

LANGRY®

LR-FS501

Crack Depth Detector

Operating Instructions



PREFACE

Your choice of the products made by Jinan Langrui Detection Technology Co., Ltd.(Langry) is greatly appreciated. We are committed to deliver you excellent products and satisfied sales services. Please carefully read the instructions prior to use.

1. The instructions are prepared to provide the correct and complete descriptions of related products and data.

However, we do not guarantee that there are no errors or omissions. Therefore, we will not bear responsibilities for any resulting consequences.

2. Langry keeps the right of updating the instructions without prior notice.

3. Langry bears no responsibilities for possible losses from data deviation or incorrect testing conclusion arising from instrument failure and other errors.

4. When the instrument is put into operation, it means that you have carefully read and had full picture of all terms in the instructions, and you have fully agreed to all the terms in the instructions.

5. Langry will not bear responsibilities for all the signed agreements violating the statement during the sales and services process not involving Langry.

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1 Detector function and introduction

1.1 Introduction

The LR-FS501 Crack Depth Detector uses ultrasonic technology to measure the crack depth and adopts an integrated structure design. It has the advantages of simple operation, time-saving and high-efficiency, which greatly reduces the labor cost of ultrasonic sounding.

1.2 Characteristics

The LR-FS501 Crack Depth Detector can measure the depth of concrete cracks, and its main functions are as follows:

1. It adopts one-piece structure design, ready to use out of the box, no need to connect the transducer before use, which can save time and improve test efficiency.
2. The pressure coupling force value of the transducer is stable to avoid measurement errors caused by pressure changes and improve the test accuracy.
3. It is convenient to adjust the distance between the transducers, and the detector comes with positioning and lighting, making the distance measurement setting simple and efficient.
4. Touch screen design. The interface is simple and clear, and the testing process is more reasonable.
5. By choosing a tablet computer and connecting to the LANGRY Cloud platform management system, real-time testing and uploading can be achieved.
6. There are professional data analysis software, which can realize the data transmission between the instrument and the computer, analyze the test data, and generate the test report.

1.3 Specification

1. Test range: 0~500mm
2. Test accuracy: $\pm 5\text{mm}$ (crack depth $\leq 50\text{mm}$) or $\pm 10\%$ (crack depth $> 50\text{mm}$)

3. Storage capacity: 96000 measuring points
4. Power supply mode: rechargeable lithium battery
5. Dimension: L310mm*W135mm*H120mm
6. Overall weight: 2.3kg

1.4 Precautions

1. Please read this manual carefully before use.
2. Working environment requirements:
Ambient temperature: $0^{\circ}\text{C}\sim 40^{\circ}\text{C}$ Relative humidity: <90%RH
Electromagnetic interference: no strong alternating magnetic field and no direct sunlight for a long time. Necessary protective measures should be taken when used in a humid, dusty, corrosive gas environment.
3. Storage environment requirements:
Ambient temperature: $-20^{\circ}\text{C}\sim 60^{\circ}\text{C}$ Relative humidity: <90%RH
Store in a ventilated, cool, and dry environment. Do not expose it to direct sunlight for a long time. If it is not used for a long time, it should be checked regularly and charged.
4. This instrument is not waterproof.
5. Severe vibration and impact should be avoided during use and carrying.
6. Do not open the case of the instrument without permission, otherwise you will be responsible for the consequences.

2 Instrument structure

2.1 Instrument structure

As shown in Fig. 2-1, the instrument consists of an all-in-one machine and a signal line, etc. The all-in-one machine has two built-in ultrasonic transducers, which can be adjusted by sliding left and right.



Fig. 2-1

2.2 Working Principle

Ultrasonic waves propagate in the concrete and cause diffraction at the crack endpoints. Through the geometric relationship between the diffraction angle and the crack depth, a symmetrical measurement of the crack depth is achieved. At the same time, the propagation speed of the ultrasonic waves in the concrete can be measured. The detailed working principle diagram is shown in Fig. 2-2:

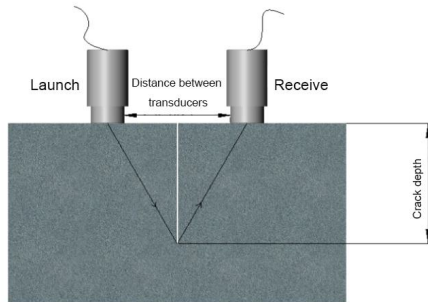


Fig. 2-2

3 Instrument operation description


3.1 Key description

 Power switch

[Test]: When the interface is in the state of the fracture depth test interface, test the crack depth.

3.2 Operation description

3.2.1 Power on

Long press  on the detector, wait for the instrument to emit a “beep”, and then power on successfully. After the instrument is turned on, the Bluetooth indicator flashes blue and the system automatically enters the main menu, as shown in Fig. 3-1. Touch the screen to select the icon to execute the corresponding function.

Note: In case of without any operation for a long time, the instrument will enter the sleep state and the automatic shutdown state in turn. During sleep, you can touch the screen or press the [Test] key on the shell to wake it up.



Fig 3-1

3.2.2 Depth Test

Depth Test consists of three parts: First, set the component name (non-mandatory option). Second, get the speed of sound. Third, test and estimate the crack depth.

Steps:

1. Set component name

As shown in Fig. 3-2, in the depth test interface, click near the "Com Nam" area to enter the component name setting interface as shown in Fig. 3-3. Click on the soft keyboard area and input characters in the area to be selected.

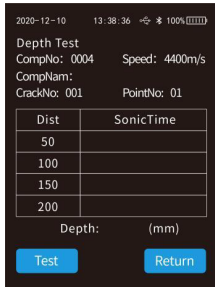


Fig 3-2

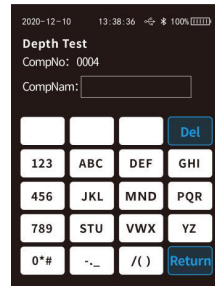


Fig 3-3

2. Obtain sonic speed

There are two ways to obtain the sound velocity value: sonic speed test or sonic speed setting; When the sound velocity test or setting is not performed, the instrument defaults to the last sonic speed value.

(1) Sound velocity test: near the crack to be tested, test the sound velocity without crossing the crack

First, in the seam depth test interface, click near the "Speed" area to enter the sonic speed test interface, as shown in Fig 3-4.

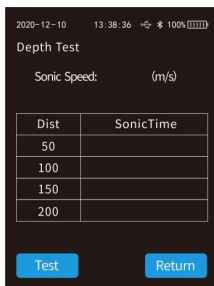


Fig 3-4

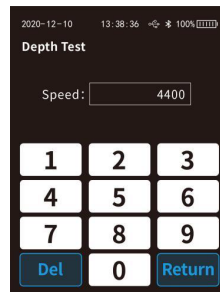


Fig 3-5

Then, take an appropriate amount of coupling agent and apply it evenly to the radiation end surface of the transducer, and then adjust the transducer to the corresponding spacing according to the spacing requirements, and click the "Test Fn" soft key in the interface or the [Test] button on the shell, Get the sonic time value of each interval in turn. When the sonic time value of the last interval 200 is obtained, the sonic speed is displayed in the "Sonic Speed" area. At this point, the sound velocity test is over.

Note: During the test, click anywhere in the box area in Fig 3-4 to retest the last interval.

(2) Sonic speed setting

Enter the sonic speed test interface according to the method in (1) above, as shown in Fig. 3-4, click near the " Sonic Speed" area to enter the sound speed setting interface, as shown in Fig. 3-5, click the soft keyboard and enter the corresponding number. So far, the sonic speed setting is completed.

3. Test and estimate the crack depth

Enter the depth test interface, as shown in Fig. 3-2, take an appropriate amount of coupling agent and apply it evenly on the radiation end face of the transducer. Then adjust the transducer to the corresponding spacing according to the spacing requirements, and click the "Test Fn" soft key or the [Test] button in the interface to obtain the sound time value of each spacing in turn. When the time-saving value of the last interval 200 is obtained, the estimated fracture depth value is displayed in the "Depth" area. So far, the depth test at the measuring point is over. At this time, the soft keys "NCrack" and "NPoint" appear at the bottom of the interface. Click the corresponding soft key to create a new crack or a new measuring point.

Explanation: a) During the test, click anywhere in the box area in Fig 3-2 to retest the last interval. b) When there is a yellow dot in front of the estimated crack depth value, it is recommended to retest the measuring point. In order to improve the accuracy of the test result during the retest, it is necessary to ensure that the test surface is flat and there is no debris or water in the crack. And so on, and the transducer is well coupled to the test surface. For other precautions, please refer to Chapter 5 below. c) Butter, petrolatum, hand cream or toothpaste, etc. can be used as the coupling agent.

3.2.3 Data view

In the “data view” interface, the data that has been measured and stored can be viewed. All data is managed in three levels according to component -crack -measurement point. In the first level data interface , each page displays 3 components in reverse order according to component numbers , as shown in Fig 3-6. Click any component to enter the secondary data interface, and each page will display 4 cracks in reverse order according to the crack number, as shown in Fig. 3-7. Click on any crack to enter the three-level data interface. Each page displays the original data of 1 measuring point in reverse order according to the measuring point number, as shown in Fig. 3-8.

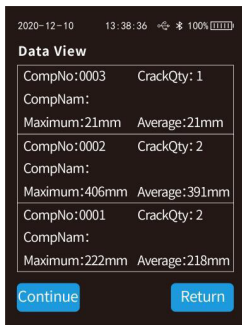


Fig. 3-6

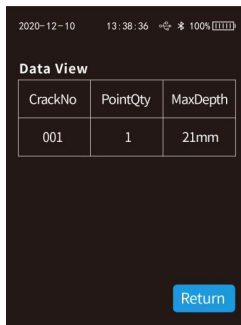


Fig. 3-7

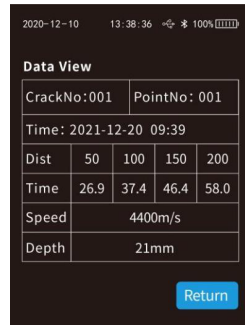
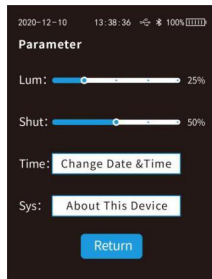


Fig. 3-8

Note: After entering the first-level data interface of data viewing, there is a [Continue] button in the lower left corner of the first page. Click the [Continue] button to continue the measurement according to the last crack number of the last component plus 1.

3.2.4 Parameter setting

In the parameter setting interface, the screen brightness, shut, time can be adjusted, and the system information of the machine can be viewed at the same time, such as version, connection rate, machine number, tell number, website, etc.



3.2.5 Data deletion

When the data in the instrument has been uploaded to the computer, the data in the instrument can be deleted to store new data. On the main menu interface, click Delete to enter the data delete interface (as shown in Fig. 3-9), and click Delete to clear all data. Click Return, the delete operation will not be executed and return to the main menu interface.

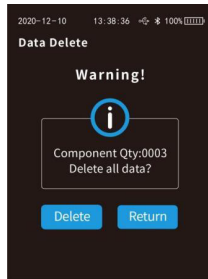


Fig. 3-9


3.2.6 Data upload

It is recommended to upload the stored data in the instrument to the computer every time the test data is completed or the data storage is almost full, and then perform the data deletion operation. Uploading data requires the following steps:

1. Connect the tester and the computer with the USB data cable provided with the instrument.
2. Turn on the crack depth tester.
3. Open the detection software that has been installed on the computer.
4. Click [Online] - [Automatic Import].
5. Select the component data that needs to be uploaded, and click "Import" to start uploading the data.
6. Wait for the data transfer to complete.

Notice: Before data transmission, first install the LANGRY detection software on the computer and install the USB serial port driver. The detailed description of the computer software can be found in the appendix below.

3.2.7 Shut down

In any interface, long press the  button to execute the shutdown operation and complete the shutdown.

4 Maintenance

4.1 Check

Before use, check that the radiation end surface of the transducer is smooth and flat, without bumps or obvious scratches.

4.2 Cleaning

This instrument is not waterproof, do not wipe it with a damp cloth! Do not use organic solvents to clean the instrument and accessories! Please wipe the instrument and accessories with a clean, soft, lint-free cloth.

4.3 Battery

This instrument samples a rechargeable lithium battery for power supply, and it can work continuously for about 20 hours even when it is fully charged. In order to ensure that the charge is fully charged, please keep charging continuously for 6 to 8 hours, and do not charge in a high temperature environment.

Note: In case of the instrument is not used for a long time, the battery will have a slight power loss, resulting in a decrease in power. Recharge before use. The power adapter will generate heat during charging, which is a normal phenomenon, and the charging environment should be well ventilated to facilitate heat dissipation. The charger provided with this machine should be used for charging, the use of other types of chargers may cause damage to the instrument.

4.4 Transducer

Strong impact or vibration may degrade or damage the performance of the transducer, so attention should be paid to the protection of the transducer at any time.

5 Precautions during on-site testing

When using the LR-FS501 Crack Depth Detector for on-site testing, in order to make the test results more accurate, certain test methods and principles should be followed, otherwise there will be larger deviations. The following items should be noted during the test:

1. Suitable for single-sided cracks of components, but not suitable for double-sided through cracks.
2. There must be no water or mud in the tested cracks
3. The depth direction of the tested cracks should be basically perpendicular to the concrete surface, otherwise the test results will be affected.
4. The surface of the measuring concrete should be clean and smooth. If necessary,

it can be smoothed with a grinding wheel or smoothed with a high-strength quick-setting mortar. The smoothing mortar must adhere well to the concrete.

5. The transducer should be tightly combined with the concrete test surface through the coupling agent, and the coupling layer should not be mixed with mud, sand or air.

6. During testing, the ultrasonic propagation path should be avoided to be parallel to the axis of nearby steel bars. If it is unavoidable, the shortest distance between the connection of the two transducers and the steel bar should not be less than 1/6 of the ultrasonic distance measurement. In order to prevent the diffracted sound waves inside the concrete from being short-circuited by the steel bars across the cracks, the connection direction of the two transducers should not be parallel to the direction of the steel bars inside the concrete, but should form a certain angle.

7. In case of suspicious data during detection, find out the cause in time, and retest, check or encrypt the measuring points for supplementary measurement if necessary.

Appendix Data analysis software description

1 Introduction

The data analysis software of the crack depth tester is a multi-function analysis software for crack depth data processing launched by LANGRY. The software can run under win 9X/NT/XP/win7 (including 64-bit) operating system. It is specially designed for personnel engaged in engineering inspection, with friendly interface and convenient operation.

2 Software installation

The crack depth tester is equipped with a program USB flash drive. Please insert the USB flash drive into the free USB port of the computer before use, open the USB flash drive, find the "Crack Depth Detector Online System" folder and open it, double-click the installation program "setup-xx" to open the installation boot program, please follow the prompts to complete the installation and run.

Note: Please tick "Generate desktop shortcut", and you can also run the software by double-clicking the desktop "shortcut" in the future.

3 System settings

3.1 Company information

Click "Tools → company information" to pop up the company information tab, as

shown in the following Fig. The company information filled in the following Fig will be displayed in the corresponding page position of the test report.

Company Informations

Company Informations

Testing company: 济南朗普检测技术有限公司

Company address:

Postal code:

TEL: 0531-88889098

Monitor telephone:

Supervision unit:

Other Information:

Other Information:

Other Information:

Other Information:

Save

Cancel

4. Receive component data

4.1 Connection to the host of the crack depth detector

1) Connect the USB data cable: Confirm that the USB data cable has been connected between the computer and the host of the crack depth detector.

2) Turn on the instrument: Press the power button to turn on the crack depth detector and keep it turned on.

3) Click the "Online (M)" option in the title bar, select and click the "Auto Import" option in the drop-down menu, and a dialog box for reading the crack depth tester data will pop up. The software has the function of automatically identifying the port. If the instrument is normally connected to the computer and is in the power-on state, the software can automatically determine the communication port and baud rate and display it. If the software does not recognize the communication port or the communication port is wrong, please click "Refresh (0)" in the dialog box.

4.2 Upload data

Import Data From Device

0 objects in all

Refresh

All Data Partial Data

Import

Cancel

In the above figure, select to import all Component (object) s or import some Component (object) s. After selection, click "import", and the instrument will automatically upload the selected Component (object) data. There is no need to operate the instrument during the upload process.

Note:

- 1)The data stored in the instrument will not be lost after the data is transferred to the computer.
- 2) During the upload process, click the “cancel” option to cancel the upload.

5. Data processing

5.1 Data view

After the data upload is complete, the system defaults to select "Detection Component (object) Data" in the Component (object) list area, and the interface is as shown in the figure below.

Object ID	Object Name	Type	Position	Crack quantity	Maximum Depth	Average Depth	Test date	Printing date
001	001	Stitch		2	340	230	2023-11-05	
002	002	Stitch		2	110	80	2023-12-08 10:37:46	
003	003	Stitch		1	0	0	2023-12-08 10:38:18	

Legend area of crack depth data for all objects

Click any Component (object) in the selected Component (object) list area to view the detailed depth data of the Component (object) , as shown in the figure below.

Object ID	Object Name	Type	Position	Crack quantity	Maximum Depth	Average Depth	Test date	Printing date
001	001	Stitch		2	340	230	2023-11-05	
002	002	Stitch		2	110	80	2023-12-08 10:37:46	
003	003	Stitch		1	0	0	2023-12-08 10:38:18	

Object basic information

5.2 Generate report

Take a single report as an example: click "Data Processing (D)" → "Generate Report" in the title bar to generate a report. A report number (e. g. report 001) appears in the "Test Report" column in the left navigation bar. Click "Report 001" to display the report content filling page, select the report type in the report composition on the right and check the data that needs to be generated in the box before the data below. After filling in the relevant content, you can choose to print preview or directly Print the report. You can also click "Export Word" in the print preview interface to save the

report as a word document locally.

5.3 Delete Component (object)

In the case of delete a Component (object) , you need to click to select it and then press "Data Processing (D)" → "Delete Component (object) " to delete it.

Note: The deleted Component (object) is placed under the deleted Component (object) list, and the wrongly deleted Component (object) can be selected for restoration in the deleted Component (object) list.

5.4 Data preservation

Click the title bar "File (F)" → "Save" to save the file (the file format is .xcsy), the original data or the filled report can be stored on the computer.

V1.2

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