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LR-G200 Integrated Rebar Scanner Operating Instructions

JINAN LANGRUI DETECTION TECHNOLOGY CO.,LTD.

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1 Overview

1.1 Introduction

LR-G200 integrated rebar scanner is a portable intelligent NDT device, which is mainly used for structural testing of reinforced concrete, and able to carry out accurate testing on depth of rebar cover and diameter of rebar on the surface of reinforced concrete, and analyze distribution of rebar.

1.2 Functions and characteristics

1. The instrument sensor is of integrated structure in small size, thus permitting easy operation.
2. Carry out testing with combination of high-power transmitting coil and multiple small coil to ensure higher accuracy and resolution.
3. Perform displacement scanning and rebar distance measurement at a higher accuracy level with use of high-accuracy grating sensor.
4. Provide different types of scanning to suit the different measurement cases.
5. Permit large and small-range testing, with the scanning distance up to 65m max. Perform data testing in a flexible way. The instrument itself allows storage of max. 4000 components.
6. Permit correction of multiple stirrup so as to obtain more accurate testing results.
7. Furthermore, the USB wire data transmission and Bluetooth wireless data

transmission are allowed so that the quick data uploading is possible.

8. Use 3.2" 65K color LCD screen to yield the higher resolution and better display, plus the capacitive touch screen, thus facilitating the man-machine interaction.

9. Perform power supply with use of 8.4v 3200mah high capacity lithium-ion battery to ensure that the instrument can continuously operate around-the-clock.

1.3 Technical indicators

Description		Technical indicators
Applicable range of rebar diameter(mm)		Φ6-Φ50
Max. range (mm)	1 st range	2~100
	2 nd range	2~200
Max. allowable deviation on concrete cover depth	±1 (mm)	2~80
	±2 (mm)	81~120
	±3 (mm)	121~160
	±4 (mm)	161-200
Applicable range on diameter estimate (mm)		Φ6-Φ50
Max. deviation on diameter estimate		±1 spec
Display accuracy on diameter estimate (mm)		0.1

Detailed specification on testing of concrete cover depth

Dia. \ Range	Small	Large
6	2~70	2~97
8	2~70	2~97
10	2~75	3~100
12	2~75	3~107
14	2~75	3~117
16	3~85	3~120
18	3~85	3~125
20	3~85	3~137
22	3~85	3~140
25	3~90	3~145
28	3~90	3~145
32	4~95	4~155
36	4~95	4~155
40	4~95	5~185
50	6~100	6~200

1.4 Performance Indicators

Performance indicators on LR-G200 integrated rebar scanner			
Quick scanning	Fine scanning	Profile scanning	Grid scanning
Yes	Yes	Yes	Yes
Data correction	Way of power supply	Instrument weight	Screen size
Yes	Lithium battery	1KG	3.2"
Image scanning	3-D imaging	Range of scanning	Mode of data transmission
Yes	Yes	Unbounded	Bluetooth or US
Laser positioning	Touch screen operation	Screen lattice	Instrument size
3-wire	Yes	320x240	235x120x130

1.5 Precaution

1. Please carefully read the instructions prior to use.

2. Expected operating environment:

Ambient temp.: -10°C~40°C

Relative humidity: <90%RH

Electromagnetic interference: no strong alternating electromagnetic field

Exposure to direct sunshine for an extended period prohibited

Corrosion control: take necessary measures to ensure proper operation at the humid, dust and corrosive gas environment.

3. Expected storage environment:

Ambient temp.: -20°C~50°C

Relative humidity: <90%RH

In case of out of use for an extended period, please regularly switch on the instrument and recharge it. The instrument shall be placed at a well ventilated, cool and dry location without repeated exposure to direct sunshine.

4. Prevent moisture impact, and operation at the intense magnetic fields, such as in the vicinity of large electrical magnet, transformer, VFD, etc.

5. Vibration control: take measures to prevent violent vibration and impact during operation and handling.

6. Charge management: the instrument is recharged with the rechargeable lithium battery. In case of low battery, recharge the instrument without delay to avoid battery damage. Perform recharge with the recharger specific to the instrument rather than other types of adapter or recharger, which may otherwise lead to battery damage.

7. Maintenance: conduct proper cleaning at the end of operation every time to prevent declined performance or property damage due to dust presence in the

instrument or plug connector.

1.6 Responsibility

The instrument is a precision detector. We will bear no responsibility in case of the following user operations being identified.

1. Incompliance with the above working environment requirements or storage environment requirements.
2. Non-standard operation.
3. Unauthorized removal of the casing and parts.
4. Serious instrument damage by operator or accident.

2 Instrument Description

2.1 Instrument Composition

The instrument consists of main machine, specific charger and attachment.

2.1.1 Main Machine

LR-G200 integrated rebar scanner is illustrated below.



2.1.2 External Interface

USB interface: data transmission interface is used for connection to the computer to upload the data saved in the instrument.

Charge interface: when the instrument shows low battery, charge with the specific recharger via the interface.

2.1.3 Key Description

Key	Function description
	Switch on or off the instrument
...	Diameter estimate key or instrument calibration
OK	Confirm current selection
C	Back to the previous menu
	Option up or digital adjustment up
	Option down or digital adjustment down
FN	Multi-function key

Note: Refer to the related chapters for details on function of each key.

2.2 Testing Principle

The instrument will generate the pulsed magnet field via high-current excitation transmitting coil. In case of rebar being detected underneath the magnetic field, the rebar will produce the turbulence at the excitation of pulsed magnet field, and then make an induced magnetic field. The receiving coil will convert the induced magnetic field to an electrical signal. The main machine performs real-time analysis of the electrical signal, and then identify the location of rebar, concrete cover depth and diameter. The receiving coil is configured in a multiple set of coil combination, thus yielding the higher testing accuracy against the traditional coil testing in a single way.

3 Operation Description

3.1 System Overview

LR-G200 Integrated rebar scanner system is designed to assure indication of each function menu, instrument status, measurement data and result. The man-machine interaction for the entire system is achieved through the key and touch units, which is easier to operate than the traditional simple key operation.

3.1.1 Interface Description

The system interface mainly contains the menu selection and data result display, in which there are title display zone and content display zone. In the title display zone, the current interface title, Bluetooth device and USB interface readiness

and instrument battery status appear. In the content display zone, the main content in the current interface appears.

3.1.2 Operation Method Description

The user can work via key or touch screen. Use of touch screen is more convenient so we recommend to run the instrument with touch screen.

Key operation: the user can select the desired menu via Up or Down key in each interface, and confirm with **【OK】** key. Exit or cancel with **【C】** key.

Touch screen operation: the user can work with the icon in the touch screen.

3.2 Function description

The instrument is designed for rebar detection, data view, data uploading, data deleting, system setting, instrument information, etc. The main interface of the system is illustrated in Fig.3.1

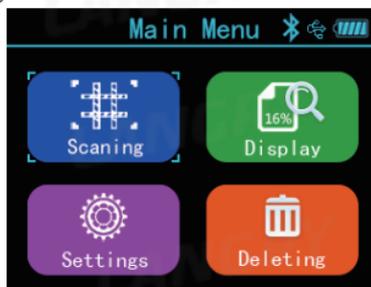


Fig.3.1 Main interface

3.2.1 Rebar Detection

The rebar detection function is designed for detection on depth of rebar cover, rebar location, rebar diameter and distribution. Moreover, the obtained testing data can be saved to facilitate data view or uploading after detection. The rebar detection interface is illustrated in Fig.3.2.

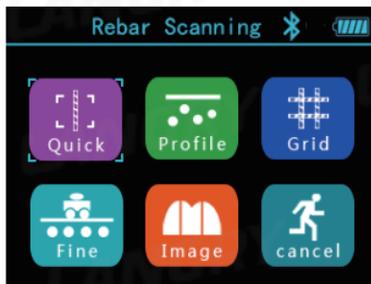


Fig.3.2 Main interface on rebar detection

The following operations are allowed in the rebar detection interface:

Key:

【▲】 and **【▼】** key: select the mode of rebar scanning

【OK】 key: go to the parameter setting interface under the appropriate mode of scanning

【C】 key: return to the main menu

Touch: touch the appropriate icon to go to the appropriate mode of scanning

3.2.1.1 Scanning parameter setting

The scanning parameter setting is mainly used to set the parameters which may be selected under the current mode of scanning. The parameter scanning interface is illustrated in Fig.3.3 (take the quick scanning parameter setting interface as an example).



Fig.3.3 Scanning parameter setting interface

The following operations are allowed in the parameter setting interface:

Key:

▲ and ▼ key: select the option requiring adjustment

【OK】key: go to the status of change for the option

【C】key: exit the parameter change status or return to the rebar detection interface.

【FN】key: go to detection

Touch: touch the area requiring change to complete parameter change. Touch the appropriate icon button to function as expected.

The parameters permitting change are as follows:

Component No.

The component no. consists of digit, letter and symbol. The user can set a component no. in max. 12 digits and min. 1 digit. The user may carry out setting whenever required, as detailed below:

Move the cursor to the desired component no. Press **【OK】** key or directly touch the field to go to the component no. edit status. Now, a soft keyboard will appear in the bottom of screen. Select the character to be entered with use of direction key, and press **【OK】**key to confirm or directly touch Enter. Later, press **【C】** key or touch the return button to exit the edit status.

Design Diameter

It is used to set the diameter of rebar being detected. Total 15 types of rebar diameter can be selected, ie. 6, 8, 10, 12, 14, 16, 18, 20, 22, 25, 28, 32, 36, 40, 50.

You have to set the design diameter at both X and Y directions simultaneously

under the grid scanning and image scanning modes.

Design Depth

It is used to set the depth of design cover for the rebar being detected within a range of 2-200.

You have to set the design depth at both X and Y directions simultaneously under the grid scanning and image scanning modes.

Type Of Component

It is used to set the type of rebar component being detected. You may select two types of component, i.e. “Beam” and “Slab”.

Notes:

- 1)The component no. can be set in max. 12 digits without space. If you start detection without entering the component no., a prompt message will appear, reminding you of entering the component no.
- 2)For rebar cover depth measurement, it is required to set the rebar diameter beforehand. Only with correct setting of design diameter, can the correct Detailed specification on testing of concrete cover depth being measured be assured. Otherwise, deviation to a varying extent may occur.
- 3)Setting of design depth and component type parameters is a basis of assessing if the Detailed specification on testing of concrete cover depth at the measuring point during measurement is acceptable. All unacceptable measurements in the

measurement interface are highlighted in red for quick identification.

3.2.1.2 Quick scanning

In the quick scanning interface, slowly move the trolley at constant speed to the right to start measurement. When the trolley approaches the rebar, a green aiming box appears. Now, slowly move the trolley while the aiming box slowly approaches the centerline. When the aiming box completely fits the centerline, the aiming box turns out to be red and the red light gets lit, plus beep sound being heard. The laser light in front of the instrument will emit a red line, indicating that the instrument has detected the rebar, right below the red line. In case of automatic storage mode being set, automatic storage is performed to assess the concrete cover depth. In case of manual storage mode being set, press **[FN]** key to save the depth value, which appears in the bottom of screen. When the trolley moves far from the rebar, the aiming box gets away from the centerline. When the aiming box moves beyond the effective range of detection, the aiming box returns back to the centerline, highlighted in grey. When the trolley stays between two rebars, the aiming box is in blue.

Continue to move the trolley to the right for detection of next rebar. The same hint will appear in the instrument. Now, the concrete cover depth and distance to the previous rebar will appear simultaneously. As illustrated in Fig.3.4, the concrete cover depth is now 11mm, concrete cover depth for the previous rebar

is 13mm and the distance between two rebars is 21mm.

When the scanning distance is beyond the range of screen display, the screen will go to the next page. In case of unacceptable concrete cover depth for the rebar being detected during detection, you may withdraw the trolley for measurement again. When the trolley moves back to the left side of measuring point, the system will automatically remove the measured data.



Fig.3.4 Quick scanning interface

The following key operations are allowed during quick scanning:

- 【▲】key: view the measurement data in the previous page during detection
- 【▼】key: view the measurement data in the next page during detection
- 【FN】key: save the current depth of determination under the manual mode

[OK]key: switch between the manual or automatic save mode

[C]key: exit the scanning interface

[...]key: keep pressing the key to estimate the diameter of rebar being scanned, and instantaneously press for instrument self-calibration.

Touch operation: complete appropriate operation in the field corresponding to the touch status bar.

3.2.1.3 Profile scanning

Profile scanning is a type of scanning designed to display the location of rebar being detected, concrete cover depth, distance of neighboring rebars, measurement diameter, etc. in the longitudinal profile distribution diagram. This type of scanning is similar to the quick scanning. The profile scanning is illustrated in Fig.3.5.

With use of profile scanning, slowly move the trolley to the right. When the trolley moves above the rebar, the aiming box in the bottom right will turn out to be red, with the same display as that for quick scanning. Refer to the related chapter for more details. In the bottom left of the screen, the current displacement value may appear in a real-time manner. When the rebar is being scanned, you may see the display in the profile point in the screen, in which the concrete cover depth is marked. The following key operations are allowed for calculation of distance of neighboring rebars during profile scanning:

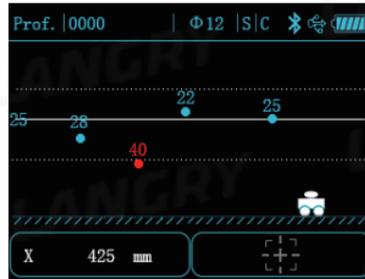


Fig.3.5 profile scanning interface

Key:

【▲】key: view the measurement data in the previous page during detection

【▼】key: view the measurement data in the next page during detection

【...】key: keep pressing the key to estimate the diameter of rebar being scanned, and instantaneously press for instrument self-calibration.

【C】key: exit the profile scanning

Touch operation: complete appropriate operation in the field corresponding to the touch status bar.

3.2.1.4 Fine scanning

The mode of fine scanning provides the real-time indication of waveform of the rebar being detected, rebar location, concrete cover depth, center-to-center distance of neighboring rebars, estimated diameter, etc. in the waveform diagram. The user may also manually add or delete the measuring point of rebar according to the waveform distribution pattern.

It is required to determine the location of rebar in a real-time manner under the quick scanning. Thus, the quick scanning is not suitable for scanning of heavily-distributed rebar. The fine scanning is specifically designed for heavily-distributed rebar. The fine scanning interface is illustrated in Fig.3.6.

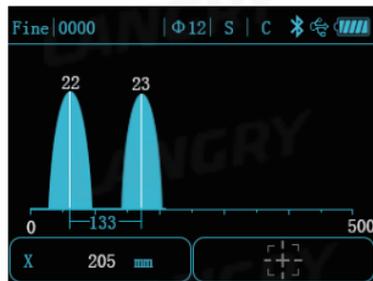


Fig.3.6 Fine scanning interface

In the fine scanning interface, locate the instrument on the surface of object to be measured, and slowly move to the right to start measurement. The signal waveform will appear in the screen, and the real-time displacement value will appear in the bottom left of screen. The signal value starts to increase with the instrument approaching the rebar, and the waveform curve slowly rises. When the instrument moves far from the rebar, the waveform curve slowly lowers down. Now, a peak may appear. The location of peak is just the location of rebar. A white line appears at the peak, indicating that there is a rebar here. The concrete cover depth for the rebar will appear above the peak. When a number of rebar is detected, the instrument will automatically calculate the rebar distance, to be displayed below the waveform.

In case of intensive distribution of rebar distance occurring during detection, the waveform signal will get gentle, wider than the waveform signal in the single rebar waveform diagram. Now, the instrument has to make judgment on rebar location in combination with variation in the neighboring waveforms. Thus, the delayed determination of rebar location may occur.

It is required to switch to the pretty heavily-distributed rebar mode in case of need to measure the heavily-distributed rebar. In the detection interface, press the Down key to switch to the pretty intensive rebar mode. Under the pretty intensive rebar mode, slowly move the trolley at constant speed to assure detection

accuracy. Press the Down key again to return to the intensive rebar mode. When the scanning distance is beyond the range of screen display, the instrument will automatically conduct screen scrolling for display, and permit max. 10m range of scanning.

The following operations are allowed in the fine scanning:

Key:

【▲】key: view the measurement data in the previous page during detection

【▼】key: view the measurement data in the next page during change on mode of detection or during detection

【...】key: keep pressing the key to estimate the diameter of rebar being scanned, and instantaneously press for instrument self-calibration.

【FN】key: keep pressing the key to go to the manual addition and deletion of measuring point interface

【C】key: exit the fine scanning

Touch operation: keep pressing the waveform display field in the touch screen to go to the manual addition and deletion of measuring point interface to complete appropriate operation in the field corresponding to the touch status bar.

In case of unacceptable waveform signal or deviation in rebar determination occurring during detection, you may withdraw to the left to erase the waveform with determination deviation, and restart scanning. Alternatively, you may keep

pressing **【FN】** key at the end of scanning or keep pressing the waveform display field in the touch screen to go to the manual addition and deletion of measuring point interface, as illustrated in Fig.3.7. Now, the user is allowed to manually add or delete the rebar measuring point in the interface.

The following operations are allowed in the manual addition and deletion of measuring point interface.

Key:

【▲】key: instantaneously press the key to move the cursor to the location of last signal. Keep pressing for quick move

【▼】key: instantaneously press the key to move the cursor to the location of next signal. Keep pressing for quick move

【FN】key: add or delete a rebar at current position

【C】key: exit the fine scanning

Touch:

Touch the waveform data display field to move the cursor to the location where the rebar needs to be added or deleted. In case that rebar addition at the current position is allowed, the rebar button in the top of screen is highlighted. Now, you can touch the button for rebar addition. Similarly, when the button for rebar deletion is On, touch the button for rebar deletion.

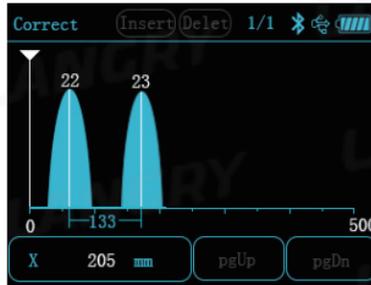


Fig.3.7 Manual rebar addition/deletion measuring point interface for fine scanning

Note:

Max. 10m scanning is permitted under fine scanning.

With access to the manual addition/deletion measuring point function under fine scanning, the instrument is not able to return to continue measurement of this component.

Set to the intensive rebar mode in default under the fine scanning. Measurement of most intensive rebars can be accomplished under the fine scanning. For the pretty intensive rebar measurement, press the Down key to switch to the pretty intensive rebar mode, in which the rebar diameter has to be correctly set. Conduct scanning slowly at constant speed to assure accuracy of sampling data.

3.2.1.5 Grid scanning



Fig.3.8 Grid scanning interface

Grid scanning is a type of measurement designed to display the location of rebar being measured, concrete cover depth and rebar distance in the grid schematic. In the grid schematic obtained from grid scanning, the user can clearly view the rebar distribution. The grid scanning is illustrated in Fig.3.8.

For grid detection, firstly carry out “Grid horizontal” scanning, and slowly move the trolley to the bottom left of screen to start recording the displacement. When the rebar is detected, plot the rebar measuring point and concrete cover depth with use of the grid line at the appropriate location, and calculate and display the distance of neighboring rebars. At the end of scanning the rebar in the horizontal direction, press **[OK]** key to switch to the “Grid vertical” scanning to continue

detection. At the end of entire detection, press **[C]** key to save data and exit the grid detection.

The following key operations are allowed in the grid scanning:

[▲] key: view the measurement data in the previous page during detection

[▼] key: view the measurement data in the next page during detection

[...] key: keep pressing the key to estimate the diameter of rebar being scanned, and instantaneously press for instrument self-calibration.

[OK] key: switch the direction of scanning

[C] key: exit the grid detection

Touch operation: complete appropriate operation in the field corresponding to the touch status bar.

3.2.1.6 Image scanning

Image scanning is a type of measurement for comprehensive analysis following repeated scanning horizontally and vertically in a field of given area based on combination of fine scanning and grid scanning, which is suitable for measurement of rebar in an irregular distribution.

For image scanning, the user can conduct scanning in max. 5x5 grid (or 2x2, 3x3, 4x4 grid), i.e. horizontal scanning 5 times and longitudinal scanning 5 times. The sequential location of scanning is up to your desire. Fig.3.9 shows the location selection interface for image scanning.

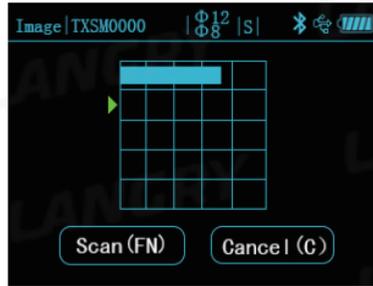


Fig.3.9 Image scanning location selection interface

The following operations are allowed in the image scanning location selection interface:

Key:

【▲】**【▼】** key: select the location to be scanned

【FN】key: go to the location scanning or cancel the scanned data for measurement again

【C】key: exit the image scanning.

Touch:

Touch the location field requiring scanning for selection. Use the touch button to complete operation.

During the single scanning measurement for image scanning, the measurement

results are displayed via the waveform diagram. For detailed function and operation parameter, refer to the fine scanning chapter for more details.

At the end of all data acquisition, the user can perform data import to the computer for data analysis, and meanwhile generate the 3D graphics to view the rebar distribution more accurately.

Note:

An individual scanning can cover max. 1m for image scanning mode.

An individual scanning for image scanning mode is not suitable for the manual addition/deletion rebar measuring point function.

3.2.1.7 Diameter estimation

It is able to display the estimated diameter under all scanning modes. In case of need to estimate the rebar diameter, move the trolley to a point just above the rebar, and keep pressing **【...】** key to go to the diameter estimate function. Wait for 3sec. after measurement, and the instrument interface will display the estimated diameter and concrete cover depth. Automatically exit 3 sec. later.

Note:

Keep the instrument location constant during diameter measurement, which may otherwise lead to deviation of measurement result.

The diameter measurement results are displayed only, and not saved.

3.2.1.8 Signal resetting calibration

In case of change to the detection environment or considerable difference between the measured depth of rebar cover and the design, it is necessary to carry out signal resetting calibration for the instrument. Under any mode of measurement, press【...】key to start the signal calibration function.

Note:

Instrument calibration shall be carried out to atmosphere, far from the ferromagnetic substances. As instructed in the interface, press【OK】key to start calibration. Exit at the end of instruct self-calibration.

The unacceptable calibration signal indicates calibration failure. Now, carry out calibration again.

3.2.2 Data view

There are two ways of viewing the component data available in the instrument, i.e. in graphic and list. The user can select an appropriate way of view on a case-by-case basis. Set to the graphic data view in default.

3.2.2.1 Component list display

In the data view interface, the component list appears, as illustrated in Fig.3.10, including:

Component list information and data statistics of designated component

The following operations are allowed in the component list display interface:

Key:

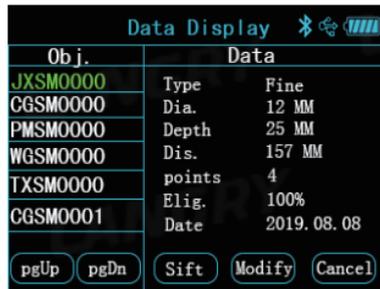
【▲】key: move upward to select a component

【▼】key: move downward to select a component

【OK】key: go to the graphic display interface containing the selected component data

【C】key: exit the data view interface

Touch: complete operation by touching the appropriate field or button.



The screenshot shows a 'Data Display' window with a table of component data. The table has two columns: 'Obj.' and 'Data'. The 'Obj.' column lists component IDs: JXSM0000, CGSM0000, PMSM0000, WGSM0000, TXSM0000, and CGSM0001. The 'Data' column lists various attributes: Type (Fine), Dia. (12 MM), Depth (25 MM), Dis. (157 MM), points (4), Elig. (100%), and Date (2019.08.08). Below the table are five buttons: pgUp, pgDn, Sift, Modify, and Cancel. The top of the window shows the title 'Data Display' and several status icons (Bluetooth, signal strength, battery).

Obj.	Data
JXSM0000	Type Fine
CGSM0000	Dia. 12 MM
PMSM0000	Depth 25 MM
WGSM0000	Dis. 157 MM
TXSM0000	points 4
CGSM0001	Elig. 100%
	Date 2019.08.08

Fig.3.10 Data view interface

Note:

The content of component data statistics information may vary depending on the different modes of component scanning:

Display content of quick, profile and fine scanning: scanning type, design diameter, design depth, scanning distance, no.s of measuring point, pass rate and detection

time, etc.

Display content of grid scanning: scanning type, design diameter X and Y, design depth X and Y, scanning distance X and Y, no.s of measuring point X and Y, pass rate X and Y, and detection time, etc.

Display content of image scanning: scanning type, design diameter X and Y, design depth X and Y, detection time, etc.

3.2.2.2 Component data graphic display

The component data graphic interface display is designed to display the current component's measurement data in graphics, which is easily read and understood. The graphic display interface for each mode of scanning is illustrated below. The following operations are allowed in the component data graphic display interface:

Key:

【▲】key: scroll up to view the data in the previous screen

【▼】key: scroll down to view the data in the next screen

【OK】key: go to the component data list display interface

【FN】key: switch horizontally or vertically to view the data (only grid scanning data allowed)

【C】key: exit the component data graphic view interface

Touch: complete operation by touching the appropriate button.

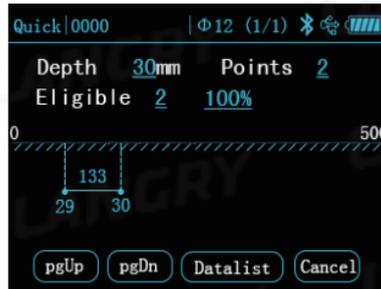


Fig.3.11 Quick scanning

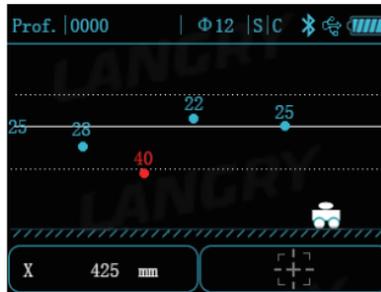


Fig.3.12 Profile scanning

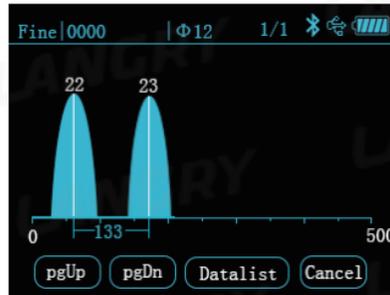


Fig.3.13 Fine scanning

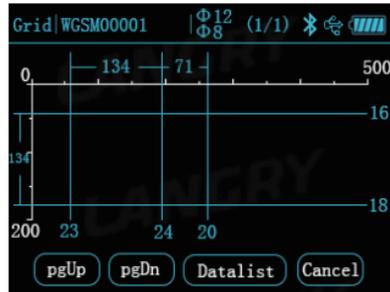


Fig.3.14 Grid scanning

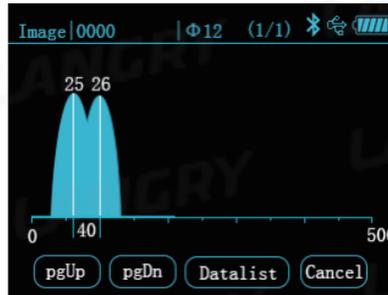


Fig.3.15 Image scanning

Note:

1. The title bar of component data graphic display interface mainly provides information on the scanning type of the component, no. of component and design diameter; the graphic display field provides information on location, depth and distance of measuring point in the measurement data in graphics.
2. In the graphic display interface of image scanning component data, you will see the summary of all measurements first, as illustrated in Fig.3.16. The user shall press the down direction key to select the scanning location to be viewed, and then press **OK** key to go to the graphic data view interface for selection of scanning location.

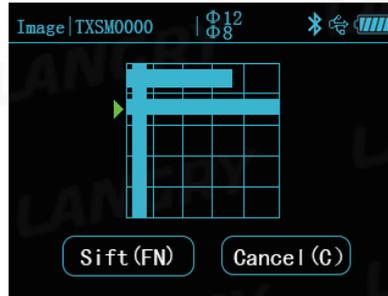


Fig.3.16 Scanning location view interface with image scanning

3.2.2.3 Component data list display

The component data list display interface is designed to display the measurement data for the component in the data list. The list display interface for each mode of scanning is illustrated below.

Quick 0000 Φ 12 (1/1)   				
No.	Sx	Hx	ΔS	ΔH
1	110	29	-	-1
2	243	30	133	0

pgUp pgDn Cancel

Fig.3.17 Quick scanning

Prof. 0000 Φ 12 (1/1)   				
No.	Sx	Hx	ΔS	ΔH
1	78	28	-	3
2	148	40	70	15
3	231	22	83	-3
4	375	25	145	0

pgUp pgDn Cancel

Fig.3.18 Profile scanning

Fine 0000				
Φ 12 (1/1) [Bluetooth] [Battery]				
No.	Sx	Hx	ΔS	ΔH
1	60	22	-	-3
2	175	23	115	-2

pgUp pgDn Cancel

Fig.3.19 Fine scanning

Grid 0000				
Φ 12 (1/1) [Bluetooth] [Battery]				
No.	Sx	Hx	ΔS	ΔH
1	45	16	-	-4
2	179	18	134	-2

pgUp pgDn Cancel

Fig.3.20 Grid scanning at the horizontal direction

Grid 0000				
Φ ₁₂ (1/1)				
No.	Sy	Hy	Δ S	Δ H
1	45	16	-	-4
2	179	18	134	-2

pgUp pgDn Cancel

Fig.3.21 Grid scanning at the vertical direction

Image 0000				
Φ ₁₂ (1/1)				
No.	Sx	Hx	Δ S	Δ H
1	60	25	-	0
2	100	26	40	1

pgUp pgDn Cancel

Fig.3.22 Image scanning

The following operations are allowed in the component data list display interface:

Key:

【▲】key: scroll up to view the data in the previous screen

【▼】key: scroll down to view the data in the next screen

【FN】key: switch horizontally or vertically to view the data (only grid scanning-mode allowed)

【C】key: return to the component data graphic display interface

Note:

The symbols in the component data list display interface are interpreted below:

No.—No. of current measuring point

Hx—Measured depth at the current measuring point at Direction X under the quick, profile, fine, grid and image scanning modes

Hy—Measured depth at the current measuring point at Direction Y under the grid scanning mode

Sx—Measured displacement at the current measuring point at Direction X under the quick, profile, fine, grid and image scanning modes

Sy—Measured displacement at the current measuring point at Direction Y under the grid scanning mode

ΔH —Difference between the depth value at current measuring point and the design

ΔS —Displacement variation at the current measuring point and previous one.

3.2.3 Data deletion

The data deletion function is designed to allow data deletion manually. With access to the data deletion interface, the instrument will ask you if you want to delete data or not? (Y/N). Now, press **【OK】** key or the corresponding button in the touch screen to delete data. Press **【C】** key or the corresponding button in the touch screen to cancel data deletion. The data deletion interface is illustrated in Fig.3.23.



Fig.3.23 Data deletion confirmation interface

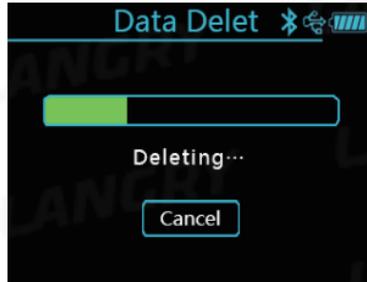


Fig.3.24 Data deletion process interface

Note:

1. Figure out if the data are uploaded to the computer prior to data deletion since the data are not retrieved after deletion.
2. The instrument is not configured to cancel with key or touch during data deletion.

3.2.4 Data uploading

It is advisable to upload the data to the computer on completion of data detection or with the memory nearly fully loaded. The user can upload the data via USB or Bluetooth interface. For Bluetooth transmission, which is an extended function, the specific mobile phone software is required to complete uploading. The user may make choice as required. Only USB transmission is outlined below.

USB transmission is carried out in steps below:

1. Conduct wiring to the instrument and computer via specific USB data cable;
2. Switch on the instrument;
3. Activate the Langrui rebar scanner management software already in the computer;
4. Click the import component data menu in the menu bar;
5. Select the component data requiring uploading, and click the upload to start uploading the data;
6. Wait until data transmission ends.

3.2.5 System setting

The system setting menu interface is designed to provide the user with the system setting parameter information for his/her own adjustment, including the power saving setting, sound setting, date setting, scan setting and system management, as illustrated in Fig.3.25.

3.2.5.1 Power saving setting

In the power saving setting, the user can set the backlight brightness, standby time, automatic shutdown time and horizontal laser light switch. At factory delivery, the backlight brightness is set at 50% brightness, standby time at 10min., automatic shutdown time at 25min., and horizontal laser light On. The user may make setting himself/herself whenever required, which can be accom-

plished via key and touch screen.



Fig.3.25 System setting interface

3.2.5.2 Sound setting

The sound setting includes the key tone and warning tone. The key tone is the tone from the user's key operation and the warning tone is the tone when the rebar is detected. The user may make setting himself/herself whenever required, which can be accomplished via key and touch screen.

3.2.5.3 Date setting

Set the system time, including the year, month, day, hour and minute, which can be accomplished via key and touch screen.

3.2.5.4 Scan setting

The scan setting menu covers the stirrup distance, range selection and rebar type. Stirrup distance: during field detection, it is necessary to pre-scan the stirrup distance. In case of less than 120mm, set the parameter at [100], [80], [60] and [40] on a case-by-case basis. Now, the instrument will undergo the appropriate compensation correction. In case of stirrup distance above 120mm, set the parameter at [>120].

Range selection: select the small range for the small depth of rebar cover being measured. Otherwise, switch to the large range mode. Make selection on a case-by-case basis.

Rebar type: it includes the deformed bar and round steel. Make the appropriate setting based on the type of rebar being detected. Ensure correct setting on rebar type prior to detection, which may otherwise affect the measurement accuracy.

3.2.5.5 System management

Bluetooth-based uploading: instrument's extended function, to be used with the specific mobile phone software.

Language selection: select the different operation language depending on the user's need.

3.2.6 About device

The About device menu provides the information on the device, as illustrated in Fig.3.26, including the following:

Instrument type and name
Firmware version no.
Device no.
Company contact tel.
Company website



Fig.3.26 About device interface

3.3 Firmware upgrading

There is a built-in firmware online upgrading program so that the user can carry out firmware upgrading through connection to the computer via data cable. Through connection to the computer via data cable, the computer software can automatically detect the firmware version no. In case of latest version of firmware, the computer software may ask the user if upgrading is required. Refer

to the software description profile for details.

Note:

You shall not shut down the instrument during firmware upgrading. If upgrading fails, shut down the instrument and manually go to the upgrading interface for upgrading again.

4 Maintenance and repair

4.1 Pre-operation inspection

Switch on the instrument and go to any mode of scanning for instrument self-calibration. Later, carry out scanning in the calibrated unit to check for correct signal.

4.2 Cleaning

The instrument has no water resistance function. Cleaning with wet rag is prohibited. Cleaning the instrument and accessories with the organic solvent is prohibited. Clean the instrument and accessories with the clean and soft dust-free rag.

4.3 Battery

The instrument is charged with the chargeable lithium battery. The instrument can operate for continuously 24h when it is fully charged. In case of low battery, it will provide a warning on low battery and automatically goes to shutdown. Now, the instrument has to be charged. In order to ensure that the instrument is fully charged, please keep charging for 6-8h.

Note:

Charging at high temperature is prohibited. In case of out of use for an extended period, the battery may have slight power loss, leading to reduced power. Recharge prior to use. It is acceptable that the charger may be hot during charging. Keep the charging environment well ventilated to facilitate heat dissipation. Carry out charging with the specific charger. Use of other types of charger or adaptor may damage the instrument.

5 Precautions on field detection

1. The rough or uneven detection surface may affect the detection accuracy. Thus, keep the scanning surface flat without large protrusion. If the surface is too rough to be cleaned, place a sheet on the scanning surface. The depth of the sheet shall be deducted from the measurement result;
2. Keep the instrument to slowly move at constant speed during scanning;
3. Set the instrument to scan in a direction perpendicular to the rebar routing direction. Otherwise, it may lead to misjudgment or deviation in depth measurement;
4. For mesh rebar, typically locate the rebar at the top, and then carry out measurement between two rebars at the top to locate the rebar in the base;
5. In case of change to the detection environment or considerable deviation in measurement result, carry out resetting calibration on instrument signal. It is

recommended to carry out resetting calibration on instrument signal before every measurement. During resetting calibration, keep away from the ferromagnetic materials for calibration to atmosphere to ensure calibration accuracy;

6. The instrument is configured to allow large and small range switchover. There is a higher measurement accuracy for small range case, so it is recommended to use the small range for detection provided the conditions on range of measurement are met;

7. The design diameter in the measurement parameter setting must be correctly entered. Otherwise, deviation may occur on depth judgment.

6 Metering and calibration

The instrument will be calibrated according to the national calibration criteria before factory delivery. The calibration content and procedure are outlined below:

1) Calibration environment: room temperature, free of strong magnetic interference, air relative humidity of less than 80%.

2) Calibration device: 3 rebar calibration coupons, separately standing for the deformed bar of $\Phi 12$, $\Phi 16$ and $\Phi 25$.

3) Calibration content and detection method:

Depth: For the deformed bar in 3 sizes, the calibrated depth varies. For the $\Phi 12$ rebar, depth up to 40mm shall be detected. For the $\Phi 25$ rebar, depth above 60mm

shall be detected.

Carry out detection with the large and small ranges, and take 3-5 key sampling points for continuous measurement and take note of results.

The detection results shall be acceptable to the requirements in 1.3 Performance indicator.

Diameter: make measurement on diameter of deformed bar in 3 sizes in the coupon. Make measurement on the deformed bar of each size 3 times and figure out the average value. The detection results shall be acceptable to the requirements in 1.3 Performance indicator.

Diameter: make measurement on diameter of deformed bar in 3 sizes in the coupon. Make measurement on the deformed bar of each size 3 times and figure out the average value. The detection results shall be acceptable to the requirements in 1.3 Performance indicator.



7 Data analysis software description

7.1 Introduction

The rebar detection data analysis software is a multi-function analysis software developed by Jinan Langrui Detection Technology Co., Ltd. for processing the rebar detection data. The software can run in XP/win7/win10 OS, presenting friendly interface and easy operation, which is specifically designed for project detection staff.

- 1)Conduct management on all component information as well as the detection data at each measuring point;
- 2)Conduct analysis and evaluation on detection data according to the construction quality acceptance criteria;
- 3)Display the component data in a graphic way;
- 4)Generate a detection data file through integration of several ones; it is easy to add or remove the detection data;
- 5)Print the preview and export treatment results;
- 6)It is easy to import the rebar scanner data into the computer with use of the software to facilitate further analysis and archive;
- 7)Automatically generate the detection report in word format.

The data files saved in the software has the file extension name in .xgfy format. The detection report automatically generated has the file extension name in

.docx format.

7.2 Software installation

7.2.1 Installation of port driver

LR-G200 rebar scanner is furnished with the program U-disc. Please attach the U-disc to the available USB port in the computer prior to operation. Activate the U-disc and find out the port driver folder and open it. Double click the installation program “setup” dialog box and then click “INSTALL”.

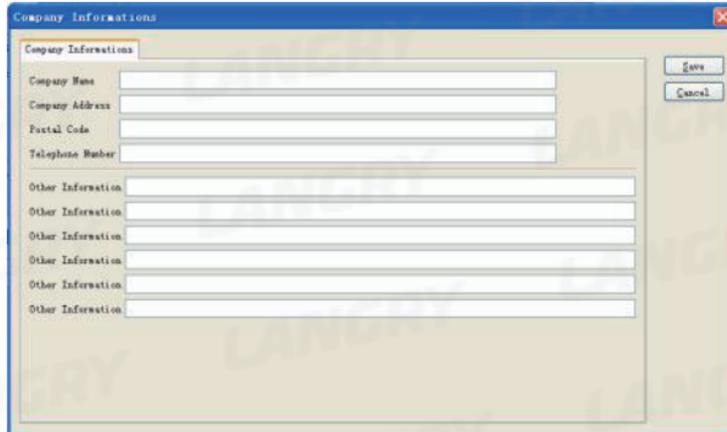
Start installation. Later, the “Driver pre-installation success” may appear in the screen and click Ok. Next, attach the computer USB communication port to the rebar scanner USB port via communication cable. Switch on the rebar scanner, and the computer will show that the new hardware has been located. Several minutes later, you may start operation on completion of hardware identification. If you are asked to confirm the authorized selection, please select “Ok” and confirm.

7.2.2 Software installation

The rebar scanner is furnished with the program U-disc. Please attach the U-disc to the available USB port in the computer prior to operation. Activate the U-disc and find out the “Rebar scanner online system” folder and open it. Double click the installation program “setup-x.x” and open the installation wizard. Please complete installation as instructed and operate it.

★ Please tick the option to generate a desktop shortcut. Then, you can run the software by double clicking the desktop shortcut.

7.3 System setting



The image shows a screenshot of a software dialog box titled "Company Informations". The dialog box has a blue title bar with a close button (X) in the top right corner. Below the title bar, there is a tab labeled "Company Informations". The main area of the dialog contains several input fields: "Company Name", "Company Address", "Postal Code", "Telephone Number", and five "Other Information" fields. On the right side of the dialog, there are two buttons: "Save" and "Cancel".

7.3.1 Enterprise information

Click “Tool (T) → Enterprise information” menu item so that the enterprise, information option card may appear below. The enterprise information as shown below may appropriately appear at the corresponding page location in the testing report.

7.3.2 Report setting

Click “Tool (T) → Report setting” so that the following dialog box appears, showing the print report title and print report options. A set of proposed report template has been provided in the software for user's use. The template may be customized to meet the user's special requirements.

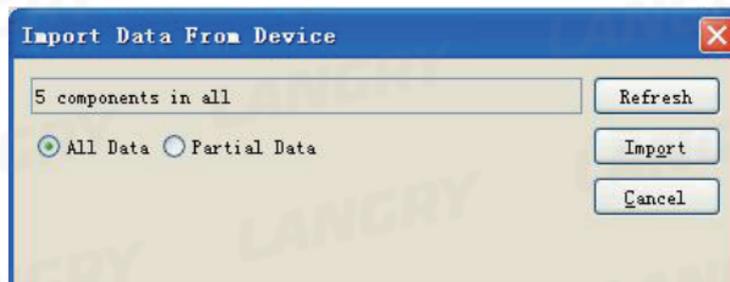


7.4 Receiving component data

7.4.1 Connection to the rebar scanner host computer

- 1) Wiring of communication cable: confirm that the USB communication cable leading the computer to the rebar scanner host computer has been attached.
- 2) Instrument power-on: press the power-on key to switch on the rebar scanner host computer, and keep it online.
- 3) Click the title bar “Rebar scanner” option. Select the “Import detection data” option in the pull-down menu, and click it. The rebar scanner data dialog box

appears. The software provides the automatic port identification function. If the rebar scanner host computer is correctly attached to the computer, and maintained online, the software can automatically identify the communication port and Baud rate, and display it. If the software fails to identify the communication port or the communication port is incorrect, please click the “Refresh” in the dialog box.



7.4.2 Data uploading

Select to import all components or partial components as illustrated above. Then, click “Import” so that the instrument can automatically upload the selected component data. No operation is required during uploading.

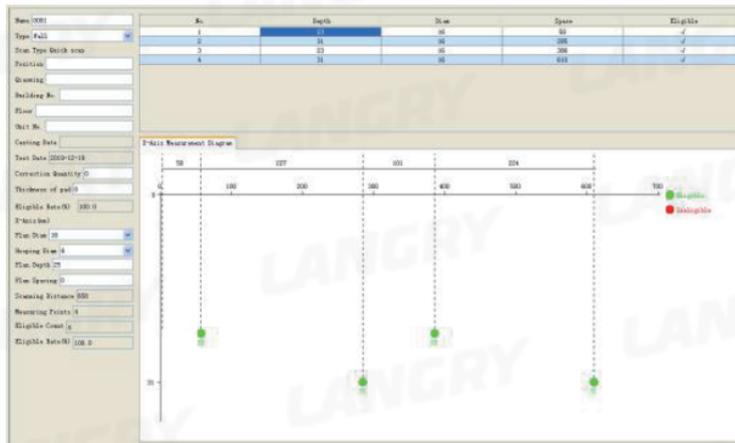
★When the data are transmitted to the computer, the data saved in the instrument will not get lost.

★You may click Cancel to stop uploading at any time during uploading.

7.5 Data processing

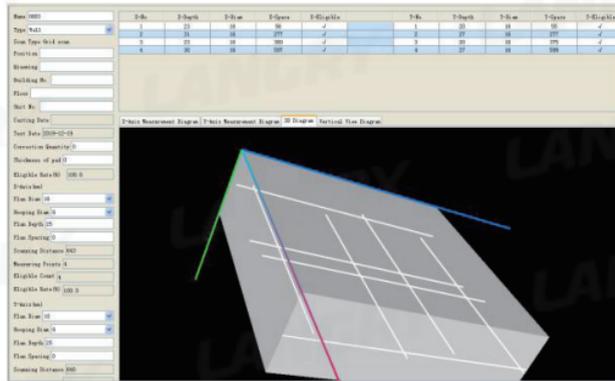
7.5.1 Original data processing

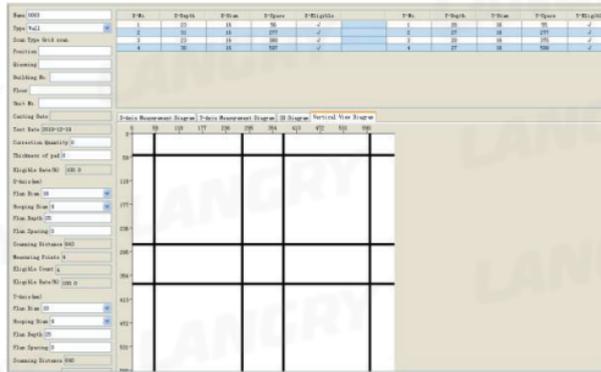
In the software's home page, fill out the detection information and enterprise information, and then automatically generate a “Detection report” and “Original data record”, which can be separately printed. In the “Detection data” master window, you can alter all the parameters which were not correctly entered, and make calculations again to meet the need of different clients.



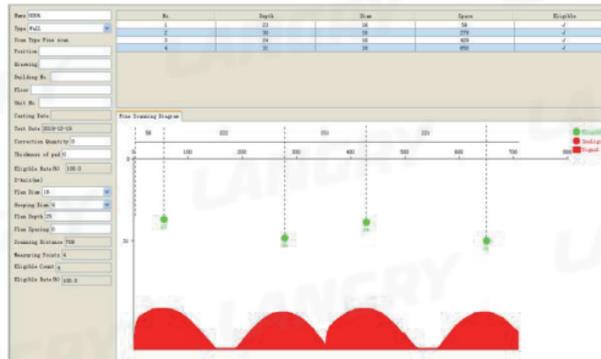
When the data are uploaded, select the component no. in the left navigation bar, and fill out and set the component information in the right item box. Furthermore, you can view the detection results on the component.

Grid scanning and image scanning can display 3D stereogram and plan in the right graphic display box.





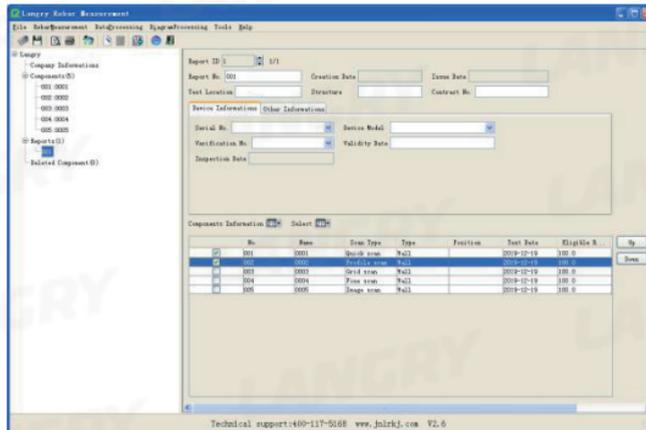
Display the waveform schematic via fine scanning



7.5.2 Report generation

Click the title bar “Data processing (D)” → Generate report to generate a report. A report no. (for example, Report 001) may appear in the “Detection report” bar in the left navigation bar. Click the “Report 001” to display the report fillout interface. In the right report composition option, select the report type and tick in the square box before the data in the bottom the data requiring report generation. After completing the report, you may select print preview to print the report.

★In the print pre-view, click “Export word” to save the pre-viewed report in word format.



7.5.3 Data deletion

If you want to delete a component, click selection and press “Data processing (D)” → “Delete component” to delete the selected component.

★The deleted component goes to the list of deleted components, in which you may select the component deleted by mistake and retrieve it.

7.5.4 Data save

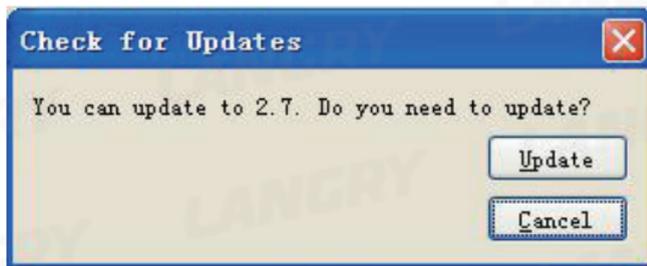
The original data or completed report can be saved in the computer. Click the title bar “File (F)” → “Save” to save the file in a format of .xgjy.

7.6 Upgrading

The user can manually carry out software upgrading and firmware upgrading. The computer shall be attached to the internet.

Software upgrading: click the title bar “Help” → “Check new version” so that the software will automatically check for latest version of software. If so, the computer may ask the user if upgrading is required. Click “Upgrade” to start automatic upgrading.

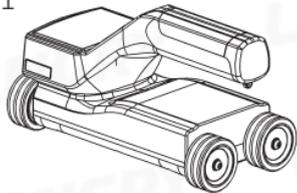
Firmware upgrading: attach the rebar scanner to the computer’s USB port via data cable. Switch on the rebar scanner, and click the software title bar “Rebar scanner” → “Upgrade the rebar scanner” so that the software may automatically check for latest version of firmware software. If so, the computer may ask the user if upgrading is required. Click “Upgrade” to start automatic upgrading.



Components

- 1.LR-G200 Integrated rebar scanner
2. U-disk memory
- 3.Charger
- 4.Communication data line
- 5.Instrument box
- 6.Instrument package
- 7.Operating instructions
- 8.Product certificate

1



2



3



4



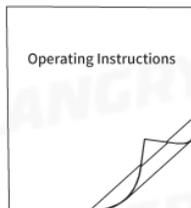
5



6



7



8



Manufacturer warranty

LANGRY guarantees that the tool is free from defects in materials and manufacturing processes when it leaves the factory, and the warranty is valid only if the user correctly installs, operates, maintains and cleans the tool in accordance with Langry's operating instructions.

The warranty covers the free replacement or repair of damaged parts during the whole service life of this tool. If the parts need to be repaired or protected due to normal wear and tear, they are not covered by the warranty.

Other claims are not covered by the warranty unless there is a different provision under the specific law of the customer's country. In particular, langry shall not be liable for any direct, indirect, incidental or inevitable damage, financial loss or additional expenses caused by or related to the improper use or abuse of this tool. Expressly exclude implied warranties of merchantability and fitness for a particular purpose.

In case of repair or replacement, the tool or relevant parts shall be sent to Langry's market organization immediately after the failure is determined.

JINAN LANGRUI DETECTION TECHNOLOGY CO.,LTD.

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