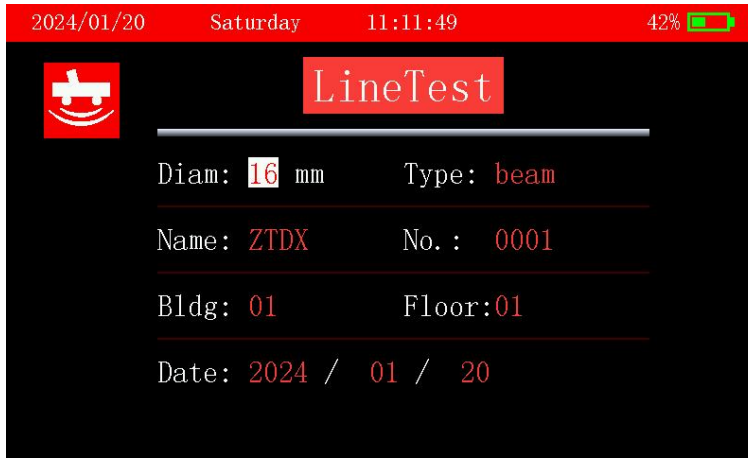

Figure 3.7 Single line test

2. Input the diameter of the main bar and hoop bar of the

reinforcement to be tested, then press the up and down keys to change the number and use the left and right keys to move the cursor. Input the test number, move the probe away from the metal, press the confirmation key to reset; press the switch key to select the test thickness mode (deep test or shallow test). Note: Deep test mode can be used to protect the layer thickness of 60mm or more design values. Press the confirmation key to reset.

3. Determine the position of the hoop bar (or lower bar).

Place the probe along the long axis of the concrete surface in the direction of the reinforcement and move it along the vertical direction of the hoop bar (or lower bar) to determine the position of the hoop bar (or lower bar). When the instrument beeps, it indicates that the approximate location of the rebar has been detected, which can be marked with a line on the object under test.

4. Start scanning

First of all, it is necessary to reset the instrument and mark the starting point of the test. At the same time, the long axis of the probe is placed on the concrete surface along the direction of the rebar, and between the two turns, when the instrument is pushed to detect the rebar along the vertical direction of the main rebar, the instrument automatically emits a beep and displays the grid layout of the rebar on the instrument. When the limit of the test area or restricted area is detected, press the direction key to start detecting the ring bar. Mark the same and follow the method of detecting the main bar, with the direction of the long axis of the probe along the direction of the rebar placed on the

concrete surface, between the two main bars, and advancing along the vertical direction of the hoop bar. After the test is completed, press the store button to save the data.

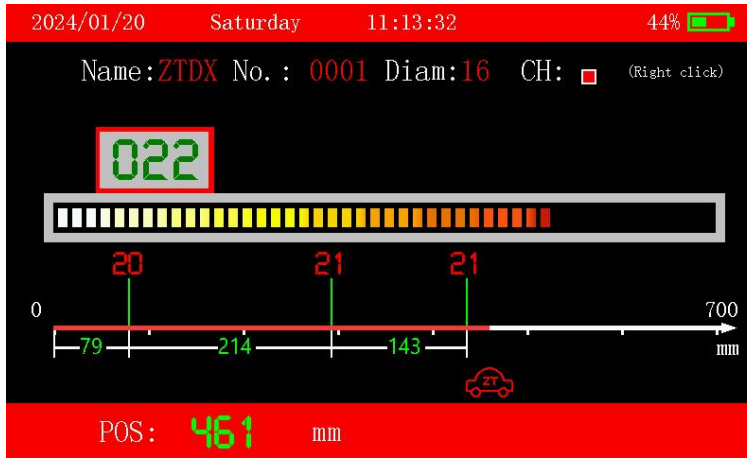

Figure 3.8 Single line test interface

3.2.3 Scanning the reinforcement grid and detecting reinforcement spacing

1. Connect the probe trolley, enter the "Scanning Test" interface, and select "Grid Scanning".
2. Input the diameter of main bar and hoop bar to be tested, press up and down to change the number, and press left and right to move the cursor. Input the test number, move the probe away from the metal, press OK to reset; press the switch to select the test thickness mode (deep test or shallow test). Note: Deep test mode can be used to protect the layer thickness of more than 60mm design value. Press "OK" to reset. 3.
3. Determine the position of the hoop bar (or lower bar).

   Place the probe along the long axis of the concrete surface

in the direction of the reinforcement and move it along the vertical direction of the hoop bar (or lower bar) to determine the position of the hoop bar (or lower bar). When the instrument beeps, it indicates that the approximate location of the rebar has been detected, which can be marked with a line on the object under test.

4. Start scanning

First of all, it is necessary to reset the instrument and mark the starting point of the test. At the same time, the long axis of the probe is placed on the concrete surface along the direction of the rebar, and between the two turns, when the instrument is pushed to detect the rebar along the vertical direction of the main rebar, the instrument automatically emits a beep and displays the grid layout of the rebar on the instrument. When the limit of the test area or restricted area is detected, press the direction key to start detecting the ring bar. Mark the same and follow the method of detecting the main bar, with the direction of the long axis of the probe along the direction of the rebar placed on the concrete surface, between the two main bars, and advancing along the vertical direction of the hoop bar. After the test is completed, press the store button to save the data.

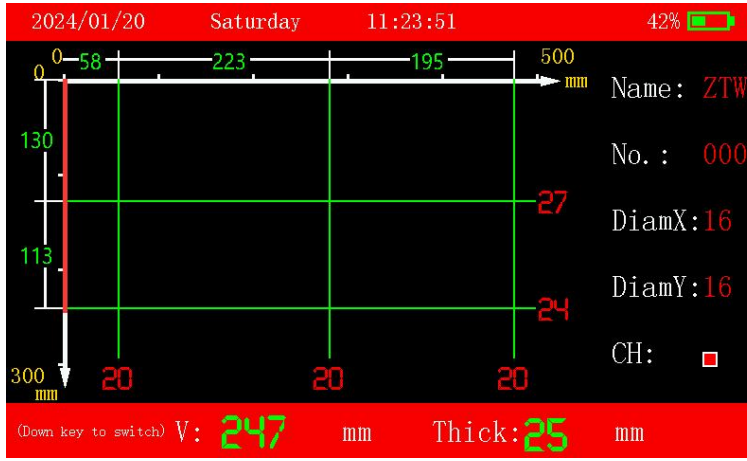

Figure 3.9 Grid scanning interface

3.2.4 Scanning Rebar Profiles and Detecting Rebar Spacing

1. Enter the "Scanning Test" interface, press the down button to select "Profile Scanning".

2. Input the diameter of main bar and hoop bar to be tested, press up and down key to change the number, press left and right key to move the cursor. Input the test number, move the probe away from the metal, press OK to reset; press the switch to select the test thickness mode (deep test or shallow test). Note: Protective layer thickness design value of 60mm or more can be used for deep test mode. After switching, press "OK" to reset and retest.

3. Determine the position of the hoop bar (or lower bar).

   Place the probe along the long axis of the concrete surface in the direction of the reinforcement and move it along the vertical direction of the hoop bar (or lower bar) to determine the position of the hoop bar (or lower bar). When the instrument beeps, it indicates that the approximate location of the rebar has

been detected, which can be marked with a line on the object under test.

4. Start scanning

First of all, it is necessary to reset the instrument and mark the starting point of the test. At the same time, the long axis of the probe is placed on the concrete surface along the direction of the rebar, and between the two turns, when the instrument is pushed to detect the rebar along the vertical direction of the main rebar, the instrument automatically emits a beep and displays the grid layout of the rebar on the instrument. When the limit of the test area or restricted area is detected, press the direction key to start detecting the ring bar. Mark the same and follow the method of detecting the main bar, with the direction of the long axis of the probe along the direction of the rebar placed on the concrete surface, between the two main bars, and advancing along the vertical direction of the hoop bar. After the test is completed, press the store button to save the data.

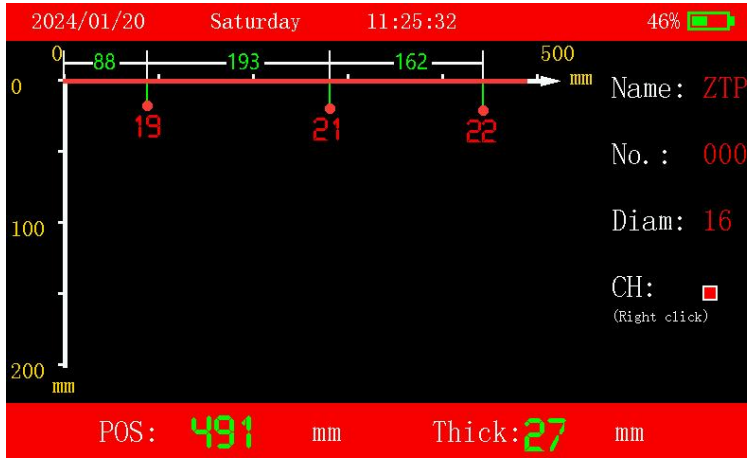

Figure 3.10 Profile scanning interface

3.2.5 Plane test, inclined bar measurement

This function is used to test whether the bar under test is inclined, the test steps are as follows.

1. Enter the "plane test" interface, set the test; shown in Figure 3.11.

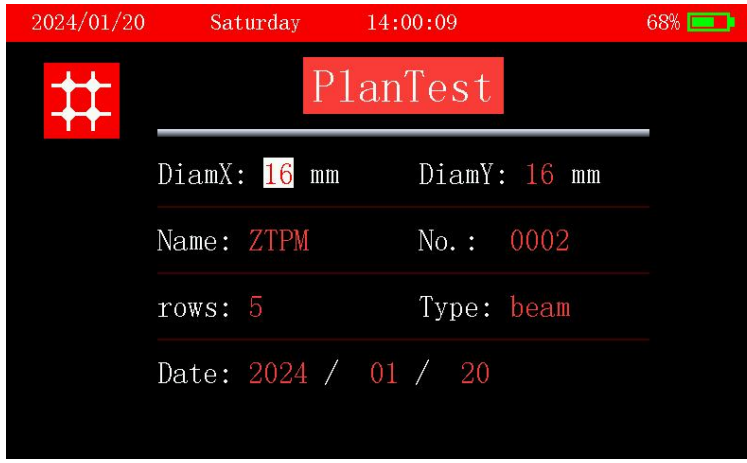

Figure 3.11 plane test setup interface

2. Enter the diameter of the main rod and hoop rod to be tested, press the up and down keys to change the number, press the left and right keys to move the cursor. Input the test number, then adjust the number of test points, you can divide the rebar into several parts according to the number of test points, mark the position of the rebar as a point every time you carry out the test, and finally virtualize the points in the same column into a line so that you can see whether the rebar is inclined or not.
3. Test method (take the number of points as 5 as an example)

Specimen first draw 1m*1m measurement area, each

divided into horizontal and vertical x 5 rows and 5 columns, in the test, you need to make sure that the starting position of each row and each column of the tram is the same, and the air of the probe, press the confirmation button to reset, then start to put the tram and the detector along the vertical direction of the main rebar, the detection of the rebar, the instrument will beep automatically, the instrument displays the map of the rebar. At the beginning, the instrument will display X direction, after moving horizontally (vertically) for 1 time, press the key to switch to the next row (column), and then carry out the test, and so on, when the test is completed for 5 rows (columns), press the key to change the direction, at this time, the instrument will display the Y direction, and the test method is the same as before.

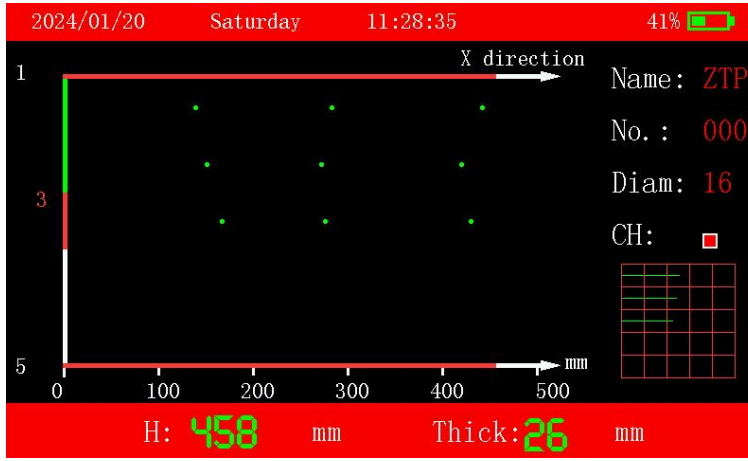

Figure 3.12 Plane Test Interface

☞Friendly Tips.

Due to long-term work in the complex outdoor environment, as

well as by the external magnetic field, temperature and other interference factors, it is recommended that from time to time on the instrument for self-check (or calibration), found that the error is not within the specification requirements, you can set up the thickness error correction function of the instrument can be fine-tuned to ensure that the instrument is normal use; case does not need to go back to the factory to calibrate, reducing the tedious work.

4. Data management

4.1 Data view

Reinforcing steel data management interface shown in Figure 4.1, from top to bottom can be data view, data transfer and data deletion functions, press OK to enter the data view interface, data view interface shown in Figure 4.2, the left side of the regional name number, the right side of the regional data thickness and statistical results. Press ↑, ↓ key to select different components in the component area, the right side of the thickness data area displays the thickness data and statistical results of the currently selected components, according to the "Code for Quality Acceptance of Concrete Structural Engineering Construction" (GB 50204-2015) in the relevant provisions of the qualified rate to determine the calculation. Press ← key, → key to view component data, → key to view full screen backward to view current component data, ← key to view full screen forward to view current component data. Pressing "OK" in the data view state displays the percentage of storage space used. Press "Back" to return to the data management interface.

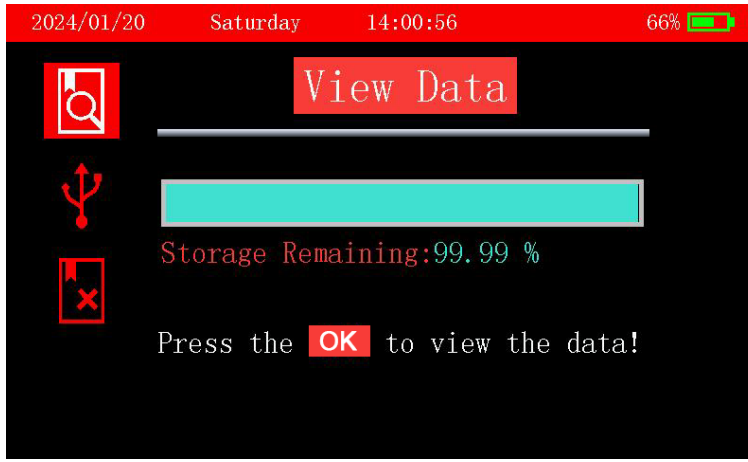

Figure 4.1 Data Management Interface

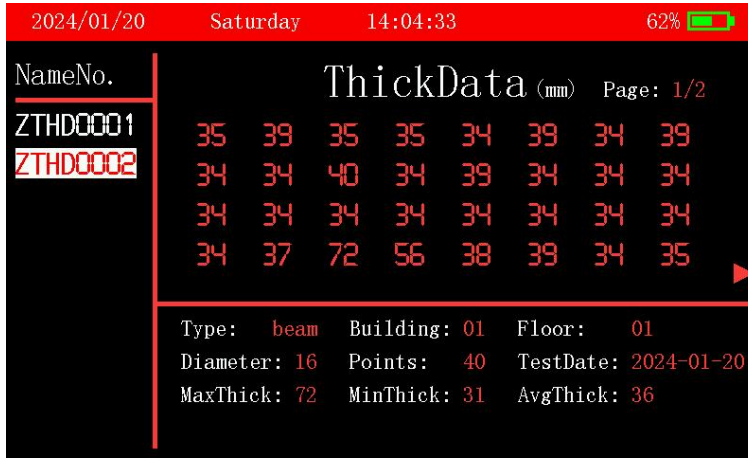

Figure 4.2 Data View Interface

4.2 Data Transfer

Press the ↓ key in the data management interface of steel bar scanning (FIG. 4.1) to enter the data transmission interface, as shown in FIG. 4.3. Connect the USB cable, press the OK key to transmit data, and press the Return key to return to the function selection interface.

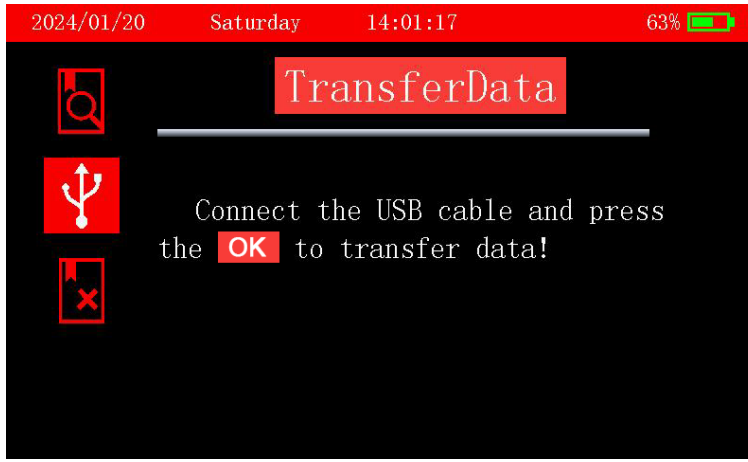

Figure 4.3 Data transmission interface

4.2 Data Deletion

In the data management interface (Figure 4.3), press the ↓ key twice to enter the data deletion interface, as shown in Figure 4.4. Press the OK key to delete all data, and after the data deletion is complete, you will be prompted if the deletion is successful. Press the back key to choose the interface for data return function.

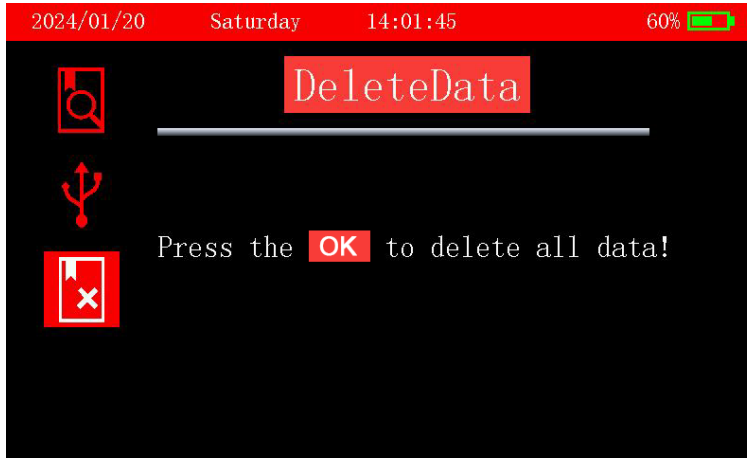

Figure 4.4 Data transmission interface

4.3 System Settings

The system setting interface is shown in Figure 4.5. The ↑, ↓, ←, → keys can be used to select the settings of backlight brightness, date, time theme color and shutdown time, and the values are adjusted by the ↑ and ↓ keys. When the shutdown time is set to 00 minutes, it means the instrument stops shutting down automatically.

Figure 4.5 System Setting Interface

5. Introduction of analyzing software

5.1 Introduction to the software

Rebar Detector analysis software is developed by the company for the analysis of the protective layer of steel reinforcement testing data processing software, post-processing analysis of the data collected on-site was achieved, and generate inspection reports and data preservation and other functions.

The software can run under Windows XP, Windows 7, Windows 8, Windows 10 and other systems.

5.2 Software Installation

Double-click the rebar scanning and analyzing software installation file, and follow the software prompts to install. As shown in Figure 5.1.

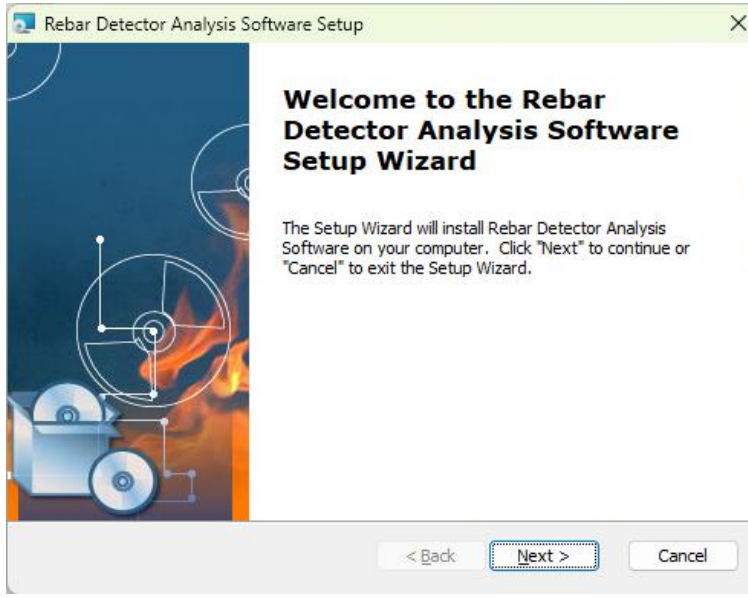

Figure 5.1 Installation Program

Finally, the serial port driver that must be installed for USB to data transfer pops up. If it has been installed before, it cannot be selected for installation. As shown in Figure 5.2.

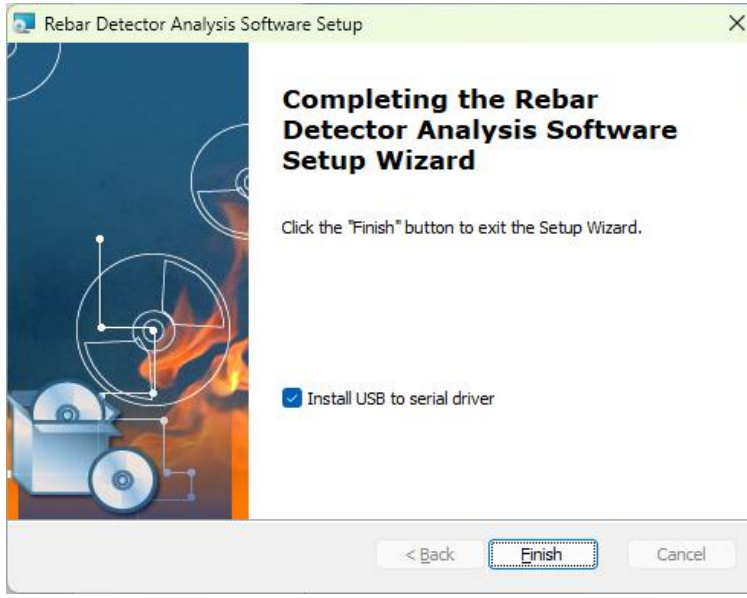

Figure 5.2 Driver Selection

If you choose to install the driver, please check the option of "USB to Serial Driver". Click Finish, as shown in Figure 5.3, click Install.

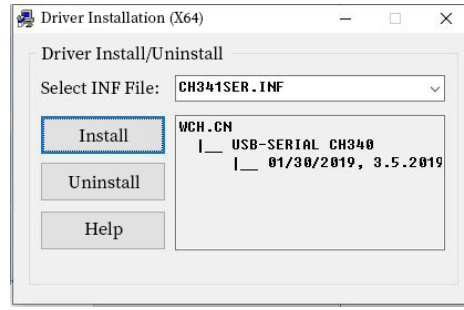

Figure 5.3 Driver Installation

If you have previously installed the driver will be prompted, the driver pre-installation failed, click on the uninstallation, and then click on the installation.

After successful installation of the software, click on the desktop steel scanning and analyzing software can automatically open the software, software interface shown in Figure 5.4.

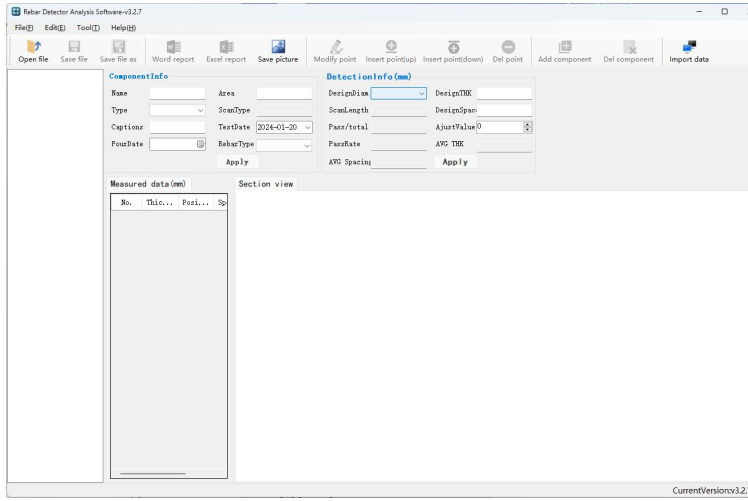

Figure 5.4 Run the software interface

5.3 Introduction to the software interface

Please double-click the steel scanner analysis software, select the steel data analysis as shown in Figure 5.5.

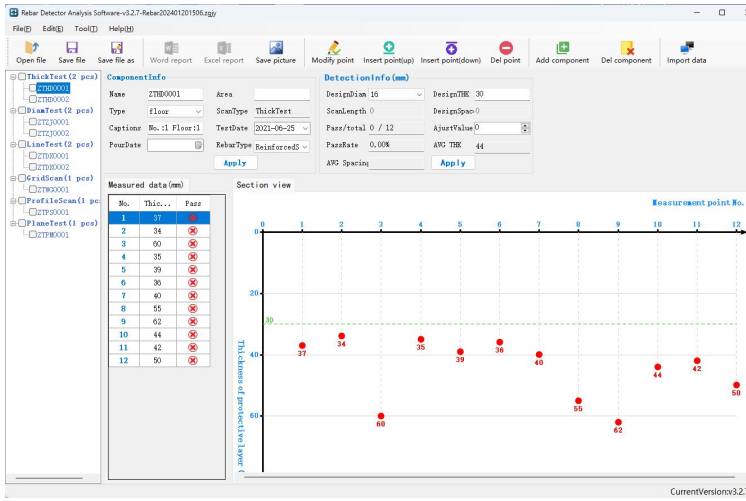

Figure 5.5 Rebar Detector **analysis software interface**

5.4 Software description

5.4.1 Read inspection data

1. When transferring the rebar scanning data, please use the USB connection cable to connect the PC and the instrument communication port, and then the software clicks on the import data -> transfer, the instrument selects the data management -> data transfer -> press OK to transfer.
2. After successful data transfer, the software will load the transferred data.

5.4.2 Open File

In the rebar data analysis, click "Open File" to open the file, pop-up "Open File" dialog box; select *. Zgjy file saved in the path to be analyzed and processed.

5.4.3 Browse data files

After opening the preprocessed file, select the type of detection that you want to analyze and process, as shown in Figure 5.8.

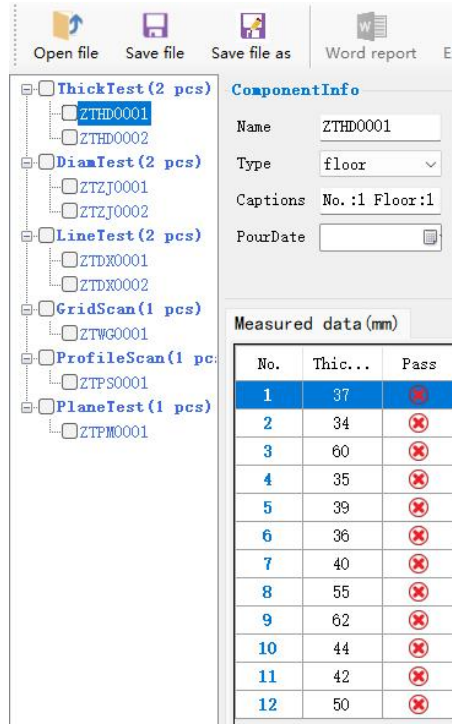

Figure 5.8 Analyzing and Processing Diagram

1. Select the type of data to be analyzed. The software processing is divided into four types, the same as the instrument: single point test (thickness test), single line test, profile test, grid test, and plane test.
2. The component list shows all the component numbers of the current type.
3, right-click and want to browse the component, component information box displays the basic information of the component, according to the actual construction drawings or specifications set the appropriate parameters.
4. Data list displays the component data, including the measurement position, the thickness of the protective layer and whether it is qualified.
5. Image area displays the corresponding type of data and graphics.

☞ Friendly Tips.

Positive deviation and negative deviation can be adjusted automatically according to the different upper and lower limit values for the selected component type, and can also be adjusted according to the corresponding different situations.

5.4.4 Save Picture

Click Save Image to bring up the pop-up, select the save path, enter the file name of the saved graphic, and click Save to save the graphic displayed in the image in *.bmp format under the specified path.

5.4.5 Generate Report

1, in the list of components, select the component number to handle the generation of inspection reports, as shown in Figure 5.10.

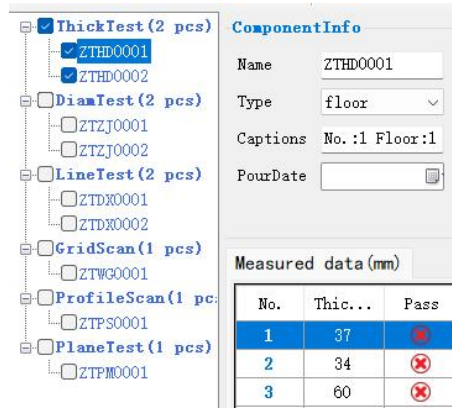

Figure 5.10 Selecting the component number

2. Click Generate Report to bring up the Generate Report dialog box as shown in Figure 5.11, fill in the basic information of the generated report and click OK.

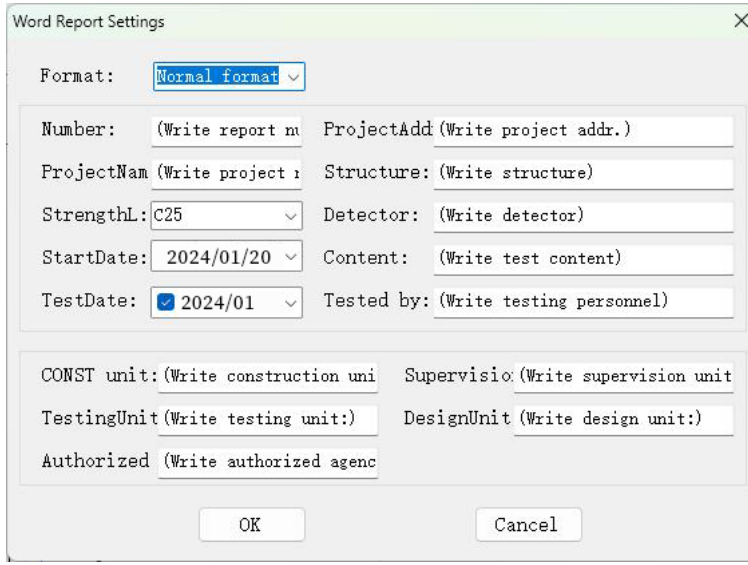

Figure 5.11 Generate report interface

☞ Friendly Tips.

Generate a report file, different test methods, can not be generated in the same report.

6. Repair and maintenance

1. Instrument Operation

When operating the instrument, please press the keys, and do not operate the instrument keyboard with oil and mud hands, so as not to affect the service life of the keyboard.

2. Power supply

The instrument is powered by built-in special rechargeable lithium battery, such as fully charged, can be on standby for not less than 12 hours. Please pay attention to the power indicator, if the power is insufficient, you need to turn off the instrument as soon as possible and charge the instrument with a charger in a timely manner, such as charging in a timely manner, may result in the loss of test data due to a sudden power outage or even damage to the instrument.

It is forbidden to use other batteries or power supplies to power the instrument, otherwise it may cause damage to the instrument, battery leakage, fire and so on. If you have any questions, please contact our company or distributor.

☞ **Friendly reminder: When the battery is used for a period of time and the capacity is insufficient, the battery symbol in the upper right corner of the screen will be displayed. The more green part, the more battery power; when the power is white, it means that the power has been used up and must be charged.**

3. Charging

This instrument has a built-in lithium battery, it is recommended to charge in the off state. Support Type-C USB standard port charging, charger charging, please connect the power socket end to AC220 ± 10% V power outlet, the other end

of the Type-C USB plug into the instrument USB interface or directly with a USB cable plugged into the computer. When charging, the LCD display of the instrument is charging, indicating that the instrument is charging the built-in lithium battery; when the LCD display of the instrument is charging is complete, indicating that the built-in lithium battery is full, at this time you should promptly pull out the charger or the USB cable, in order to avoid overcharging of the battery to avoid over-charging of the battery to affect the battery life. Charging process, the instrument battery and charger will produce a certain amount of heat, is a normal phenomenon, the instrument will be placed in a well-ventilated, easy to dissipate heat is recommended.

☞ **Friendly Tips.**

Please keep charging continuously for about 5 hours to ensure that the power is completely sufficient at one time, please do not charge in the environment above 50 ℃; Due to the high charging current, it is recommended that you use the manufacturer's original charger and USB cable for charging, otherwise it may cause damage to the instrument.

4, lithium battery

Rechargeable battery general service life is about 500 times of charging and discharging, if the service life of the battery is about to be used up, found that the battery can not work properly, charging on the lack of power, each time full or use a very short period of time and other phenomena, it may be rechargeable batteries have been damaged or the battery's service life has been reached, please contact our after-sales service department, and timely replacement of batteries. Prohibit short-circuiting the battery or close to high-temperature heat sources.

5. Store\clean

When the instrument is not in use, please place the instrument case in a ventilated, cool, dry (relative humidity less than 90%) room temperature environment. If the instrument is not used for a long time, the rechargeable battery will be naturally discharged, resulting in a drop in power. Please charge the instrument before use and power up and check the instrument regularly, generally once a month is good.

After each use of the instrument, it should be properly cleaned to prevent water, oil, mud and dust from entering into the connector, which may affect the test performance or poor measurements and other phenomena.

☞ **Friendly Tips.**

Do not put the instrument and accessories into water or use a wet cloth to clean them!

Do not use organic solvents or acidic or alkaline liquids to clean the instrument and accessories!

Please use a clean please soft dry cloth to wipe the instrument and use a soft brush to clean the jack!

6. Failure and treatment

The instrument cannot be turned on: You should check whether the battery power is sufficient or directly connect the power adapter and turn on the instrument. Connect the power adapter and turn on the instrument power soft switch. If the above methods are not effective, please connect the power adapter to charge the battery for half an hour before turning on the instrument.

Auto shutdown: The instrument has the ability to detect the battery power, when the battery power is too low, the instrument will shutdown automatically. You can charge the battery for a period of time first, or connect the power adapter directly and then turn on the instrument.

Friendly Tips.

Our company provides one year warranty and lifetime maintenance service for the instruments. About the instrument maintenance, please contact with our company or the instrument distributor, it is not recommended to repair by yourself.

7. Liability

This instrument is a precision testing instruments, if the user has the following behavior or man-made damage, the company does not bear the responsibility:

1. Non-normal operation of the instrument
2. Opening the machine and disassembling any parts without permission.
3. Violation of the above working environment requirements or storage environment requirements.
4. Serious damage caused by man or accidental impact, etc.

Appendix 1 Quick Index of Menus

Main Menu	Submenu	Function Description
Rebar Scan	Single point test	Measure the thickness and location of the protective layer of a single rebar.
	Single Line Test	The most commonly used test mode, measuring the thickness, location and spacing of the protective layer of rebars in the same direction according to the specification requirements.
	Grid Scan	Scanning of reinforcement bars in the form of a grid diagram, which can be scanned once in the X direction and once in the Y direction.
	Section Scanning	Scanning of reinforcement in the form of engineering drawings and section drawings.
	Plane Test	Tests on diagonal bars.
Data Management	Data Browsing	View information about the measured data stored inside the instrument.
	Data Upload	Upload test data to PC
	Data	Delete internal test data

	Deletion	
System Settings	Setting time	Setting the system time
	Calibration Values	Setting the instrument calibration error

Appendix 2 Measurement and calibration

Before the Rebar Detector leaves the factory, it has been tested according to the relevant standards, and it can leave the factory only after it has been tested as qualified.

Testing content and steps are as follows:

F2.1 Inspection environment

1. Room temperature environment;
2. No strong electromagnetic field interference;
3. The air does not contain corrosive gases, relative humidity is less than 80%.

F2.2 Accreditation equipment

1. A set of plexiglass plate;
2. Length of not less than 500mm, diameter of Φ12, Φ16, Φ20 ordinary II rebar;

3. A set of standard thickness bracket.

F2.3 Testing items and testing methods

1. Appearance

a. Connectors, fasteners, no loose phenomenon, reliable contact;

b. Plating, oxidation treatment surface treatment should be flat, consistent color, gloss, no peeling, corrosion, scratches and other defects;

c. Clear text symbols and signs.

2. Detection method

Reinforcing steel testing:

a. Sampling one specification of rebar from Φ12, Φ16, Φ20 common grade II threaded rebar, and measuring the value of protective layer thickness continuously 3 to 6 times for each of the three key points with a Rebar Detector to find the average value or check the passing rate.

b. Measurement of commonly used protective layer thickness value area: each rebar diameter area is generally three values of 20, 30, 50, each continuous measurement of 3 to 6 times the diameter of the rebar, calculate the average value of the diameter of the rebar.