



**C-Tech**

Laboratory equipment co.,limited

## Light Weight Deflectometer EVD

# PRODUCT MANUAL



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## I. Documentation

### 1. Introduction

Thank you for the purchase of the light weight deflectometer EVD. This innovative test instrument represents a cutting - edge product featuring the latest technology. In order to benefit from all advantages and possibilities offered and prevent unnecessary damage, carefully read this manual and follow information comprised.

The manufacturer will not be liable for damage caused by failure to follow these instructions, misuse or abuse of the equipment, or any part thereof, negligence, accident fire or force of the elements.

The manufacturer gives no assurance as to the accuracy of the documentation and disclaims any implied warranties of merchantability and fitness for a particular purpose.

In no event shall Tianpeng be liable for any anticipated or lost profits, incidental or consequential damages or incurred by the purchaser or any third party in connection with the purchase, installation, repair or operation of the equipment or any part thereof.

#### ATTENTION



Please do always crosscheck with your domestic test method, to make sure that test results will be reliable.

**Basis standard:** In accordance with Code for Soil Test of Railway Engineering (TB10102-2004), Industry Standard of People's Republic of China, EVD Plate Loading Test in Section 21.

### 2. General safety notes

These instructions must be submitted beforehand to all persons involved with any tasks concerning the instrument.



#### Useful information and notes

#### ATTENTION



Indicates warnings related to processes entailing the risk of physical injury or material damage in case of inadequate execution. These warnings must be followed in order to ensure safe operation.



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**ATTENTION**

If the light weight deflectometer is used in a manner not covered by these instructions, the protection provided by the instrument may be impaired.

**ATTENTION**

The evaluation of the measuring results depends on material and subsoil. It is always required to determine on a trial basis correlation values to the domestic test method for the pre - existing ground or ground intended for backfilling. The water content of the soil must not vary widely. Homogenous soil is a prerequisite to obtain a correlation between the measuring methods.

**ATTENTION**

The light weight deflectometer must be calibrated at least once a year. Test results of a device that has not been calibrated or of a device with expired calibration date must not be used for evaluation of the bearing capacity of soil or rock. Prescribed calibration intervals must be observed.

**WARNING**

The light weight deflectometer should never be placed near any inflammable liquids such as alcohol, thinner etc. There is a risk of fire if such inflammable liquids make contact with the electric components in the interior of the device.

**WARNING**

Never place or charge the instrument in areas with excessive humidity, high temperatures, direct sunlight or close to open flames, otherwise this may give rise to the risk of electric shock.

**WARNING**

Read the instruction manual carefully to ensure correct installation and set - up. When no test is performed, keep the falling weight in its rest position at the bottom of the guide rod. Otherwise the fall weight could fall down and cause injuries or damage. Furthermore the instrument may become unstable.

### 3. Safety precautions for power supply

**WARNING**

Never place any heavy objects on the charging cable. Never twist or pull it, and take care that it does not become knotted.

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**WARNING**

Ensure that the charging cable is completely inserted into its socket. A poor connection can lead to equipment damage. Use only the cable included in the delivery.

**3.1 Power Supply****ATTENTION**

The assembly may be destroyed if the leads of the battery are interchanged. In the course of the charging procedure, no measurement should take place.

**3.2 Mains Power Supply****ATTENTION**

The charging procedure should be performed in dry indoor locations.

**4. Safety precautions during operation****ATTENTION**

Tianpeng shall not be liable for any damage, consequential damage or financial loss that occurs as a result of improper use and/or lack of professional knowledge when evaluating the test data. It is essential to ensure that the calibration is up to date and that the device is operated in accordance with the instructions of this document and local standards.

**ATTENTION**

Please do always crosscheck with your domestic test method, to make sure that test results will be reliable.

**WARNING**

The device has been designed for outdoor use only. Never use it in buildings; otherwise damage to the building is possible.

**ATTENTION**

Never disassemble or alter the light weight deflector or accessories like charging cable etc.

**ATTENTION**

In the case of unusual noise, smoke, smell or excessive heat generation, switch off the device immediately.

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**ATTENTION**

Do not expose the instrument to direct rainfall. If it rains, cover and protect it.

**ATTENTION**

The instrument must be protected from water, liquids and flammable substances. Penetrating flammable liquids may come into contact with electrical components, giving rise to a fire.

**WARNING**

Clean surfaces with solvent - free agents only. Gently wipe surfaces with a soft, dry cloth. Residual pollutions have to be removed by means of a cloth moistened with water, well - wrung, and then wipe again with a soft, dry cloth. Flammable substances like alcohol, petrol or thinner are forbidden. Penetrating flammable liquids may come into contact with electrical components, giving rise to a fire. Fire may also be caused by cable damage issuing from inadequate connecting/disconnecting methods.

**WARNING**

When placing the instrument on the test ground, do not let the load plate fall down; otherwise foot injuries and damage to the device are possible.

**WARNING**

Keep the falling weight always at the bottom on the buffer elements (vibration dampers), and lift it only immediately before performing a test. Engage it at the top into the releasing mechanism, in order to prevent injuries and material damage. The falling weight has not to be released before the start of measuring procedure itself.

**WARNING**

The instrument should never be left without supervision or transported with the falling weight in upper position.

**ATTENTION**

When performing a test, only the operator should come close to the device. Do not release the falling weight in the presence of other persons in direct vicinity.

**ATTENTION**

Damaged cable may give rise to fire. In the course of the charging procedure, no measurements should take place, as no reliable results can be expected.

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## 5. Packaging

It is recommended to store the packaging of the device for transport at a later date (e.g. for calibration). Upon delivery, check immediately that all goods are undamaged and complete. Check in particular that there is no visible external damage to the packaging. If the device or any other item included in the damage proves to be damaged, immediately record the type of damage and inform the carrier. Tianpeng must be informed as well, so we can enter into communication with the carrier.



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## II. Scope of delivery

### 1. Basic package

EVD is mainly composed of electronic settlement measuring unit, mini printer, mechanical loading mechanism and loading plate, as shown in the figure.



#### Front settlement measuring unit

- (1) Switch: Switch on or Switch off the Control Unit
- (2)↑: Cursor Up
- (3)←: Cursor Left
- (4)→: Cursor Right

#### Outlets or ports of the Instrument

- (1) 3-Pin Round port: Connect to the Sensor.
- (2) Round 232 port: Connect to Printer, or PC
- (3) USB port: Connect to PC for Data transmission



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(5)↓: Cursor Down

(6) Return

(7) Enter

## 2. Technical parameters

Total weight for mechanical loading mechanism		30.0kg
Mechanical loading mechanism	Weight of drop weight	10.0kg
	Weight of guide tube (including damping device, release mechanism)	5.0kg
	Maximum impact force	7.07KN
	Duration of impact	18.0±2ms
Loading plate	Diameter	300.0mm
	Plate thickness	20.0mm
	Weight	15.0kg
Electronic settlement measuring instrument	Powered by built-in rechargeable lithium battery	3.7V
	Settlement value measurement range	0.1~2.0mm±0.02mm
	Test range of dynamic modulus	EED<225Mpa
	Data storage	2000
	Applicable temperature range	0~50℃



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### III. Functions and features

Light Weight Deflectometer (Abbreviated as LDW, LDW will be used in later sections) is suitable for the detecting and monitoring of the bearing capacity of soils, with wide applications like the construction quality control test for railway, highway, airport and industrial building under dynamic loads, especially for the locations not readily accessible, like road bridge transition section, existing railway line, etc. Three measuring impacts are to be performed after the measuring routing is started. Settlement value is displayed on the instrument after each impact. Upon completing a serial of measurement, the average settlement value and Dynamic Deformation Modulus value are made and displayed on the LCD screen. After one test cycle, the average settlement value and dynamic deformation modulus value can be obtained and displayed on the LCD.

#### 1. Basic function test

Upon the completing of the serial of test, three settlement values are displayed on the screen, and the average settlement value  $S_i$  and the dynamic modulus of resilience are calculated automatically and also displayed on the screen.

#### 2. Storage

Store the three settlement values under each serial number, average settlement value and the dynamic modulus of resilience.

#### 3. Printing

Print the test data, calculation results, and testing curves by means of the Bluetooth printer.

#### 4. Time/Date

Modify the current time and date.



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## IV. Test preparation

### 1. Preparation of measurement area

Select a flat area within the measurement range, and place the load plate by gently rotating and pressing. The load plate must be in full contact with the measurement area so that the impact force can be effectively transmitted to the measurement surface, so as to obtain the maximum settlement of the area. If the ground is not flat, the gap under the load plate shall be filled with loose medium grained sand.

### 2. Connecting hosts

The instrument should be powered off before connection. Connect the sensor of loading by plugging into with the thick end of the cable, to the 3-pin round port of settlement measuring instrument by plugging into with the thin end of the cable.

#### ATTENTION



Please make sure the marks on both the plug end and the socket are in alignment, and hold on the two ends of the cable before plug in or pull out, not allow to pull or drag the on the cable. Care must be exercised to avoid any damaged for the connection between the plug and the sensor socket.

### 3. Position the loading mechanism

Place the loading mechanism on the sensor of the Loading plate.

### 4. Removing the shipping&handling lock

A shipping & handling lock is provided to secure the drop-weight on the guide tube during transporting. Please remove the shipping & handling lock before taking measurements.

#### ATTENTION



Remove the shipping & handling lock before taking measurements, and not allow to press down the lock during the test. The lock can be press down to secure the drop hammer until completing the test.



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## 5. Precompacting the test area

To achieve an optimal position of the loading plate on the base, precompact the test area under the loading plate by three impacts. Move the drop-weight fully up along the guide bar with one hand, and engage it in the release mechanism. Use the bubble level to align the guide tube until it is perpendicular to the soils, release the lever, the drop-weight falls down on the resilient element package. Hold the bounding drop-weight by hand and engage it in the release mechanism at predetermined position. Engage three times repeatedly, and precompacting finishes.



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## V. Operations of the Instrument

### 1. Startup interface

Long press the power button to switch on the electronic settlement measuring instrument, while "start ..." is displayed on the screen until the main display interface shows up as illustrated in figure5.1.



Figure5.1

Battery level is displayed on the top right corner of the screen, as the battery icon with four bars filled in indicates the battery is fully charged, while the battery icon with no bars left in indicates the battery is shortage of power and need to be charged.

Enter into the main display interface by pressing the Enter button (as illustrated in figure 5.2). Press left button to switch on/off the backlight.

### 2. Main display interface

Click up/down buttons to select the options and enter the related programs, as illustrated in Figure 5.2.



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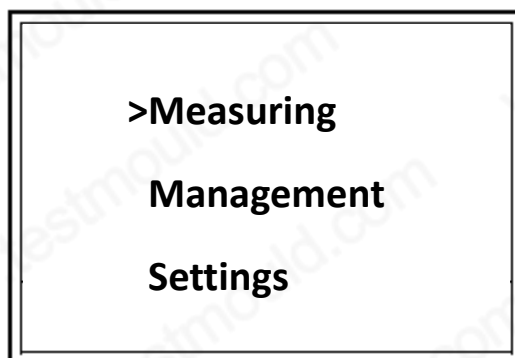


Figure 5.2

### 3. Test program

Select the test Measurement option in the main interface and Press enter button to access to the test program, as illustrated in figure 5.3. In this interface, users can alter the serial numbers, and "3 preload pulses" is also displayed on the bottom of screen. Please perform the precompacting using the way as previous specified in "Precompacting the test area". Engage the drop-weight in the release mechanism and remain it horizontal after completing three precompacting impacts. Proceed to the next step of the program by pressing Enter button.

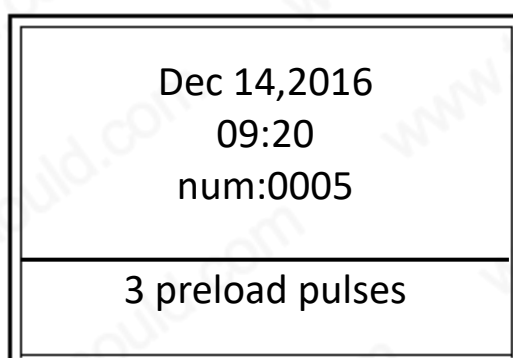


Figure 5.3

As shown in Figure 5.4 is the test program. A beep sound prompts to perform the test after entering the test program. The first settlement value is determined and displayed on the screen after the completing of the impacts simultaneously with a stop of the beep sound. Beeping again to prompt to perform the second impact and the second settlement value will be memorized by the program. During the process the settlement amplitude value falls out of the range(0.1~2.0mm). The words 'invalid ' displayed on the top right of the screen indicates the settlement value falls out of the measurement range(0.1~2.0mm). Try again after beep again.



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num:0005	
S1=	Start
S2=	
S3=	

Figure 5.4

**ATTENTION**

Make sure the sensor is well connected before switch on the instrument, or the test will fail. If the sensor is not connected well or connected incorrectly, a warning words 'the sensor is unconnected' will displays on the interface.

**ATTENTION**

Suggest users to finish three impacts in 35 seconds complied with related rules and provisions.

Close the beep sound by pressing Enter button, and press Cancel to fail the test as illustrated in Figure 5.5. The system will return to main interface (Figure 5.2) in 2 seconds, and please perform the test again.

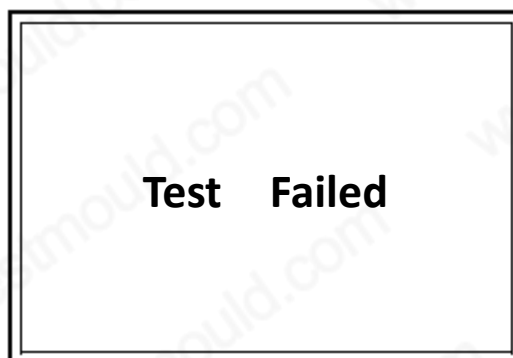



Figure 5.5

Skip to the interface as shown in Figure 5.6 after the completion of the three impacts test. The results for Si, Evd and Test Curve are displayed on the screen. press Right to print.

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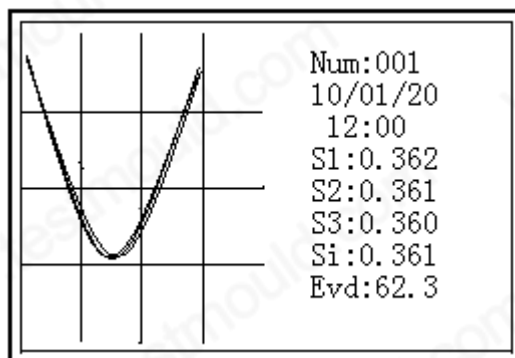


Figure 5.6

**ATTENTION**

The green light on the bottom of the screen informs the connection state of the Bluetooth, while the green light informs the readiness of Bluetooth printing.

Press Return or Enter in test result interface, it will remind users if save or not. (As illustrated in the Figure5.7) If press the Enter, it will save the Data and return main interface. If you press the Return button, it will give up the save and return to the main interface. (As illustrated in Figure 5.2)

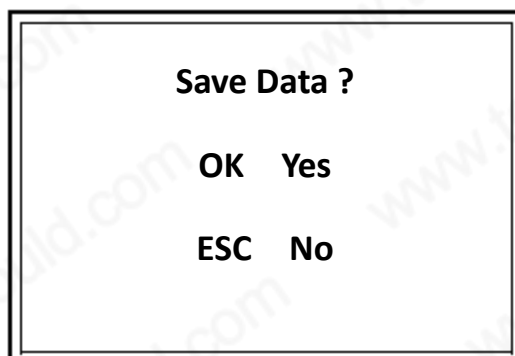


Figure5.7

**4. Data management**

Select and enter the Data Management from the main interface as illustrated in Figure5.8.

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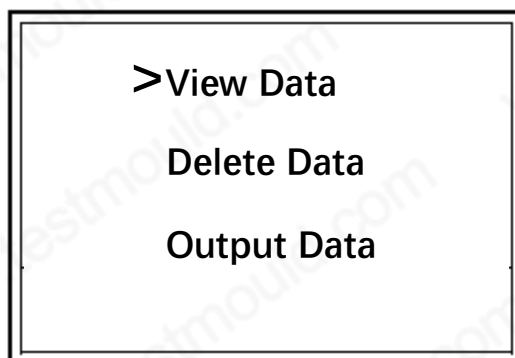


Figure5.8

#### 4.1 Data review

select and enter the View Data from the data management interface as illustrated in Figure5.9.

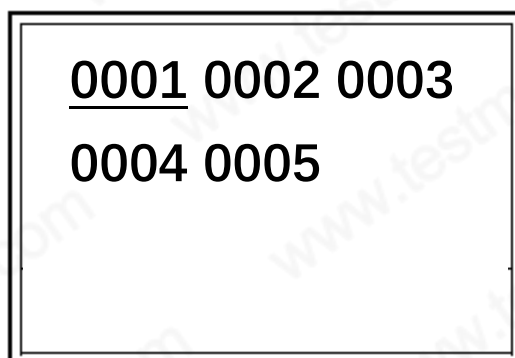


Figure5.9

Use Up, Down, Left or Right buttons to select the Serial numbers from the interface, press Return to go back to the data management interface. Press Enter to display the test result for the serial numbers at the current cursor lies location (As illustrated in Figure5.6), and perform relevant operations.

#### 4.2 Clear the data

Transfer the data onto the PC and clear all the data from the instrument before performing the test. (For details refer to 5.4.3. Outputting the data below)

The method of operating: Select and enter Delete Data from data management interface, as illustrated in Figure 5.10. Operating follows the instructions displayed on the screen. Press Return to bring back to the main interface with no data deleted. Press Enter to delete all related data, and the



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progress of deleting will be displayed on the bottom left of the screen. Return to the data management interface after all data is deleted.

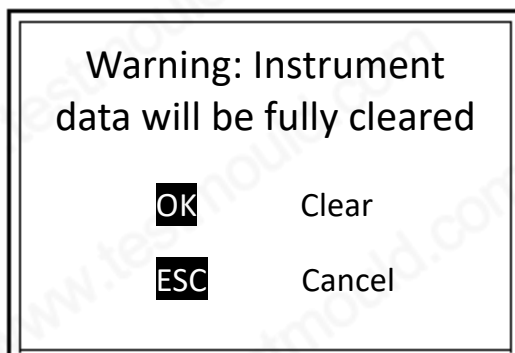


Figure 5.10

### 4.3 Output the data

Suggest to transfer the data to the PC timely after the test, operation method as below:

- (1) Connect the instrument with the PC by using USB cable or serial port line.
- (2) Switch on the instrument.
- (3) Select and enter the Output data submenu from the main interface.
- (4) Open Evd Dynamic Deformation Modulus analysis software on the PC.
- (5) Click data reading, select serial ports (COM1, COM2, etc.).
- (6) Click the opening serial port in the software from the PC.
- (7) Press the Enter button (As illustrated in Figure 5.11) and wait until the completion of the data output, and the system will return to main interface.

#### ATTENTION



Open the software from the PC and determine the transferring serial port on the data management interface before switch on the instrument, or the data will be transferred incompletely. Driver (CD comes with the installation program) should be installed before USB is used for transferring.).



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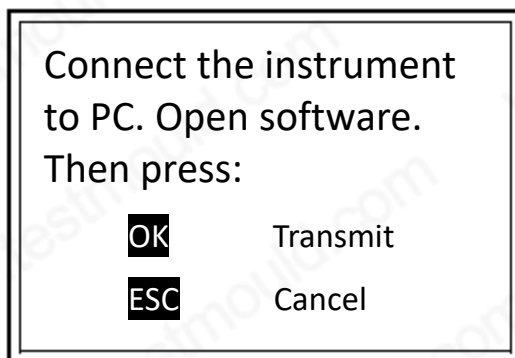


Figure 5.11

## 5. System setup

Enter the System Setup from Main Interface to modify the Date, Clock and language. Use Left and Right Buttons to move the cursor, and use Up and Down buttons to change the number value. Press the enter button to determine and return the main interface, while press the return button to cancel and return to the main interface.

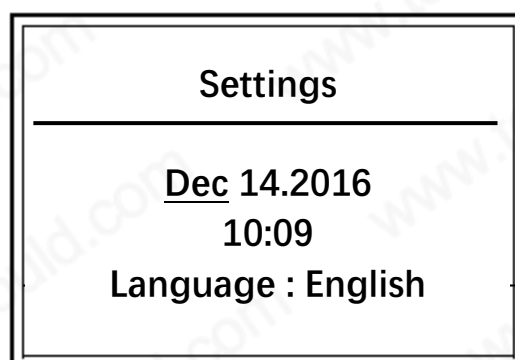


Figure 5.12

## 6. Test completion

- (1) Long press the power button to switch off the EVD Light Weight Deflectometer, as it's saving settings and shutting down displays on the screen.
- (2) Disconnect the cable establishing connection between the instrument and the sensor on the load plate, tightly hold the end of the cable and pull out the plug from the sensor port.
- (3) Lock the drop-weight by means of the shipping & handling lock.



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(4) Put back the instrument into the carrying case.

## 7. Charging

(1) Charging host: the battery of host can be charged by means of the supplied charger. The charger can be connected with mains 220V/50Hz. Then connect the charger with thick end of USB cable, and connect the host with the thin end of the USB cable. In process of charging, the indicator light below the screen right under the instrument name on the screen on the left displays red, the indicator will turn yellow when finish charging, fully charged takes 8 hours. Take out the battery, when the instrument is idle or not in use for a long time.

(2) Printer charging: the printer should be charged by means of the supplied charger. Connect the power adapter to AC power source 220V/50Hz and connect the charger plug with the power port of the printer, when the printer starts charging. In process of charging, the [FEED] light on the printer will turn red, and go off when fully charged. The charging will take approximate 3 hours.

### ATTENTION



When the printer is used for the first time after a lengthy period or has been standing idle for a lengthy period, recharge the battery prior to use.

### ATTENTION



For charging the power pack, it is only allowed to use the supplied charger. It's forbidden to apply the other chargers on the instrument apart from the supplied charger, or it will cause the danger of explosion. Not allow to open the outer shell of the charger.



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