HUATEC
Industry Instrumentation

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1. Overview

Pull-out adhesion testers measure the adhesion of metal, concrete and other material coatings - the self-positioning feature brings a whole new revolution in the way adhesion is measured. The working principle of the instrument is to use the hydraulic system to measure the adhesion of the coating of a certain diameter on the surface of the substrate to measure the adhesion. The multifunctional digital display of the tester displays the size of the adhesion, in MPa or KN. The product is designed and manufactured according to relevant international and national standards, with leading technology and stable performance.

Meet the standard:

① ISO 4624 《Paints and varnishes-Pull-offtest for adhesion》
② ASTM D 4541 《StandardTest Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers》
③ ASTM D7234 《Standard Test Method for Pull-OffAdhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers》
④ GB/T 5210-2006 "Adhesion test of paint and varnish pulling method"

Instrument features:

(1) Portable handheld instrument, can be used in any place, no external power supply - can be used in the laboratory, can be used in the field.
(2) Large and easy to read LCD digital display.
(3) Select the spindle size, measurement unit and storage data, and automatically calculate the result according to the spindle size.
(4) Portable instrument box with alloy and stainless steel body, rain proof, dust proof, anti-impact.
(5) High quality hydraulic pump can be applied to any occasion, warranty for three years.
(6) The pressure and display system are calibrated by the standard dynamometer, the accuracy is controlled within ±1% (full scale).
(7) Self-positioning spindle, smooth and rough surface has no effect on the measurement results.
(8) High-grade industrial pressure sensor to ensure continuous high precision.
(9) Optional 10mm, 14mm, 20mm and 50mm spindle.
(10) LCD display, you can select MPa or KN unit.

2. Main technical parameters

Force measurement range: 0-10 KN
Strength value measuring range: 10mm spindle 0-127.38MPa
14mm spindle 0-64.99MPa
20mm spindle 0-31.84MPa

50mm spindle 0-5.09MPa

Display resolution: 0.001KN / 0.001MPa

Piston stroke: 10 mm

Indication error: ≤±1%F.S

Mass (main engine) : 2.8Kg

3. Intelligent numerical display

(1) The working principle and use method of intelligent pressure numerical display

The intelligent numerical display is mainly composed of a pressure sensor and a measurement display circuit, which are connected through a data connection line. The voltage signal generated by the pressure sensor is converted into A digital signal by A/D converter, and the adhesion value is displayed by the liquid crystal display after processing by the single chip computer.

The panel of the intelligent numerical display is shown below

Key function description:

: Start and shut down, long press 9s to enter the setting (calibration) state, non-calibration personnel do not operate.


: Spindle size selection key, set to left shift function key.

: Peak switching key. In the setting state, it is the scroll down key.

: Reset key, which is set to scroll up.

: MPa/Kn Switch key.

4. How to use intelligent numerical display

4.1 Data Measurement

After pressing the 

key, the instrument will display the startup screen (as shown below).

First, press the 

key to enter the peak measurement state, and then press the 

key to clear the display value of the instrument and start pressurizing. F20 in the figure indicates that the size of the spindle currently in use is 20mm. If the peak value is displayed on the power supply, press the clear key to clear the value and then press the pressure directly. (as shown below)

4.2 Function and Parameter Settings

Press the  key to select the spindle size.

F10 indicates that the size of the spindle in use is ¢ 10mm

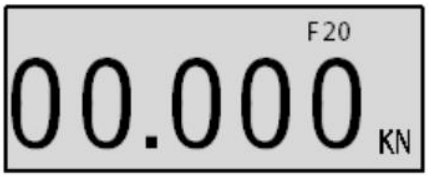
F14 indicates that the size of the spindle in use is ¢ 14mm

F20 indicates that the size of the spindle in use is ¢ 20mm

F50 indicates that the size of the spindle in use is ¢ 50mm

The unit conversion is performed when the 

key is pressed, the data is converted to KN value by pressing once, and the Mpa value is returned by pressing repeatedly. As shown in the following picture



5. Instrument calibration (Statement: The instrument has been calibrated by standard dynamometer before delivery)

In order to maintain the stability and accuracy of the detector, the instrument should be checked regularly. Adjustment can be carried out through the full degree correction parameters and polyline correction parameters, the specific steps are as follows:

Before adjustment, ensure that the meter is fully charged and turn off the backlight. Preheat the machine for 1 minute. Gently press the hand pump handle to raise the piston slowly and clear the display value when the standard sensor placed on the piston is about to touch the test bench.

When pressurized to full scale or 1/2 full scale, record the standard sensor and instrument display values.

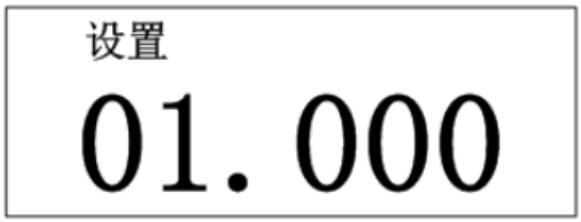
Full degree correction factor = standard force value ÷ display value * original correction factor

(Do not multiply when the original correction factor is 1)

◆ **Instrument calibration please go to the metrology Bureau and other units with metrological verification qualification for calibration, users do not calibrate themselves**

Full degree correction factor input. In the normal measurement state of KN value, press the 

key 9S to enter the "Set" calibration coefficient state. Input full degree correction factor (as shown below)



Modify the correction factor by turning up, turning down, and moving the function key left. After modification, press the 

key to confirm the exit, and the input of the correction coefficient is completed.

If the detection requires higher accuracy, please use the data line correction, after entering the full scale "setting" calibration state, press the 

key, and enter the five correction coefficients of 0-1/5 range,1/5-2/5 range,2/5-3/5 range,3/5-4/5 range, and 4/5-full scale in turn. Modify the correction factor by turning up, turning down and moving left. After modification, press the 

key to exit, and the correction coefficient is automatically

entered. As shown below.

Line correction factor = standard force value ÷ display value * original correction factor
(Do not multiply when the original correction factor is 1)

6. Basic Rules

The adhesion tester is calibrated before leaving the factory. In the adhesion test, the detector should be within the calibration validity period, otherwise it should be re-calibrated. The instrument can pass the calibration and verification of any authoritative testing institution in the country.

7. Test method

The general operation steps of adhesion test are:
(1) Grind the measured position with the grinding piece (increase the roughness of the measured surface, make the test block bond more firmly with the coating), and clean the measured surface. Rough side can be done without grinding.
(2) Paste the spindle on the surface to be measured with high-strength quick adhesive or AB adhesive and store it at room temperature for more than 24H.
(3) Use a cutter matching the spindle to cut through the coating along the spindle perimeter.
(4) Completely loosen the main engine unloading valve counterclockwise, and press the small black piston on the quick sleeve by hand.
(5) Connect the fast sleeve with the spindle.
(6) Turn on the instrument in the "peak" state to clear, tighten the unloading valve for pressure testing.

Note: Put the instrument in the "peak" state during testing, otherwise the force value will quickly return to zero when the test block is pulled out. Please select the appropriate channel according to the size of the test block. The instrument will automatically calculate the strength value according to the area of the test block. Commonly used F20 is 20mm test block.

Instrument preparation → Coating preparation → pasting spindle → cutting circumference → Instrument installation → adhesion test

Testing instruments, tools and materials shall meet the following requirements:

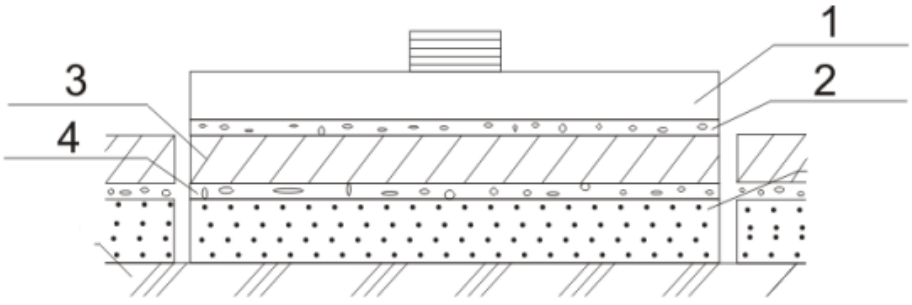
1. The spindle should be completely pasted on the surface to be measured;
2. Use a cutter to cut through the cured adhesive and coating to the base material along the circumference of the spindle;
3. Epoxy binder, high strength fast binder or AB glue should be used;

Cutting shall meet the following requirements:

1. Cutting should be carried out before the drawing test;
2. The cutting should be from the coating surface to the substrate surface, and the depth should be consistent as far as possible;
3. The cutting size should be the same as the spindle size;

Spindle pasting shall meet the following requirements:

1. The surface of the spindle should be clean and dry before pasting;
2. The binder should be stirred evenly, accompanied by use, evenly coated, and the adhesive layer should not be too thick:
3. When pasting the spindle on the surface to be measured, the adhesive should not stick to the adjacent matrix surface;
4. After pasting the spindle, it should be fixed in a cross shape with tape in time and cannot be shifted;
5. Curing time before binder hardening, when the temperature is higher than 15 ° C, not less than 24h; When the temperature is 5 ~ 15℃, not less than 48h; When the temperature is below 5℃, it shall not be less than 72h; Do not immerse in water during the curing period. At less than 5℃, the standard block should be preheated for pasting. Paste the spindle (as shown below).



1. Spindle 2. Binder 3. Coating 4. Substrate

When testing the adhesion, the pressure should be applied at A constant speed, and the pressure speed should not exceed 1MPa/S until the spindle is completely detached, and record the peak value of the adhesion force or strength according to the format in Appendix A. After the test, reduce the pressure until the puller is reset.

Spindle processing should be carried out according to the following requirements:

1. After the adhesion test is completed, the spindle should be heated to melt the adhesive, and the surface adhesive

should be cleaned for later use. It can also be cleaned with gauze wheel or sandpaper, but try to maintain the flatness of the bonding surface.

2. After the spindle is cool, rub the surface with No. 50 sandpaper until shiny.

3. Place the spindle in a dry place, check the surface before use, and remove oil.

8. Adhesion strength calculation

The bond strength of a single specimen should be calculated according to the following formula:

$$R=X/S$$

Where: R-- bond strength (MPa), accurate to 0.01MPa;

X-- Adhesion reading (1N);

S-- Tensile area of the sample (mm).

The average bond strength shall be calculated according to the following formula:

$$R_m = 1/3 \sum_{i=1}^{3} R_i$$

Where: Rm-- average bond strength (MPa), accurate to 0.01MPa;

Ri-- Bond strength of a single specimen (MPa).

9. Note

Before using the tester, it is necessary to carefully read the manual and understand all operating methods. The instrument has been calibrated domestically before leaving the factory. The content mentioned in Section 5 of the manual is strictly prohibited for daily operation, except for instrument calibration.

The rated tensile force of this instrument is 10kN, and it should not exceed 10.5kN during use to avoid damage to the instrument.

After detecting a point, record the data and press the reset button to perform the second point detection.

When the instrument is powered on and the display is not zero, you can press the reset button to reset.

When the display screen is not clear. Alternatively, when the backlight is turned on, the number on the instrument panel significantly darkens, indicating that the battery voltage is insufficient and should be charged promptly. The

equipped charger is a high current charger, fully charged within 3 hours of charging. After being fully charged, remove the charger promptly to avoid overcharging the battery and affecting its lifespan.

After using the instrument, it should be wiped clean in a timely manner. The instrument part should be waterproof, moisture-proof, oil-proof, collision resistant, and kept away from high temperatures.

10. Product standard configuration

1. Digital display manual pump 1pc
2. Pull out the sleeve quickly 1 pc
3. Charger 1 pc
4. Standard 20mm spindle 10 pcs (if you need other sizes, please contact us.)
5. Cutters 1 pc
6. Abrasive pads 6 pieces
7. Adhesive 1set
8. Certificate, warranty card, manual 1each
9. Portable instrument case 1 pc