

Rebar Locator TC100 Instruction Manual



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Conventions used in this manual:

- 1、 Words in box represent the key, e.g. **ENTER** indicates the ENTER key.
- 2、 The words with gray shading indicate the item on the interface, e.g. **Serial number** indicates the “No.” item on corresponding interface.
3. Words with gray shading without box in data processing software indicate control name (check box and input box etc.) in the pop-up window on the screen, e.g. file name input box in the window of opening file.
4. Words with gray shading in box represent the button in data processing software, e.g. **ENTER** indicates the ENTER button in dialog box.

1. Overview

1.1 Brief introduction

Rebar Locator is used to detect reinforced concrete project and new reinforced concrete structure construction quality and determine the location and layout of rebar. If the diameter is known, it will be used to detect the thickness of concrete covering layer. If the diameter is not known, it will be used to detect rebar diameter and thickness of concrete covering layer at the same time. And it can detect the location of magnetic substance and electric conductor in non-magnetic and non-conductive medium, e.g. cable inside wall body and water & heating pipe etc. This instrument is a kind of intelligent nondestructive test equipment possessing the functions of automatic detection, data memory and output.

1.2 Main functions

- 1、 Detect the location and direction of rebar in concrete structure;
- 2、 Detect covering layer thickness of rebar (diameter is known);
- 3、 Estimate diameter of rebar and thickness of covering layer;
- 4、 Self-calibration function of transducer;
- 5、 Memory and view of detected data;
- 6、 Transfer data.

1.3 Main features


- 1、 Accurate location of rebar and detection of rebar diameter and covering layer thickness;
- 2、 Multiple location modes of rebar: Sound alarm prompt, signal strength bar, thickness and signal value;
- 3、 Sensor is placed above the rebar in parallel;
- 4、 High detection accuracy of rebar diameter and covering layer thickness;
- 5、 Interface of software is succinct and operation is simple.

2. Instrument composition and maintenance requirements

2.1 Instrument composition

The instrument is composed of main unit, two signal cables, transducer etc.

2.2 Preparation before operation

Firstly, take the instrument out of the casing. During **Thickness Test** and **Diameter Test**, connect the transducer to the main unit properly. Then press the  key on the keyboard. Start-up screen occurs.

2.3 Replace battery

When insufficient electric quantity or voltage < 7.0V are showed on start-up screen,













please replace the battery. Note: Don't reverse the battery polarity.

2.4 Precautions

1. Avoid water in.
2. Avoid high temperature ($>50^{\circ}\text{C}$).
3. Avoid being near very strong magnetic field, e.g. large electromagnet and transformer etc.
4. When the instrument is not used for a long time, please take out of the battery to avoid damaging the circuit due to battery leakage.
5. Without permission, please don't open the instrument casing. Otherwise, user will responsible for the consequence!


3. Instruction of operation interface

3.1 Keyboard introduction

There are 9 keys on the keyboard.  key is ON/OFF;  key is used to confirm operation in parameter setting and automatic calibration;  key is used to store measured values;  key is used to return to the last menu;  key is used to switch the first measuring range and the second measuring range;  --the first measuring range,  used in the condition of the thin covering layer,  --the second measuring range, used in the condition of the thick of covering layer; , ,  and  keys are used respectively in auxiliary functions like menu selection, digit add & subtract and cursor movement etc.

3.2 Brief introduction of operation

3.2.1 Start-up

Press the  key on instrument panel. Then begin operation. Start-up interface is shown as figure 3-1.

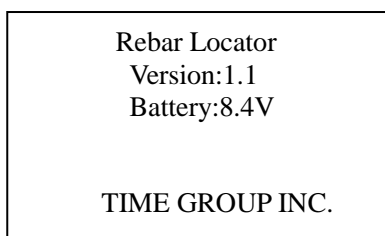


Figure 3-1 Start-up interfaces

3.2.2 Interface of function selection

Press any key on start-up interface and enter the interface of function selection, as figure 3.2 shows. It includes functions of **Thickness Test** (detecting covering layer thickness),

Diameter Test (detecting reinforced bar diameter), Rebar Scan (detecting covering layer thickness of grid pattern or multiple parallel rebar) (This function is only available for TC110), Transfer Data, View Data, and Delete Data, press and keys, select corresponding functions and press key to enter into corresponding functional interfaces.

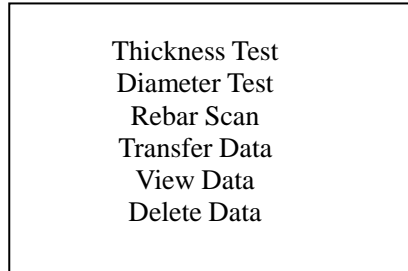


Figure 3-2 Interface of function selection

3.2.3 Thickness test

Interface of thickness test is shown as figure 3-3. Firstly, project information is set. During setting, if Diameter (default is 16mm) and No. (the initial position is fixed as 1) are known, press and keys to move the cursor and press and keys to adjust the value of cursor position. After above setting is finished, press the key to confirm the setting. Then transducer is self-calibrated. At this time, transducer should be placed in the air and away from the strong magnetic field interference. At the same time, wait! is showed on the screen. After wait! is missing, it indicates self-calibration of transducer is end, as figure 3-4 shows. At this time, enter into detection status.

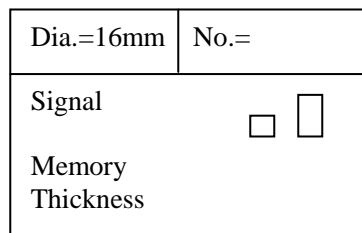


Figure 3-3 interface of thickness test

During detection, current signal value of transducer is showed on the right side of Signal Value; the number of saved detecting covering layer thickness is showed on the right side of Memory; covering layer thickness of detected rebar is showed on the right side of Thickness; length of black scroll bar above the Signal Value indicates the trend which transducer is close to the top of rebar. When black scroll bar is lengthened, it indicates that transducer is close to the top of rebar. When black scroll bar is shortened, it indicates that transducer is away from the top of rebar. When transducer is scanning over the rebar, the instrument gives the audible alarm. At the same time, covering layer thickness of detected

rebar is showed on the position on the right side of **Thickness** in large print. At this time, press the **SAVE** key to save the data. The value on the right side of **Memory** is added 1 automatically indicating memory is end to continue detection of this project.

No. =	
<div style="background-color: black; width: 100px; height: 15px; margin: 0 auto;"></div>	
Signal Memory Thickness	

Figure 3-4 interface of thickness test

During detection, press the **ESC** key to return the status of setting project information; press the **ENTER** key to self-calibrate transducer. At this time, transducer must be placed in the air and away from rebar and strong magnetic field. After **wait!** on the screen is missing, self-calibration is end. At this time, continue detection. Press the **RANGE** key to switch the first nominal range and the second nominal range. After switching nominal range, it is necessary to press the **ENTER** key to self-calibrate transducer. Otherwise, detection results are wrong.

To find the position on the top of rebar, firstly, roughly scan. After hearing the alarm, shift the transducer backwards. Because the speed of shifting the transducer is too fast, it is possible to miss the data during collecting the data. Therefore, after audible alarm, move back the transducer as slow as possible. When audible alarm is heard for the second time, data on the right side of **Signal Value** are changed. Repeat such operation till the value on the right side of **Signal Value** is the maximum. At this time, center of diamond pattern on the transducer is just on the top of rebar.

Note: When covering layer thickness is beyond the lower limit of nominal range of covering layer thickness, ≤XX is showed on the screen. When covering layer thickness detected by the first nominal range is more than 50mm, to improve the detection accuracy, switch into the second nominal range to carry out detection.

3.2.4 Diameter test

Interface of diameter test is shown as figure 3-5. Firstly, No. is set (the initial position is fixed as 2). Press **←** and **→** keys to move the cursor and press **↑** and **↓** keys to adjust the value of cursor position. After above setting is end, press the **ENTER** key to confirm the setting. Then transducer is self-calibrated. At this time, transducer should be placed in the air and away from the strong magnetic field interference. At the same time, **wait!** is showed on the screen. After **wait!** is missing, it indicates self-calibration of transducer is end, as figure 3-6 shows. At this time, enter into detection status.

No.=0000	
Signal Memory Diameter Thickness	

Figure 3-5 interface of diameter test

During detection, current signal value of transducer is showed on the right side of **Signal Value**; saved amount of information is showed on the right side of **Memory**; estimated rebar diameter at the current transducer is showed on the right side of **Diameter**; equivalent covering layer thickness at the current transducer is showed on the right side of **Thickness**. Length of black scroll bar indicates the trend which transducer is close to the top of rebar. When black scroll bar is lengthened, it indicates that transducer is close to the top of rebar. When black scroll bar is shortened, it indicates that transducer is away from the top of rebar.

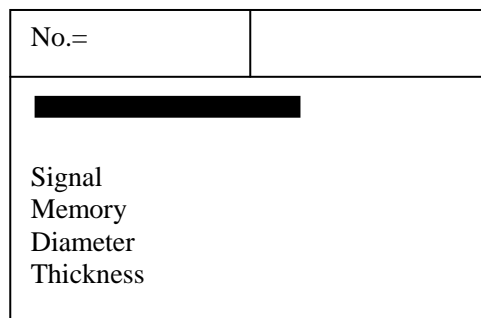


Figure 3-6 interface of diameter test

To find the position on the top of rebar and detect accurately detected rebar diameter and covering layer thickness, firstly, roughly scan. After hearing the alarm, shift the transducer backwards. Because the speed of shifting the transducer is too fast, it is possible to miss the data during collecting the data. Therefore, after audible alarm, move back the transducer as slow as possible. When audible alarm is heard for the second time, data on the right side of **Signal Value** are changed. Repeat such operation till the value on the right side of **Signal Value** is the maximum and black scroll bar is the longest. At this time, center of diamond pattern on the transducer is just on the top of rebar. Then press the **RANGE** key and wait for a while so that the detected rebar diameter and covering layer thickness can be estimated and showed correspondingly in the position on the right side of **Diameter** and **Thickness** in large print. At this time, press the **SAVE** key to save the data. The value on the right side of **Memory** is added 1 automatically indicating the number of this project information is saved. At this time, continue detection. Press the **ESC** key to return the status of setting project information.

During detection, press the **ENTER** key to self-calibrate transducer. At this time, transducer must be placed in the air and away from rebar and strong magnetic field. After wait! on the screen is missing, self-calibration is end. At this time, continue detection.




Note: If covering layer thickness is less than the corresponding minimum of measurable covering layer thickness value in table 3.1, **Diameter** will show **too thin**; if covering layer thickness is more than the corresponding maximum of measurable covering layer thickness

value in table 3.1, **Diameter** will show **too thick** . At this time, diameter cannot be detected.

Table 3.1 Nominal range of rebar diameter unit: mm

Rebar diameter	The minimum measurable covering layer thickness	The maximum measurable covering layer thickness
6	7	60
8	10	60
10	11	65
12	14	65
14	15	65
16	16	65
18	16	65
20	18	65
22	18	65
25	19	65
28	21	65
32	21	65

3.2.5 Transfer data

Interface of transferring data is shown as figure 3-12. Through  and  keys, select corresponding transferring modes. Then press the  key to enter into corresponding function interface.

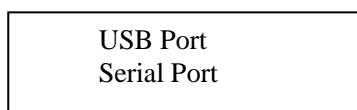




Figure 3-12 interface of transferring data

3.2.5.1 USB transfer

USB transfer interface is shown as figure 3-13. Press the  key to carry out transfer and press the  key to return function selection interface without transferring data. During transfer, prompt **Transferring...**, as figure 3-14 shows. After transfer is finished, prompt **Transfer end**, as figure 3-16 shows. Then press any key to return function selection

interface.

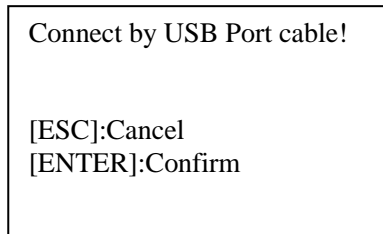


Figure 3-13 USB transfers

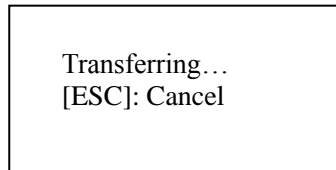


Figure 3-14 USB transferring

3.2.5.2 Serial port transfer

Serial port transfer interface is shown as figure 3-15. Press the **[ENTER]** key to carry out transfer and press the **[ESC]** key to return function selection interface without transferring data. After transfer is end, prompt **Transfer end**, as figure 3-16 shows. Then press any key to return function selection interface.

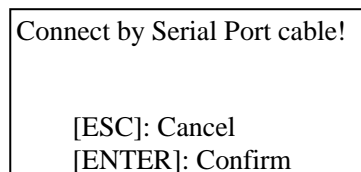


Figure 3-15 Serial port transfers

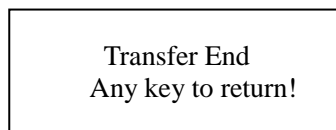







Figure 3-16 Transfer end



3.2.6 View data



Interface of viewing data is shown as figure 3-17, figure 3-18, figure 3-19 and figure 3-20. **No.** region is on the left side. Selected project **Data** is on the right side. Project No. is begun with **1XXX** includes data of detecting covering layer thickness under the condition of known rebar diameter. Project No. is begun with **2XXX** includes data of detecting rebar diameter and covering layer thickness at the same time under the condition of unknown rebar diameter. Press the **[↑]** and **[↓]** keys to select different projects in project No. region. Arrowhead indicates current selected project. Data of current selected project is in right data region.

No.	Data(mm)
=> 1xxxx 2xxxx	Know Dia.

Figure 3-17 Interface of viewing thickness

Look up data of this project by means of pressing  and  keys.  key is used to look up data of current project backwards through the full screen turning.  key is used to look up data of current project forwards through the full screen turning. Press the  key to return the function selection interface.



When project No. begun with 1XXX is selected through  and  keys, that is to say, interface of viewing the thickness as figure 3-17 shown, Diameter Known is the set diameter during detection according to design data. Following data are those of detecting covering layer thickness in this project.

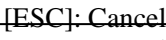
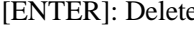
When project No. begun with 2XXX is selected through  and , that is to say, interface of viewing diameter as figure 3-18 shows, saved rebar diameter and covering layer thickness of this project are showed in right data region. Rebar diameter corresponds to covering layer thickness one by one. By following coincidence relation of geometric location, that is to say, the first data of No. line in Thickness data column corresponds to the first data of No. line in Diameter data column. The second data in the same line is also corresponding.

No.	Data(mm)	
=1xxxx 2xxxx	T (mm)	Dia.

Figure 3-18 interface of viewing diameter

3.2.7 Delete data


Interface of deleting data is showed as figure 3-21. Press the  key to delete all data. After deleting all data, then return automatically to function selection interface. Press the  key to return the function selection interface without deleting data.

Confirm delete?
 : Cancel
 : Delete
Figure 3-21 Interface of deleting data

Notice: After all data are deleted, they cannot be restored. Please be cautious to

use this function.

3.2.8 Shut down

Press the  key to achieve the shut down.

Notice: To reduce the impact on the screen, after shut down, about 30s later, the instrument can be started again.

4. Detection

Precautions:

1. During entering into detection status (**Thickness Test**, **Diameter Test**) each time, system can calibrate the transducer automatically. At this time, the transducer should be placed in air or away from magnetic medium like metal etc.
2. Detected surface is as flat as possible to improve the detection accuracy and avoid wrong interpretation.
3. During detection, the transducer is moved at uniform speed as much as possible to avoid moving in reverse direction before finding the rebar, that is to say, avoid moving the transducer to and fro before finding the rebar. Otherwise, it is easy to cause wrong interpretation.
4. The speed of moving the transducer should not be more than 20mm/s. Otherwise, it is easy to cause larger error even rebar missing.
5. If continuous working time is longer, to improve the detection accuracy, pay attention that the transducer should be placed in air and away from the rebar every other about 5mins. Press the **ENTER** key to reset once and eliminate all errors (when detection results are doubted, after resetting it, detect it again).
6. When **Thickness Test** function of detecting covering layer thickness under the condition of known rebar diameter, to assure detection accuracy of covering layer thickness, user should set the rebar diameter value corresponding to actual rebar diameter because rebar with different diameters responds the transducer differently. Therefore, when the same rebar is detected by means of different rebar diameter setting values, detection results are sure to be different.
7. **RANGE** key is used to switch the first nominal range and the second nominal range and increase the accuracy of detecting covering layer thickness. After switching, **ENTER** key must be pressed to reset once.

4.1 Reset

1. Placed the transducer in air and away from the metal (at least 0.5m away from the metal).
2. On the interfaces of **Thickness Test**, **Diameter Test**, press the **ENTER** key to reset and eliminate the environmental influence.
3. About 3seconds later, after **wait!** on the screen is missing, reset is end. At this time, enter into normal detection status. If stronger electromagnetic field interference is in the environment, reset time is longer possibly.

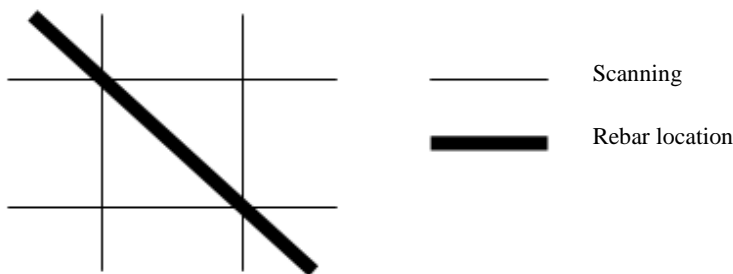
Notice: Do not reset at the position that is near the rebar. Otherwise, it will cause serious distortion of detection results.

4.2 Location of single rebar and detection of covering layer thickness

and rebar diameter

Detect covering layer thickness under the condition of known rebar diameter

1. Take out of the instrument and connect the transducer;
2. Turn on the instrument power and select the function of **Thickness Test**. According to design data, rebar diameter is set as known diameter. Project No. of this detection is set.
3. The transducer is placed in air and away from the metal (at least 0.5m away from the metal). Press the **ENTER** key to reset and eliminate the environmental influence.
4. According to design data or experience, the rebar direction is determined. If rebar direction is not determined, multiple points scanning on two orthogonal directions should be carried out to determine the rebar position as following figure shows.



5. The transducer is placed on the surface of detected body and moved at uniform speed in parallel with rebar and along the direction that is vertical to rebar direction. **The speed should be less than 20mm/s**. When the transducer reaches the top of detected rebar, the instrument gives the humming to prompt that rebar is under this position and show covering layer thickness automatically. At this time, press the **SAVE** key to save detection results into current set project No. The transducer is moved to and fro at nearby position in reverse direction. At the same time, two-digit value on the right side of screen can be observed. The position that the minimum occurs and **Signal Value** is the maximum is accurate position of rebar. Center of rebar is coincident with that of diamond pattern on the transducer.

Value determination

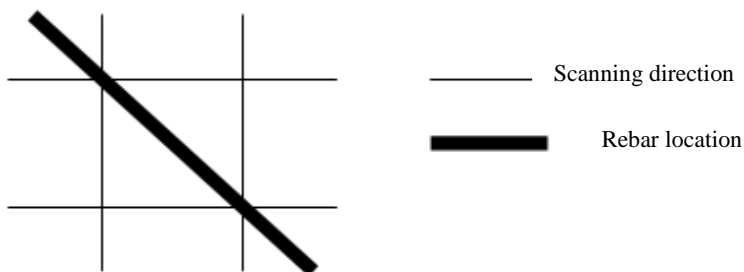
When covering layer thickness is more than certain value, detection signal of transducer is rather weak. At this time, to reduce wrong interpretation, rebar position is not determined automatically by means of general procedure. It requires that user determines the rebar position according to change laws of current value. Such determination is called as value determination. Observe the two-digit value in small print shown on the right side of the screen. When this value is changed from large to small, it indicates that the transducer is near the rebar gradually. Continue to move the transducer. When this value is changed from small to large, it indicates that the transducer is away from the rebar gradually. The transducer is moved to and fro at nearby position in reverse direction. The position that the minimum of value occurs and **Signal**

Value is the maximum is accurate position of rebar.

Detect covering layer thickness and rebar diameter under the condition of unknown rebar diameter

Under the condition of unknown rebar diameter, this instrument can detect rebar diameter and covering layer thickness at the same time. Steps are as follows:

1. Take out of the instrument and connect the transducer;
2. Turn on the instrument power and select the function of Diameter Test. Project No. of this detection is set.
3. The transducer is placed in air and away from the metal (at least 0.5m away from the metal). Press the **ENTER** key to reset and eliminate the environmental influence.
4. According to design data or experience, the rebar direction is determined. If rebar direction is not determined, multiple points scanning on two orthogonal directions should be carried out to determine the rebar position as following figure shows.



5. The transducer is placed on the surface of detected body and moved at uniform speed in parallel with rebar and along the direction that is vertical to rebar direction. **The speed should be less than 20mm/s.** When the transducer reaches the top of detected rebar, the instrument gives the alarm to prompt that rebar is under this position. The transducer is moved to and fro at nearby position in reverse direction. At the same time, Signal Value on the screen can be observed. The position that Signal Value is the maximum is accurate position of rebar. Transducer position is kept unchangeable. Press the **RANGE** key. After a while, detect the diameter and covering layer thickness of detected rebar, which are showed correspondingly on the positions on the right side of Rebar Diameter and Thickness. At this time, press the **SAVE** key to save detection results into current set project No.

5. Detection method of rebar

In real rebar concrete structure, layout of multiple parallel rebar (main rebar) plus stirrups (e.g. beam and column etc.) or layout of grid pattern (e.g. plate and wall etc.) is usually used. What's more, buried position of rebar in concrete cannot be determined in advance usually. Therefore, to improve detection efficiency and accuracy, we need follow certain principle and summarize a great amount of experience of actual detection. Finally, we generalize a set of

detection method applicable for rebar.

Step 1 Obtain documents

Obtain design & construction material of detected component and determine the approximate position, direction and diameter of rebar in detected component. Rebar diameter parameter of instrument is set as design value. If above information is not obtained, rebar diameter is set as default. Rebar diameter and covering layer thickness are detected by means of the functions of Diameter Test.

Step 2 Determine detection regions

One region on detected component is selected as detection region according to the demand. Region surface is relatively smooth is selected as much as possible to improve the detection accuracy.

Step 3 Determine the position of main rebar (or top rebar)

Select one starting point and scan the main rebar or top rebar along the direction that is vertical to the main rebar (for beam and column etc.) or the top rebar (for plate and wall of grid pattern rebar) to determine the position of main rebar or top rebar. Then move the certain distance horizontally to carry out another scanning as figure 5.1 shows. Points scanned twice are connected together by means of straight line. Notice: If scanning line is just above the stirrups or lower rebar as figure 5.2 shows, the condition that rebar is not found or rebar position is not determined accurately will occur possibly. The phenomenon is determination deviation of rebar position is larger during repeating scanning. At this time, this scanning line should be shifted twice diameters of rebar for scanning again.

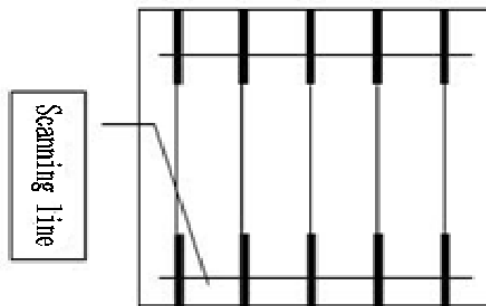
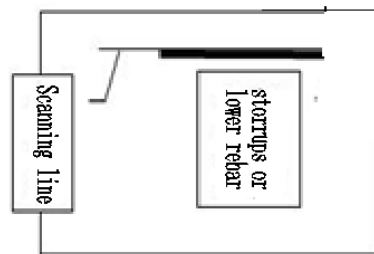


Figure 5-1



Figures 5-2

Step 4 Determine the position of stirrups (or lower rebar)

Carry out scanning along the direction that is vertical to stirrups (or lower rebar) in the middle of determined two pieces of rebar to determine the position of stirrups (or lower rebar). Then select the middle position of another two pieces of rebar to scan it as figure 5.3 shows. Points scanned twice are connected together by means of straight line.

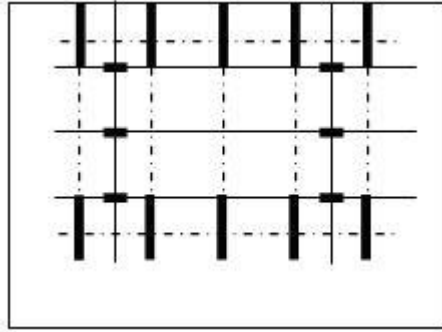


Figure 5-3

Step 5 Detect covering layer thickness and rebar diameter

Detect covering layer thickness under the condition of known rebar diameter: Select the function of **Thickness Test** of instrument and set No. and rebar diameter properly. Carry out scanning in the middle position of two pieces of stirrups (lower rebar) along the direction that is vertical to main rebar (top rebar) to determine the covering layer thickness of detected main rebar (top rebar). Carry out scanning in the middle position of two pieces of stirrups (top rebar) along the direction that is vertical to stirrups (lower rebar) to determine the covering layer thickness of detected stirrups (lower rebar). Pay attention to setting the status of corresponding grid pattern rebar.

Detect covering layer thickness and rebar diameter under the condition of unknown rebar diameter: Select the function of **Diameter Test** of instrument and **set No properly**. Carry out scanning in the middle position of two pieces of stirrups (lower rebar) along the direction that is vertical to main rebar (top rebar) by means of transducer in parallel to the rebar to determine the accurate position detected main rebar (top rebar). Then the transducer is placed above the detected rebar in parallel to detect rebar diameter and covering layer thickness of this point. Carry out scanning in the middle position of two pieces of main rebar (top rebar) along the direction that is vertical to stirrups (lower rebar) to determine the accurate position of detected stirrups (lower rebar). Then the transducer is placed above the detected rebar in parallel to set status of corresponding grid pattern rebar and detect rebar diameter and covering layer thickness of this point.