LANGRY™

UPV2100

OPERATING INSTRUCTIONS

Catalogue

Chapter 1: Instrument Functions and Introduction

1.1 Instrument Introduction

The UPV2100 Ultrasonic Pulse Velocity Tester calculates the sound wave velocity based on the propagation distance and time of the received ultrasonic pulses, and then evaluates the performance of solid materials and detects defects such as cracks. The ultrasonic speed depends on the density and elasticity of the material, as well as the presence of defects such as cracks, which determine the strength and quality of the material. By detecting objects, structures, and building components, the following information can be obtained:

·Strength;

·Density;

·Crack depth.

1.2 Main functions and features

(1) A professional concrete testing instrument with multiple testing modes.

(2) The integrated design of the host makes operation simple and detection easy and efficient.

(3) External receiving transducer can be used to achieve Opposite Faces Pulse Velocity Method and Adjacent Faces Pulse Velocity Method, with higher detection accuracy.

(4) High magnification acquisition, accurately reflecting waveforms when facing complex working conditions and long-distance testing.

(5) 2.4-inch high-definition color LCD screen.

(6) Professional upper computer data analysis software.

1.3 Technical Specifications

Upper limit of measurement range for integrated ultrasonic pulse propagation time (μs)	100
Upper limit of integrated ultrasonic pulse propagation time display range (μs)	120
Allowable range of basic absolute error in ultrasonic pulse propagation speed measurement (m/s) V_d - measured velocity value in meters per second in the formula	Speed range between 1000 and 2499 meters per second ± (0.02V_d+10)
	Within the speed range of 2500 to 6499 meters per second ± (0.01V_d+10)
	The speed range is 6500 to 10000 meters per second ± (0.03V_d+10)
The allowable error limit (in microseconds) for the main absolute error of ultrasonic pulse propagation time measurement: In the formula, To is the measured time value, us	The speed range is between 1000 and 2499 meters per second ± (0,02T_O+0,1)
	Within the speed range of 2500 to 6499 meters per second ± (0,01T_O+0.1)
	Within the speed range of 6500 to 10000 meters per second ± (0,03T_O+0.1)
Center distance of integrated ultrasonic transducer (mm)	120 ± 1
Ultrasonic oscillation operating frequency (kHz)	50 ± 5
Instrument power supply voltage (V) - powered by built-in battery	3.7 ± 0.5
Power consumption (W), not exceeding	5
Average battery life (h)	8
Host weight (kg), not exceeding	0.65
Overall dimensions of the host (length x width x height) (mm)	240 × 65 × 140

1.4 Precautions

1. Please read this manual carefully before using this instrument.

2. Work environment requirements:

Environmental temperature: -20 ℃~40 ℃ Relative humidity:<80% RH

Power supply voltage fluctuation range ≤± 10%

Electromagnetic interference: No strong alternating magnetic field and must not be exposed to direct sunlight for long periods of time; In humid, dusty, corrosive gases Necessary protective measures should be taken when using in the environment.

3. Storage environment requirements:

Environmental temperature: -20 ℃~60 ℃ Relative humidity:<80% RH

Store in a ventilated, cool, and dry environment, and do not expose to direct sunlight for long periods of time. If not used for a long time, regularly turn on the device for inspection and perform charging operations.

4. This instrument does not have waterproof function.

5. Avoid severe vibration and impact during use and transportation.

6. Do not open the instrument casing without permission, otherwise the consequences will be borne by yourself.

7. Please use the original adapter and data cable for charging, with a charging temperature range of 10-35 degrees Celsius. If the instrument is not used for a long period of time, it should be charged once a month for no less than 1 hour each time.

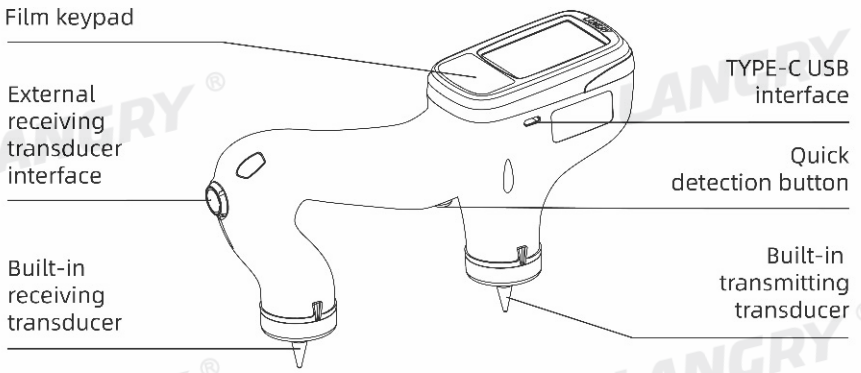
8. In the tested area, if there is a significant deviation in the measured values of strength, density, etc., the stability of the speed and time measurement results, the correctness of the conversion coefficient setting, and the presence of defects in the concrete and the influence of steel bars should be checked on the standard sample.

Chapter 2 Instrument Composition

The UPV2100 is mainly composed of an integrated host, an external receiving transducer, signal lines, etc.

2.1 Host composition

The integrated host includes one built-in transmitting transducer and one built-in receiving transducer. The built-in transducer located below the LCD is the transmitting transducer, with a center to center distance of (120 ± 1) mm.



The electronic compartment of the host is composed of a liquid crystal display screen and thin film buttons, etc; The side of the host is equipped with a Type-C USB interface for device charging and data transmission, and the tail is equipped with an external receiving transducer interface; At the same time, a quick detection button is set below the grip area of the host.

Chapter 3 Instrument Operation Instructions

3.1 Thin film button instructions

Symbol	name	description
OK	OK	- Enter the next level interface - Enter the setting value switching state
▲	upward	- Move the cursor up or left - Increase in numerical value - Switch to another set value
▼	down	- Move the cursor downwards or to the right - Decrease in numerical value - Switch to another set value
⏻	Back /Power Supply	Short press to return to the previous level/long press to turn on/off

3.2 Quick detection button

In the parameter setting interface, press this key to enter the detection interface;

On the detection interface, press this key to start or end the detection;

After one measurement cycle is completed, press this key to save the data;

3.3 Battery Level Description and Firmware Upgrade

When the host enters the ultra-low battery state, a warning box pops up on the interface;

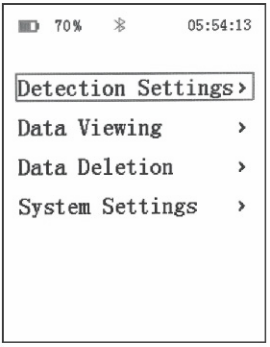
Suggested to use after charging. It takes about 4 hours to charge.

Firmware upgrade: Connect the host to the PC through a data cable, select the "Upgrade" option from the "Concrete Ultrasonic Testing Instrument" menu above the PC interface, and the PC will automatically search for the host connected to the computer and click "Upgrade". After the upgrade is completed, the host will automatically restart.

Attention: During the upgrade process, it is necessary to keep the host turned on and the PC connected to the internet.

3.4 Instrument operation interface

3.4.1 Main interface of the instrument

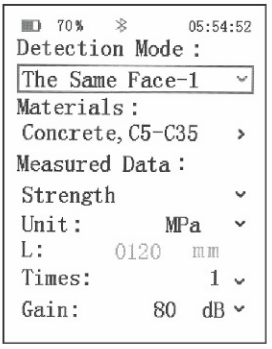


The main interface contains multiple interface items that allow for quick modification of instrument operating parameters. Press the back button on the main interface to display relevant information about the device.

At the top of the instrument display screen, the built-in battery level, connection status to the computer USB port, Bluetooth status, and current time are displayed.

Use the up or down keys to move the cursor to the desired interface line; The selected interface line is displayed in a blue box state. Use the OK key to enter the sub interface, and use the return key to return to the previous level.

3.4.2 Detection parameter setting interface



1) Detection modes:

The Same Face Pulse Velocity Method -1

The Same Face Pulse Velocity Method -2

Opposite Faces Pulse Velocity Method

Adjacent Faces Pulse Velocity Method

Crack Depth.

2) Materials

Used to select the material type and composition of the tested object; And set separate coefficients for the selected material composition and measurement data. Please refer to Appendix A to set the correlation coefficient.

3) Measurement data

Used to select the object to be measured by the device (such as "intensity").

4) Unit of measurement data

Used to select the unit of data to be measured (e.g. "megapascals")

5) L (measurement spacing)

When using an external receiving transducer, set the relevant distance between the external receiving transducer and the internal transmitting transducer

6) Series measurement times

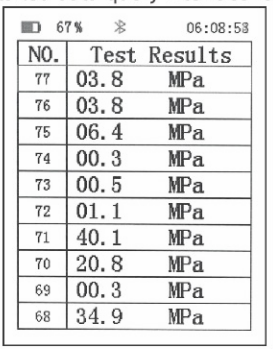
Set the measurement times in the series measurement, ranging from 1 to 10 times.

7) Gain

Used to adjust the amplification factor of the received signal, with an adjustment range of 10-90dB.

3.4.3 Data viewing interface

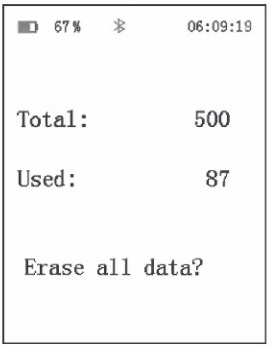
The saved data is arranged in reverse chronological order according to the detection time. Press the OK key to enter the detailed data query interface for that data.



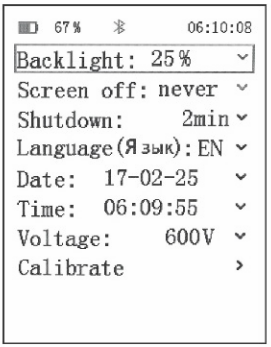
3.4.4 Data deletion interface

After entering the data deletion interface, press the OK key to pop up a deletion prompt dialog box, and then press the OK key to delete all saved data in the device.

Attention: Deleted data cannot be recovered, please operate with caution!



3.4.5 System settings interface



Backlight brightness: Set the display screen brightness; Please note that increasing the brightness of the display screen will increase the power consumption of the instrument and shorten the battery life.

Screen off time: Set the time for the instrument to automatically enter energy-saving mode: When not in the detection interface, if no operation (button operation, movement, vibration, etc.) is performed on the instrument within the set time, the instrument will automatically enter energy-saving mode.

Shutdown time: Set the automatic shutdown time of the instrument; When not in the detection interface, if no operation is performed on the instrument within the set time, the instrument will automatically shut down.

Language: Select the instrument interface language.

Date and Time: Set the date and time of the instrument, and calibrate the internal clock.

Voltage: Set the excitation voltage of the transducer. After modifying the emission voltage, it is necessary to recalibrate the instrument.

Calibration: Used to calibrate instruments to ensure the accuracy of measurements. In this item, parameters such as the sound time delay value of the instrument can be set.

Special note:

1. Before entering the calibration interface, if the instrument is connected to an external receiving transducer, the calibrated sound time delay is between the external receiving transducer and the built-in transmitting transducer. Otherwise, the calibrated sound time delay is between the two built-in transducers.

2. The serial number of the calibration block used during calibration must be consistent with the serial number of the integrated host.

Chapter 4 On site Inspection Operation

4.1 Preparation before use

Press the power button to turn on the instrument and enter the main menu. If the display screen prompts for charging or the instrument is turned on and immediately turned off, the battery should be charged.

Attention! When using the instrument on site, it is strongly recommended to wear a wristband to prevent the instrument from slipping or falling from your hands, which may damage the body.

4.2 Calibration

Calibration of the instrument is required in the following situations: when the ambient temperature deviates by (20 ± 5) ° C, regularly check the accuracy of the instrument, and when the measurement time deviates from the value marked on the calibration block by more than ± 0.5 μs.

In the "Detection Mode" section of the detection parameter setting interface, setting it to "The Same Face-1" mode can verify whether the sound time delay between the two built-in transducers is correct, and setting it to "Pair Test" can verify whether the sound time delay between the external receiving transducer and the built-in transmitting transducer is correct. After setting the detection mode (when selecting the measurement mode, the measurement distance L also needs to be set), enter the detection interface and check whether the measurement time is consistent with the time marked on the calibration test block (hereinafter referred to as "sample"); When the deviation between the measurement time and the value marked on the calibration block exceeds ± 0.5 μs, calibrate according to the following steps.

2. Select the "Calibration" option in the system settings interface, and the measurement process will automatically start. Place the sensor on the calibration block, keep the sensor perpendicular to the sample surface, stabilize it, and apply a certain amount of pressure (coupling agent needs to be applied when using an external receiving transducer). After waiting for the instrument delay value Δ T to stabilize, press the quick detection button. Calibration will be automatically completed, and the new instrument delay value Δ T will be displayed on the screen. Press the button multiple times to perform 2-4 calibrations until the measurement deviation T1 does not exceed ± 0.1 μs. At this point, retain the last measured Δ T value. Press the shortcut detection key to save the calibration results.

3. Enter the detection interface in state 1 again and check the instrument calibration results on the calibration block. Observe the measurement time T (μs) through the display screen to ensure stable measurement values. The time displayed by the instrument should be within ± 0.1 μs of the time indicated on the sample.

4. If the measured value of the instrument differs significantly from the above standard value, it is necessary to check whether the sensor is normal. If the measurement value cannot be adjusted to the normal range, the instrument needs to be sent for maintenance.

4.3 Preparation before measurement

Before starting the measurement, necessary parameters need to be set. Most settings are made when the instrument is first turned on, and adjustments are made as needed when measurement conditions change.

1. Select working mode: In the "Working Mode" item of the parameter settings interface, select the corresponding working mode.

2. Select the material type and composition, and modify the coefficient:

In the "Material" section of the parameter settings interface, select the material type and composition of the tested object. The instrument offers a variety of material types and composition options, including "known composition heavy concrete" (such as "General B35-B60", "Composition -1", etc.), "unknown composition heavy concrete", "lightweight concrete", "brick", "abrasive", "other", etc.

After selecting the material type and composition, choose the corresponding calculation formula coefficient. For the materials of "General B35-B60" in "Heavy Concrete with Known Composition" and "General B7.5-B35" in "Light Concrete", the calculation formula coefficients comply with the requirements of the ГОСТ 17624 standard. The calculation formula coefficients for "composition-1" and "composition-2" in "known composition heavy concrete" are based on measurement data of medium grade heavy concrete in the Chelyabinsk region. Attention! According to the ГОСТ 17624 standard, the preset calculation formula coefficients cannot exempt users from the responsibility of separately calculating the "ultrasonic velocity measurement data" relationship for their own raw materials and materials, and inputting the calculation formula coefficients. After selecting the material, you can view the concrete state information of each component and the calculation formula coefficients preset by the instrument. For example, the calibration characteristic of "component-1" in "heavy concrete with unknown composition" can be used for two situations: 1- concrete after steam curing, cooling, and drying; 2- Concrete that hardens at room temperature, dries on the surface, and is cured at 15 ° C for at least one day.

3. Set measurement data: Perform the following operations in the "Measurement Data" and "Unit" items of the detection parameter setting interface:

Choose the physical quantity and unit of measurement. The available options include "Strength" R (in MPa, N/mm^2, kg/cm^2), and "Density" ρ (in kg/m^3, t/m^3, g/cm^3).

4. Modify the series measurement frequency: In the "Frequency" option of the detection parameter setting interface, set the measurement frequency in the series measurement, ranging from 1 to 10 times.

5. Set gain: Set the appropriate amplification factor for the received signal according to different detection modes and detection objects.

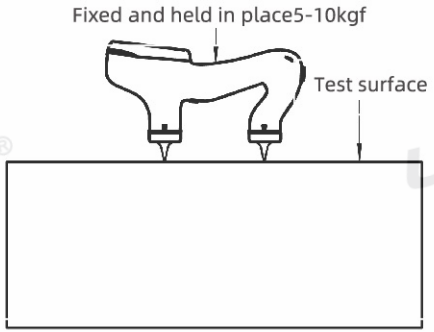
4.4 Measurement Operation

4.4.1 The Same Face Pulse Velocity Method-1

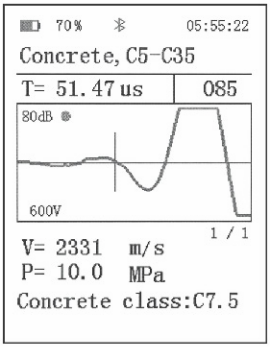
In the parameter setting interface, press the quick detection button to enter the detection interface. In the detection interface, the first row of the display screen shows the material type, the second row shows the ultrasonic pulse propagation time - T (microseconds), and the measurement number currently stored in the instrument memory. The center of the display screen shows the measurement curve, and below it (according to the settings in the "Measurement Data" submenu of the "Settings" item in the main menu), the ultrasonic pulse velocity - V (meters/second) and one of the following data are displayed: intensity R, density ρ.

Place the built-in transducer on the surface of the object being tested, keep the transducer fixed in a plane perpendicular to the test surface, and maintain a certain pressure of 5-10 kilograms of force.

Note: In any detection mode, when using the built-in transducer, a force of 5-10 kilograms must be maintained and perpendicular to the test surface.



The Same Face Pulse Velocity Method -1



Observe the measurement time T (microseconds) and velocity V (meters/second) on the display screen to ensure that the displayed values are stable. When the time display value is stable and the indicator circle in the waveform display area turns green, press the quick detection button to pause the sampling, and press the quick detection button again to store the single measurement result in memory.

When the set series of measurements is 2 to 10 times, the first detection in the series ends when the quick detection button is pressed for the first time. Pressing the quick detection button again will start the second detection in the series, and so on. After completing the last measurement in the series, the measurement results will be given - the average value of ultrasonic pulse propagation time, the average value of ultrasonic pulse propagation speed, the average value of the measured parameter, and the concrete grade B ф (only applicable to concrete and "other" group materials); At this point, press the quick detection button again to store the measurement results in memory and automatically start a new series of measurements. Press the back button to exit the detection interface.

4.4.2 The Same Face Pulse Velocity Method-2

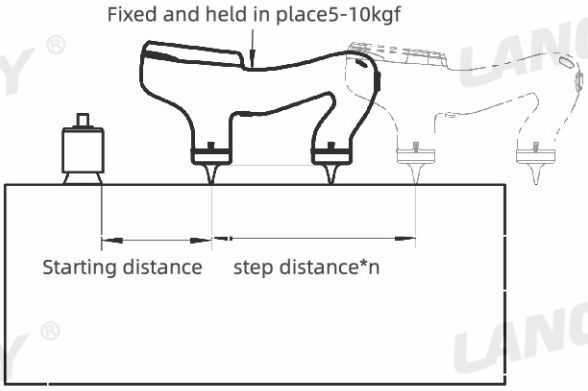
Connect the external receiving transducer to the host and set the starting distance and step distance. The rest of the settings and operation methods are similar to flat measurement.

Note:

1.In level measurement -2, when measuring distance, use the inner edge of the external receiving transducer as the reference, not its center.

2. In any detection mode, when using an external receiving transducer, a coupling agent (preferably butter, but also Vaseline, hand cream, or toothpaste) must be applied to ensure good coupling with the test surface.

3. When arranging flat measurement points, a row of ultrasonic measurement points should be arranged, and the connection between the transmitting and receiving transducers and the nearby steel bar axis should be at an angle of 40 ° to 50 °.



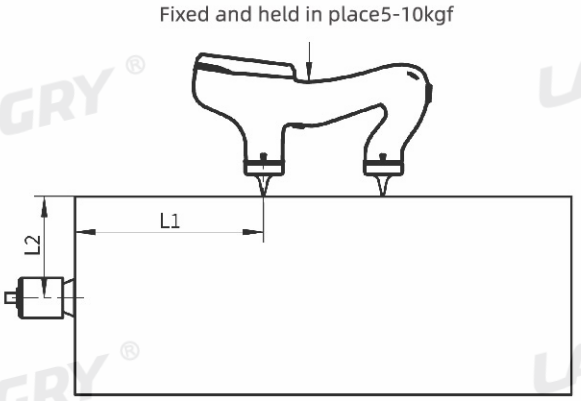
The Same Face Pulse Velocity Method -2

4.4.3 Adjacent Faces Pulse Velocity Method

Connect the external receiving transducer to the host and set the distances L1 and L2. The rest of the settings and operation methods are similar to flat measurement.

Note:

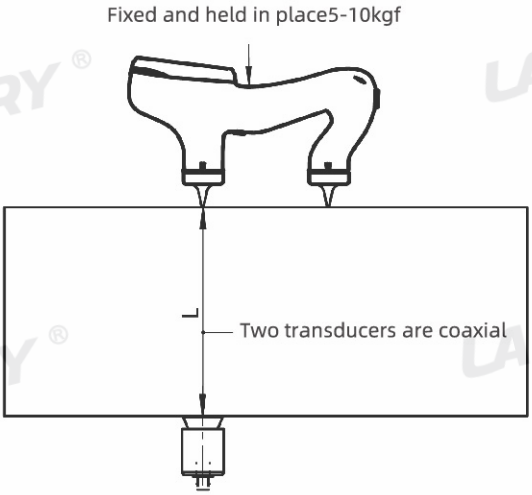
1. It is recommended to set up three measuring points, and the distance measurement should be consistent with the corresponding three measuring points on the testing surface.
2. The distance L and L2 between the center of the transducer and the edge of the component should not be less than 300mm, and the difference between the two should not be greater than 1.5 times.



Adjacent Faces Pulse Velocity Method

4.4.4 Opposite Faces Pulse Velocity Method

Connect the external receiving transducer to the host and set the distance L, the rest of the settings and operation methods are similar to flat measurement.



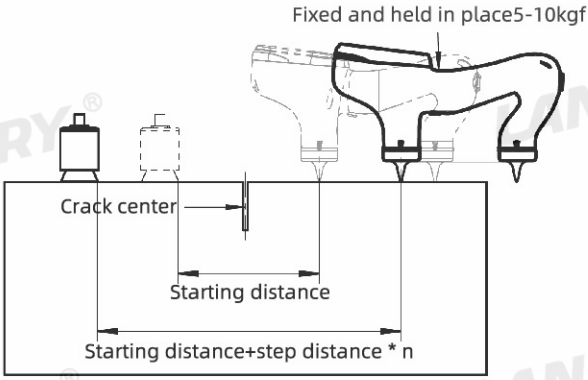
Opposite Faces Pulse Velocity

4.4.5 Crack Depth

4.4.5.1 The crack depth measurement mode is an auxiliary mode. When measuring, it should be noted that cracks have different characteristics, sizes, and features, and may be filled with material debris, dust, and water. Therefore, the actual relative error in measuring crack size may reach a significant level.

4.4.5.2 Connect the external receiving transducer to the host and set the starting distance, step distance, and sound velocity. The rest of the settings and operation methods are similar to those for flat measurement.

Explanation: The sound speed can be set based on experience or measured on site. After the measurement is completed, the sound speed will be synchronously changed to the measured value.



Crack depth - cross crack

Note:

1. During testing, the number of measuring points that cross or do not cross the seam shall not be less than 5. When the arrangement of measuring points is limited, the number of measuring points shall not be less than 3; The horizontal measurement distance should not exceed 500mm;

2. The arrangement of measuring points should maintain a certain angle between the connecting line of the measuring points and the centerline of the steel reinforcement, and should avoid other small cracks and appearance defects in the testing area;

The line connecting the 3.5 cross seam measuring points should intersect with the crack at a position that is not misaligned and has a larger width; When the crack length is short, it is advisable to intersect with the position of 1/2 of the crack length.

4.5 Output the results to the PC end

The device is equipped with a USB interface and communicates with the computer through an online system.

Note: Every time the device is connected to the computer via a USB cable, battery charging will be activated.

Chapter 5 Online System Software

5.1 Introduction

The non-metallic ultrasonic testing instrument online system software is a multifunctional analysis software used for data processing. The software has a user-friendly interface and easy operation, designed specifically for engineering testing personnel.

5.2 Software Installation

For the first use, open the official website www.langryndt.com, find the corresponding model in the corresponding category of the product center and enter its product details page, click download; After downloading and installing the online system software, you can start using it.

5.3 Data Transmission

Data transmission can be done through USB. When using USB to transfer data to a computer, please prepare the instrument in advance

Connect the USB data cable and turn on the instrument. Start the online system software, select the instrument menu, and click on "Auto Guide"

The software will automatically read the memory data of the instrument and import the data that needs to be transmitted to the computer.

5.4 Data Processing

Online system software can process all components and data.

5.4.1 Testing Component Data

Right click on the 'Detect Component Data' node in the tree view to select automatic import. After selecting one of the component data, right-click or choose the data processing menu to delete the selected component.

5.4.2 Testing Report

Used to generate a report document for the currently opened data file.

Right click on the "Detection Report" node in the tree view or select the data processing menu to create a new detection report.

After selecting one of the detection reports, right-click or choose the data processing menu to delete the selected detection report

Report; The composition of the detection report can also be modified.

5.4.3 Data Deletion

Select the data to be deleted, right-click or select the data processing menu to delete the selected data.

The deleted component data can be viewed and restored in the deleted component.

5.5 Printing and Preview

Select the report that needs to be previewed and printed, right-click, choose the data processing menu or select the file menu, and enter

Preview of line printing; Printing operations can also be performed on the print preview interface.

5.6 Data Preservation

Select the file menu and click "Save" or "Save As" to save the current data file.

5.7 version upgrade

5.7.1 Instrument version upgrade

After connecting the instrument, select the instrument menu, click "Upgrade", download and upgrade the instrument version.

5.7.2 Software Version Upgrade

Select the Help menu and click 'Check for New Version' to check or upgrade the version of the online system software.

LANGRY™

V1.2

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