C-Tech
Laboratory equipment co.,limited

WALKING PROFILER DAPPES-3

PRODUCT MANUAL

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SINCE 2006

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I. Introduction

Pavement smoothness and pavement structure depth are two important indicators in pavement evaluation and pavement construction acceptance. The smoothness of the road surface directly reflects the driving comfort of the vehicle as well as the safety and life span of the road surface, while the depth of the road surface structure reflects the roughness and anti-slip properties of the road surface. The detection of pavement flatness and pavement structure depth can provide important information for decision makers, and decision makers enable to make optimized decisions for road maintenance, repair and overhaul. On the other hand, the detection of pavement smoothness and pavement structure depth can accurately provide information on pavement construction quality, and it can provide an objective indicator for pavement construction quality assessment.

There are two main categories of instrumental measurement of road surface roughness: The first type is the profile measurement of the pavement longitudinal section (direct detection type), that is, the longitudinal profile curve is measured, and then the measured longitudinal profile curve is mathematically analyzed to obtain the flatness index. The second category is the measurement of the response of the vehicle to the road surface (responsive detection type), that is, to measure the dynamic mechanical response of the vehicle to the change of the longitudinal profile of the road surface, and then mathematically analyze the measured mechanical response to obtain the flatness index. The conversion of the flatness index is mainly obtained by calibrating the results measured by standard instruments. Generally, the detection speed of the first type detection method is slow, but the detection accuracy is high, and the detection speed of the second type detection method is fast, but the detection accuracy is relatively low. The second type of testing equipment needs to be regularly calibrated with the help of the first type to test equipment. Generally, it needs to be calibrated after six months to one year after be used, because the mechanical properties of the testing vehicle may change after a period of use. Direct pavement flatness meter and responsive pavement flatness meter are essential instruments for pavement construction, acceptance, maintenance, evaluation, and management departments.

There are two main types of pavement structure depth measurement technology: the first type is contact measurement method, that is, the relevant structure and depth of road surface depth (MTD) are directly obtained by using relevant test equipment and experimental methods, and the commonly used method is sanding method. The second type is the non-contact measurement method, that is, the elevation point of the detection point relative to the horizontal plane is measured to obtain the pavement section depth (MPD) or the sensor measurement structure depth (SMTD) through the mathematical model calculation. Then through the correlation model, it is converted into the pavement structure depth (MTD). The conversion is mainly obtained by performing calibration experiments on the results measured by the instrument. The commonly used method is the laser detection method. The two methods are widely used in actual engineering detection and measurement. The first detection method requires a lot of manpower and material resources, and the detection speed is slow, but the detection result directly reflects the pavement structure depth value, while the second detection method detection speed is faster, but before used it needs to be converted by the model.

II. Introduction of DAPRES-3

DAPRES-3 walking profiler belongs to the computerized pavement longitudinal section profile data collection and pavement flatness (direct detection type), structural depth (non-contact measurement) analysis system. It can detect the profile curve of the longitudinal section of the road in real time, and convert the measured profile curve into various flatness indexes and structural depth indexes through a mathematical model. This instrument can be used for flatness acceptance of new pavement construction and flatness evaluation of existing pavement. At the same time, it can be used as a standard flatness meter for the calibration/correction of other flatness meters. It can also be used for urban roads, new pavements, tunnels, airports acceptance and inspection of the structural depth of the runway and other areas. The flatness index and structural depth index measured by this tester conform to the national pavement acceptance and maintenance standard specifications (road subgrade pavement field test regulations: JTGE 60-2008, highway engineering quality inspection assessment standard: JTG F80-2017).This instrument is mainly used for:

1. Road or airport runway pavement construction quality acceptance.

2. Provide calibration reference for responsive flatness detector and other flatness detectors.

3. Road surface management system or airport runway surface roughness test and evaluation.

4. Depth test and evaluation of urban roads, newly constructed pavements, tunnels, airport runways and other road pavements.

The main features of DAPRES-3 walking profiler are: Small size and portable, intuitive and convenient operation, reliable operation, good data processing and output functions, It can measure and process various flatness indicators of any road length [international flatness indicator (IRI), standard deviation of flatness(σ), driving quality index (RQI), etc.] and structural depth index [average structural depth value (MTD)]. It can obtain the detection speed, distance and slope (slope) of the longitudinal section profile of the road, and all the original data can be automatically saved. The data acquisition and data processing of this tester is completed by the portable tablet computer. The data acquisition and data processing of this tester is completed by the portable tablet computer. The distribution curve of flatness and structural depth index can be printed directly on site, without any post-processing, and the software is fully functional. The tester and the tablet computer use wireless Bluetooth for connection and transmission, eliminating the need for wired cumbersomeness. The detection performance of DAPRES-3 walking profiler is ahead of similar products at home and abroad.

III. Instrument configuration

(The basic quotation of the detector only includes the necessary configuration)

1. Detector car (one, necessary)

   The detector car is equipped with the detection system hardware. The detector car includes a push rod and a push rod fastening screw.

2. Table PC (one, optional)

   Tablet computers can be provided by our company or users. Please specify when ordering. The tablet computer needs to be installed with Windows 7 or newer and Chinese platform software.

3. Detection system software (one CD, necessary)

   The detector system software is installed in the CD and equipped with installation software.

4. Portable printer (one, optional)

   Portable printers can be provided by our company or users. Please specify when ordering.

5. Power charger (one set, necessary)

6. Calibration platform for the detector (one piece, necessary)

   This platform is used to calibrate the detector to calculate the reference level of the detection system.

7. Instruction manual of the detector (one copy, necessary)

8. Power inverter (one, optional)

   This power inverter can convert DC 12V power to AC power and provide external power for notebook computers and portable printers. Both laptops and portable printers have an internal power supply, which can last about 2 hours during normal operation. No external power supply is required, but the external power supply provides charging in the absence of electricity. If you need to charge in the field, you can use a power inverter to convert the 12V DC voltage in the cigarette lighter in the car to an AC voltage as an external power supply. The power inverter can be provided by our company or the user. Please specify when ordering.

9. Carrying case (one, necessary)

   The carrying case can be loaded with all necessary instrument configurations for easy portability.

IV. Technical parameters

1. Measurable indicators

   International Roughness Index (IRI), (left track, right track)

   Roughness Standard Deviation (σ), (left track, right track)

   Ride Number (RN), (left track, right track)

   Distribution of points that absolute height (height difference) is greater than a given height

2. Measurable structural depth index

   Pavement structure depth data (SMTD)

3. Output:

   Various flatness index (any length of the entire segment and segment)

   Distribution chart of various flatness index

   Pavement longitudinal profile curve and height (height difference) data of each sampling point

Pavement structure depth data (any length of the entire section and section)

4. Operating characteristics:

Operators: 1

Operating speed: normal walking speed

Calculated road length: any length above 5m

Flatness sampling interval: 12.5 cm

Construction depth sampling interval: 1mm

System power supply: Large-capacity rechargeable lithium battery

On-site output: data can be directly analyzed on site and the results printed

Operating ambient temperature: -40℃ ~ 80℃

4. Performance:

Correlation of flatness reference results (reference level): Correlation coefficient R2> 0.95

Correlation of reference results of structural depth (refer to sanding method): Correlation coefficient R2> 0.95

Measurable profile height difference resolution: <0.05 mm

Distance detection resolution: <12.5 cm

5. Dimensions and weight:

Box size: 650 mm×380 mm×330 mm

Gross weight: 20 Kg

V. Assembly and setting instructions

Refer to Fig. 1 for the overall appearance of the detector.

Fig1. The overall appearance of the detector

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1. System connection

Refer to Figure 2 for system connection.

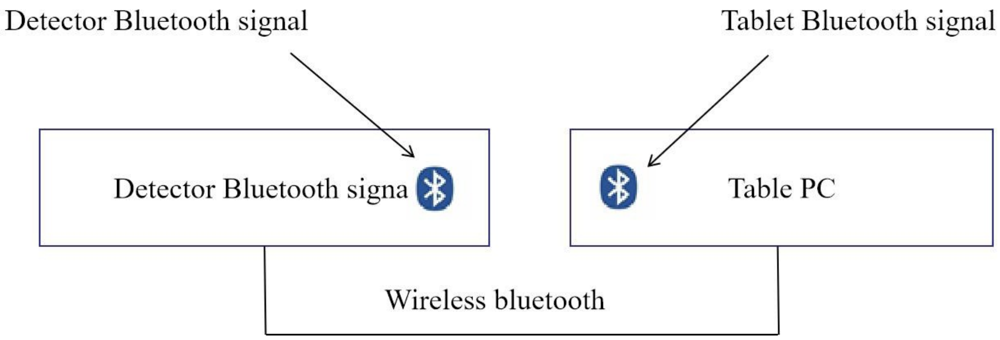

Fig 2. System connection

This software is stored on a CD. The software for the execution system of the detector is installed in the CD and equipped with installation software. The case data and system parameter files are installed in the disk. Before installation, insert the CD into the CD drive of the laptop, then look for the "SetupDAPRES-U.exe" software in the CD drive directory, and execute the software. According to the displayed prompts, the system software installation can be completed. "SetupDAPRES-U.exe" software will automatically open a folder in the C drive, the folder name is DAPRES, and automatically open a subfolder DAPRES-UASD-CHN in the DAPRES folder. For the specific installation process, please refer to "PRES Software Installation Process" at the end of this document. If there is a fault during the operation of the system software, the operator needs to check the attributes of the system parameter file (system-u.txt) and data file (Data) to change their attributes, so that the attributes of the system parameter file and data file must be read and wrote.

2. Password setting

The detector needs a password in the <Parameter Setting> function to start some parameter setting and calibration functions. The password is set to "12345" when the detector is shipped. After receiving the detector, the user needs to change the five-digit password selected by the user, and store the password in a safe place. The user needs to enter <system parameter setting> to change the password.

4. Parameter settings

The detector has system operating parameters in the <parameter settings> section of the <system settings> function. Users should not change any parameters, so as not to affect the normal operation of the system and lead to erroneous detection results.

VI. System operation

1. Tester operation

During the operation of the detector, the computer operation interface is equipped with instructions and explanations in Chinese. The user can perform the operation of the detector as long as he follows the operation instructions.

2. Sensor calibration

The <Sensor Calibration> function includes three parts, namely: technical inspection, zero angle calibration, and laser sensor calibration. The <Technical Inspection> function mainly calibrates the encoder and angle sensor of the device. The main purpose of the encoder calibration is to ensure that the collected distance and the station corresponding to the sampling point are accurate. During calibration, a test section of known length (recommended 100 meters) must be delineated, the start and end points must be marked, program is run, and you can complete the calibration as prompted by the computer interface. The calibration of the angle sensor is to obtain the relationship between the angle and the height through the shims of different heights. During the calibration, the operator uses the gasket on the front wheel of the instrument, the program is run, and you can complete the calibration according to the prompts on the computer interface. After the two calibrations, there is no need to calibrate again within a certain time.

The main purpose of <Zero Angle Calibration> is to find the sensor output when the road surface is absolutely flat, so as to compensate the sensor when the detection system is running, and it make the detection result reliable. Under normal circumstances, after calibration, the detector does not need to be calibrated for a certain period of time. In fact, since the calibration process is extremely simple and convenient, users may wish to perform calibration before each use. During calibration, the operator must first place the small calibration platform of the detector on a solid and flat surface, then place the detector on the small calibration platform of the instrument smoothly, execute the detection system software, it enter the <Sensor Calibration> function. Zero angle calibration> function. As long as the operator strictly follows the instructions provided by the computer interface, the angle calibration of the detector can be completed. The main purpose of <Laser Sensor Calibration> is mainly calibrating the laser distance sensor to ensure that the instrument can accurately measure the depth of the pavement structure. There are two main functions in this function, one is laser sensor zero calibration, and the other is laser sensor static calibration. The former is similar to the function of "zero angle calibration", and the detector is placed on the small platform of the instrument for calibration. During the latter calibration, the operator has to perform multiple calibrations using shims of different heights. The shims should be placed under the laser and follow the prompts on the computer interface to complete the calibration.

3. Function selection

In the <Function Selection> function, the operator can select the function of the instrument. This function is only available to users who have purchased two functions (flatness and structural depth). Users who purchase a single function cannot choose. If the user selects two functions, the instrument will collect two indicators (flatness and structural depth) at the same time when working. If a function is selected, only the selected indicators (flatness or structural depth) will be collected.

4. Data analysis

In the <Data Analysis> function, the operator can select the content to be analyzed (flatness or structural depth), after entering the corresponding function, the corresponding acquisition file is selected for analysis. The analysis section can be analyzed in whole sections or in sections. When selecting a sub-segment, as long as the start and end points of the sub-segment are filled in at the corresponding positions, when processing the profile curve data of the road surface of the selected sub-segment, the results obtained only reflect the selected Subsection road surface smoothness or structural depth.

VII. Matters need attention

1. In addition to the quality of the detector itself, the quality of road surface flatness and structural depth detection depends to a certain extent on whether the operator operates the detector in a standardized manner. As with other instruments, the operation of this tester has a certain impact on the quality of the test. The operator must strictly abide by the following operating procedures:

If there are many debris on the road surface, the operator should remove the debris before testing to reduce the bounce of the detector.

If the road surface of the same lane is repeatedly tested, the operator must mark the

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inspection straight line with colored paint on the inspected lane. In the subsequent repeated testing, the tester must strictly advance along the same straight line to ensure good repeatability of the test results.

2. After long-term use of the detector, the wheels of the detector body may be worn. After wear, the size will become smaller and it needs to be replaced with a new wheel. Please contact our company.
3. The body of the detector is heavy, and the structural strength of the push rod is relatively weak. When carrying, you should move the body of the detector as much as possible, rather than lifting the push rod, so as not to damage the push rod structure.
4. When testing, the detector should be placed in the shade and low temperature as much as possible to reduce the detector's exposure to strong sunlight and baking, so as to extend the life of the components.

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