LANGRY®

AT10-M

OPERATING INSTRUCTIONS

Catalogue

Chapter 1: Instrument Functions and Introduction

1.1 Product Introduction

The AT10-M Adhesion Tester is a product independently developed by Langry. This instrument uses a hydraulic pulling system to measure the force required to pull coatings of different specified diameters off their substrates, displayed on an intelligent digital pressure gauge, representing the adhesion strength between the coating and the substrate. Its pressure system has undergone strict calibration, with stable force output and high accuracy. It also has the characteristic of no temperature drift, ensuring the accuracy and reliability of test results. It is a reliable high-performance testing instrument.

1.2 Main Features

(1) The force time curve and load are displayed on the same screen, and the detection process data is fully recorded;

(2) 2.8-inch high-definition color touchable LCD screen;

(3) Loading speed prompt to make the experiment more in line with regulatory requirements;

(4) Four testing units are available: kN, MPa, psi, and lbf;

(5) Five sizes of spindles are available, including 10mm, 14mm, 20mm, 50mm, and 50 × 50mm;

(6) Automatically calculate the detection results based on the size of the spindle;

(7) The pressure system has undergone strict calibration, with an accuracy of ± 1% FS, easy calibration, stable force output, high accuracy, and no temperature drift;

(8) Integrated digital pressure gauge, using high-quality high impedance pressure sensor;

(9) The automatically aligned spindle can accurately measure on smooth or uneven surfaces.

1.3 Technical Specifications

(1) Resolution: 1psi (0.01MPa, 0.001kN, 1 lbf)

(2) Accuracy: ± 1% FS

(3) Hydraulic cylinder stroke: 10mm

(4) Measurement range: 0-10kN

(5) Battery life: 15 hours

(6) Data storage: 4000 records

1.4 According to the standard

ASTM C1583/C1583M

ASTM C1857/C1857M

ASTM D4541

ASTM D7234

ASTM D7522

EN 1015-12:2016

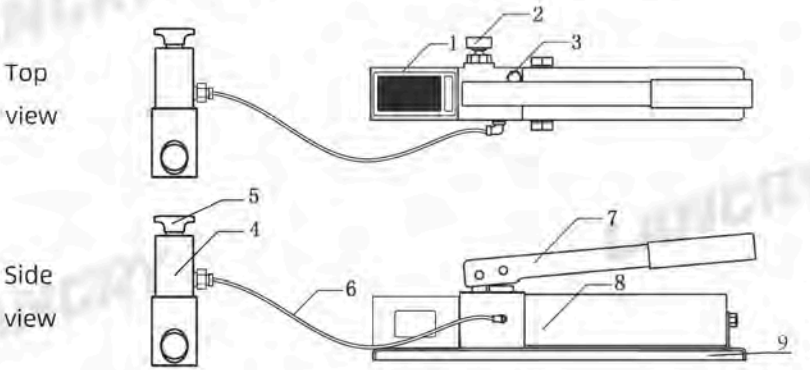
EN 12004-2-2021

EN 1348-2007

EN 1542-1999

ISO 4624ISO16276-1

1.5 Structural Diagram



1. Intelligent digital pressure gauge 2. Unloading valve 3. Oil filling hole 4. Pulling sleeve 5. Pulling sleeve cover 6. High pressure oil pipe 7. Pressurizing handle 8. Oil storage cylinder 9. Bottom plate

1.6 Precautions

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

2. Electromagnetic interference: No strong alternating electromagnetic field and no prolonged exposure to sunlight; Necessary protective measures should be taken when used in damp, dusty, and corrosive gas environments;

3. The instrument should be placed in a ventilated, cool, and dry place, and should not be exposed to direct sunlight for a long time.

4. Avoid water ingress; Avoid using in strong magnetic field environments, such as near large electromagnets, transformers, frequency converters, etc.

5. Shock resistance: During use and handling, severe vibrations and impacts should be prevented.

6. After the experiment is completed, the instrument needs to be reset to its initial state; And store it in a dry and ventilated environment to prevent dust from entering the instrument or connector and causing performance degradation or damage. Do not wipe this instrument with a damp cloth! Do not use organic solvents to clean instruments and accessories! Please wipe the instrument and accessories with a clean, soft, dust-free cloth.

7. Regularly replace hydraulic oil to prevent physical and chemical changes as well as a decrease in various performance indicators during long-term use and storage; When replacing hydraulic oil, the performance of the sealing ring should be checked at the same time. If its performance deteriorates, it should be replaced in a timely manner;

8. Charging management:

The instrument is powered by rechargeable lithium batteries. When the battery is low, it should be charged in a timely manner to avoid damaging the battery. The red indicator light is always on during charging, and it will turn off when fully charged; Charging should be done using the dedicated charger provided with the instrument, and other types of adapters or chargers should not be used to charge the instrument, otherwise it may cause damage to the battery.

Note:

Do not charge in high temperature environments. The recommended charging temperature range is 10-35 ℃; If the instrument is not used for a long time, the battery will experience slight power loss, resulting in a decrease in power. It is necessary to recharge it before use. It is normal for the charger to generate heat during the charging process, and the charging environment should be kept well ventilated for easy heat dissipation.

Chapter 2 Operation Steps

2.1 Check the oil level

If the actuator piston is not fully retracted into the cylinder, it should first be connected to the manual pump through a high-pressure oil pipe. Turn the unloading valve on the pump body counterclockwise and press the actuator handle to discharge the hydraulic oil in the actuator back into the oil storage cylinder of the manual pump. Unscrew the oil filler cap from the front of the manual pump and check the oil level. There should be 1/5 of the space in the oil storage cylinder. If the oil is not full, L-HM32 anti-wear hydraulic oil can be added. Note: The distance between the oil level in the refueling hole and the upper surface of the pump body should be around 10mm.

2.2 Exhaust

After the hydraulic system is assembled, there is often air mixed in the high-pressure oil pipe and actuator. In order to ensure the normal operation of the hydraulic system, this air must be discharged. The method is to loosen the fuel hole cover, place the manual pump slightly higher than the actuator, tighten the unloading valve in a timely manner, press the manual pump to extend the actuator piston to its maximum stroke, then open the unloading valve, press the actuator handle to retract the piston, and repeat this process several times.

Chapter 3 Working Principle and Testing Steps

3.1 working principle

The instrument evaluates the adhesion (tensile strength) of the coating by determining the maximum tensile force it can withstand before detachment. The fracture point manifested on the surface of the fracture occurs along the weakest plane in the system composed of the spindle, adhesive, coating, and substrate.

3.2 Test steps

(1) Handling spindles and coatings:

To remove oxidation and pollutants, place the attached sandpaper on a flat surface, and then rub the bottom surface of the spindle on the sandpaper 4-5 times;

As needed, use a dry cloth or tissue to remove any residue left during the grinding process;

Use the accompanying sandpaper to lightly roughen the coating;

To promote the bonding between the spindle and the coating, degrease the coating area to be tested with alcohol or acetone to remove any oil, moisture, or dust.

Note:

1.Due to the potential for defects caused by coating wear, it should only be used when it is necessary to remove surface contaminants or when the adhesive strength between the adhesive and the coating is insufficient for tensile testing;

2. Ensure that any alternative grinding techniques, degreasers, or adhesives do not alter the

characteristics of the coating. The effect can be observed by testing the sample with a small amount of degreaser or adhesive.

(2) Apply adhesive:

Adhesive selection: The adhesive included in the attachment of AT10-M Adhesive Tester is universal and has the least impact on various coatings. Under ideal conditions, its tensile strength exceeds the maximum tensile strength of the tensile system. Other adhesives can be selected based on requirements such as curing time, coating type, working temperature, and tensile strength.

Apply the adhesive evenly to the bottom of the ingot;

Fix the spindle in the prepared coating testing area;

Gently press down on the spindle and squeeze out excess adhesive. Do not twist or slide the spindle back and forth on the coating, as bubbles may be generated;

Carefully remove excess adhesive from the edges of the spindle using the attached cotton swab;

Curing for 24 hours.

(3) Test area separation (optional):

Determine whether to cut the coating around the spindle based on the standards, specifications, or contract agreements used for testing. The main purpose of cutting open the coating is to isolate a testing area of a specific diameter. When cutting the coating, it is recommended to cut it all the way to the base material. Carefully cutting off excess adhesive on the spindle can prevent larger areas of coating from pulling off from the substrate, resulting in higher tensile forces.

Cut open the coating on the edge of the spindle with the accompanying cutting tool and remove any excess adhesive;

Remove any debris during the cutting process;

When testing very thick coatings, a drilling fixture can be selected.

Note:

1. Cutting the coating may induce defects on the coating surface, such as microcracks, which may affect the test results;

2. For coatings with strong lateral adhesion, it is recommended to completely cut open the coating until it reaches the substrate.

3.3 Pull test

1. Press and hold the [⏻] to turn on the device;
2. Click "  " on the main interface to enter the detection interface
3. Click to change the spindle size to ensure it matches the size of the spindle being used;
4. Rotate counterclockwise to open the unloading valve;
5. Press the actuator handle until the piston is fully retracted. Connect the actuator component to the spindle;
6. Rotate clockwise to tighten the unloading valve;
7. Click "Reset" to reset;

8. Slowly press the pressure handle until the starting pressure is reached. The starting pressure is the point at which the instrument starts calculating the drawing rate, which is also the pressure that can store readings. The starting pressure for various spindle diameters is:

Spindle size	Start pressure			
ϕ10mm	400psi	2.8MPa	0.220kN	630 lbf
ϕ14mm	200psi	1.4MPa	0.215kN	315 lbf
ϕ20mm	100psi	0.7MPa	0.220kN	160 lbf
ϕ50mm	50psi	0.4MPa	0.785kN	90 lbf

Then steadily increase the tensile force at a speed not exceeding 1MPa/s, and the failure of the spindle and coating should be completed within 90 seconds from the application of stress.

9. Click "Save" to save the data.

3.4 Analysis of Test Results

After completing the test, the spindle and coating surface should be inspected. In addition to tensile strength, according to different national standards, it is necessary to record the nature of damage, determine the nature of damage by visually inspecting the damaged surface, and evaluate the type of damage according to the following methods.

A--Cohesive failure of substrate

A/B--The adhesion failure between the first coating and the substrate

B--The cohesive failure of the first coating

B/C--Adhesion failure between the first coating and the second coating

n--Cohesive failure of composite coating from the nth to the coating

n/m--Adhesion failure between the nth and mth coatings of composite coatings

-/Y--The adhesion failure between the last coating and the adhesive

Y--Cohesive failure of adhesives

Y/Z--The bonding failure between the adhesive and the spindle

Estimate the percentage of damage area for each type of damage, accurate to 10%.

When the damage is inconsistent, the treatment and painting process of the test panel should be repeated; The inconsistent methods for resolving destruction include:

(1) Process the spindle and coating according to the method in Chapter 3.2;

(2) When testing on a deformable substrate, if it is expected that there will be a difference in adhesion between the spindle and the unpainted substrate, both sides of the substrate can be coated with the test product;

Chapter 4 Instrument Operation Instructions

4.1 Feature Overview

This instrument mainly realizes functions such as detection, data viewing, system settings, and shutdown. The main interface of the system is shown in Figure 4.1.

Figure 4.1

4.2 Start detection

Click " " on the main interface to enter the detection interface as shown in Figure 4.2.

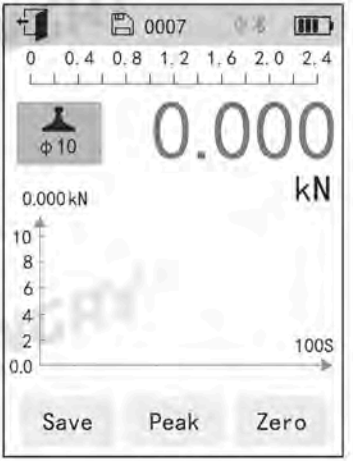


Figure 4.2

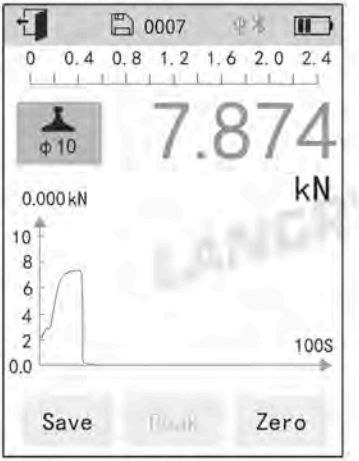


Figure 4.3

If there is no load added at this time and the instrument display value is not zero, you can first click " C " on the screen or press the "Reset" button on the side of the instrument to reset the instrument display value; If the size of the spindle does not match the actual size used, you can click on the spindle size to switch; Select measurement units (kN, MPa, PSi, lbf) according to the requirements; Then start loading, click on the "Peak" button on the

screen or press the "Peak" button on the side of the instrument panel, and the maximum value will be maintained in real time, with the peak value in red font. As shown in Figure 4.3.

After the detection is completed, click on "Save" on the screen or press the " 🖫 " button on the side of the instrument to save the data, and the instrument will record the measurement result. The instrument can store up to 4000 pieces of data, and after recording for more than 100 seconds, the curve will be displayed in pagination. In the data viewing interface, you can swipe left and right to flip the screen and view.

4.3Data View

Click " 🔍 " on the main interface to enter the data viewing interface as shown in Figure 4.3. Click on the " 🗑 " to delete all saved data.View data through " ◀ " and " ▶ ", and click to view each data item in detail as shown in Figure 4.5.

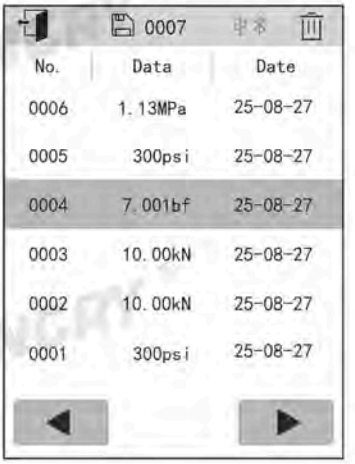


Figure 4.4

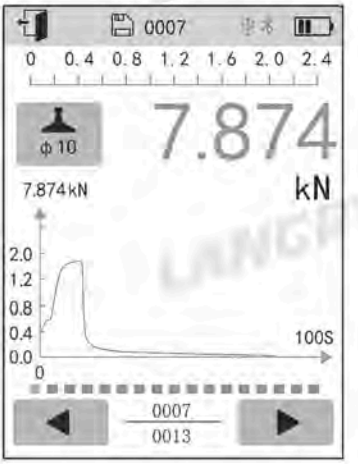


Figure 4.5

After entering the data review interface, click on " ◀ " and " ▶ " to view the previous and next data. Swipe left or right to flip through the page and view the curve.

4.4 System Settings

Click on " ⚙ " on the main interface to enter the system settings interface, as shown in Figure 4.6. If there is no need to modify the system settings parameters, click on the parameter that needs to be modified, and an editing box will appear at the bottom of the screen. After the modification is completed, click "√" to save the changes.

Figure 4.6

4.5 Instrument Calibration

Calibration settings are password controlled. Enter password 1111 in the "Operation Password" section of the parameter settings interface, and then click "Confirm" to enter the calibration state; When the password is incorrect, it is not possible to enter the pressure calibration state. If you accidentally enter, you can click "Return" to exit.

Operation steps: ① Enter password 1111 and press "confirm" to enter calibration mode. ② The instrument displays "0%". At this time, make sure that the instrument is not loaded. The standard force gauge displays zero, click "store" once, and then the instrument displays "100%". At this time, operate the manual pump and load until the standard force gauge displays the full range pressure value (10kN) of the instrument. Click "store" once to complete the calibration of the 100% range point. After completion, the instrument will automatically exit the calibration state, and the calibration accuracy can be maintained even when power is lost. If the retesting accuracy of the instrument still cannot meet the requirements for use, the above steps can be repeated.

4.6 Line correction

Enter the password in the "Operation Password" section of the parameter settings interface, enter 3333, and then click "Confirm" to enter the line correction state. By "skipping", you can adjust to the line point that needs to be corrected, operate the manual pump to load, and when the pressure value corresponds to the line point, click "store" to save the current line point.

This instrument has a full range of 10kN. If line correction is required for the 1kN-2kN range, enter 3333 in the "Operation Password" section of the parameter settings interface, and then click "Confirm" to enter the line correction state; The instrument displays 0%, click "skip" to adjust to 10%, and then load to the standard force gauge 1kN. Click "store" to display 20% on the instrument, and then load to the standard force gauge 2kN, click "store" to complete the correction of the instrument.

4.7 Restore factory settings

Enter password 9098 in the "Operation Password" section of the parameter settings interface and click "Confirm" to restart the instrument and restore it to factory settings.

Chapter 5
Common Malfunctions and Troubleshooting Methods

Fault phenomenon	cause of failure	treatment method
The pressure gauge has no pressure display	Lack of oil in the oil cylinder	Open the oil injection valve
	The unloading valve is not	Tighten clockwise
	Joint oil leakage	tighten the joint
	The manual pump is not in a	Add load after leveling the
	Pressure gauge damaged	Remove for inspection or
The pressure cannot be reached	Insufficient oil in manual pump	Come on
	Joint oil leakage	Check the joints and sealing
	Incorrect oil quality or dirty oil	oil change
Oil leakage of	The sealing ring inside the	Replace the sealing ring
The pressure gauge has a reading, but	Oil pipe blockage	Clear the rubber hose
	Connector blockage	Clean the connector
The reading on the pressure gauge has significantly decreased	The oil quality is too dirty	Clean the oil cylinder, pump
	Poor sealing of individual valves	Return to the factory for
	Serious oil leakage at the joint	Tighten or replace the
	Seal failure	Replace the same type of

Chapter 6 Safety Warning

1. The operator of the adhesion tester should understand the structural requirements and only operate it after understanding this manual;
2. Before use, the dynamometer should be subjected to air pressure loading. If there are any abnormal situations, it should not be used;
3. When conducting adhesion testing, it is strictly prohibited to stand around the actuator and attention should be paid to safety;
4. The operator of the actuator should slowly increase the pressure;
5. The actuator must not be disassembled casually during use;
6. In case of abnormal situations such as oil leakage during use, the machine should be stopped for inspection. After inspection and troubleshooting by repair personnel, it can only be used;
7. Clean L-HM32 anti-wear hydraulic oil should be added to the oil storage tank, and the amount of oil should not be too full. A certain space (about 1/5 of the space) should be left in the oil pipe to allow air to be discharged.

Chapter 7 Precautions

1. The adhesion tester must be used within the measurement range, otherwise it may affect the detection accuracy or cause permanent damage;
2. When the actuator is working, the bottom must be placed flat and stable, and subjected to vertical force. Do not work beyond the scheduled time.

Chapter 8 Packaging, Transportation, and Storage

1. The LR-FZ10 adhesion tester is packaged in a plastic sealed box, which includes the product manual, product certificate, packing list, and accessories. Please pay attention to inspection.
2. After packaging, the instrument can be transported by commonly used means of transportation.
3. During transportation, avoid dropping and being exposed to rain and snow. The instrument should be placed in a place without rain or snow infiltration and with good air circulation.

Chapter 9 Online System Software

9.1 Introduction

The pressure detection online system software is a multifunctional analysis software developed by Jinan Langrui Testing Technology Co., Ltd. for processing adhesive strength and anchoring force detection data. The software has a user-friendly interface and is easy to operate, designed specifically for engineering testing personnel.

9.2 Software Installation

For the first use, open the official website of www.langryndt.com, find the corresponding model in the pull detection category of the product center, and enter its product details page. Click on the relevant download button in the upper right corner to download and install the online system software, and then you can start using it.

9.3 Data Transmission

After connecting the instrument to the computer host using a USB data cable, ensure that the instrument is turned on, open the online system software, click on the "Online" option in the title bar, select the "Auto Import" option from the drop-down menu, and click on it. In the pop-up dialog box, select to import all components or import some components. After selecting, click "Import". The instrument will automatically upload the selected component data. The upload process does not require any operation of the instrument.

9.4 Data Processing

The online system can process all components and data.

9.4.1Detecting component data

Click on any component in the selected component list area to view its curve.
Right click anywhere on the curve graph to perform operations such as copying, saving, printing, scaling, automatic adjustment, and attribute settings on the curve; Through

attribute settings, the title, axis label marks, scale labels, and other items of the curve chart can be adjusted.

9.4.2 Inspection Report

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

Right click on the "Detection Report" node in the tree diagram 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; The composition of the detection report can also be modified.

9.4.3 Component deletion

Select the component that needs to be deleted, right-click and select the Data Processing menu to delete the selected component.

The deleted component data can be viewed and restored within the deleted component; The deleted detection report cannot be viewed and restored.

9.5 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 to preview the print; Printing operations can also be performed on the print preview interface.

9.6 Data Saving

Select the file menu and click "Save" or "Save As" to save the current data file with a file extension of. xyl.

9.7 Version upgrade

9.7.1 Instrument version upgrade

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

9.7.2 Software version upgrade

Select the Help menu and click on 'Version Update' to check or upgrade the version of the online system software.

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V1.2

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