SMART SENSOR®

Model: AR931

Divided Film/ Coating Thickness Gauge

User's Manual

Version number:SZ931-0

Preface:

➤ Thank you for you purchase our company's product.

➤ This manual provides relative information on how to use this product and measurement functions of it as well as warnings on its use. To make the best use of this product's functions, read this manual thoroughly before use. Please keep this manual handy for ease for reference.

➤ Please be sure to do some test measurement to make sure it is performing properly before musing it for real.

Contents

Statement

a. The product design and the manual updating, repairing by technician authorize by us, do not try any alternations or repair attempts.

b. Dispose of battery should be in accordance with local laws and regulations.

IntelliSafe CE

ISO 9001 UKAS

1.Before use notice

Check-up

Carefully unpack your kit after you purchased this product and ensure that you have the following items. In the event that any item is missing, or if you find any miss- match or damage or the manual appearing to lack page, etc. That result in seriously influencing the reading. Please promptly contact your dealer.

➤ Digital coating thickness tester main unit	1PCS
➤ Sensor	1PCS
➤ 9- Volt alkaline battery	1PCS
➤ Chinese Instruction Manual	1PCS
➤ English Instruction Manual	1PCS
➤ Maintenance Card	1PCS
➤ Standard sheet gauge	6PCS
➤ Iron base material for calibration	1PCS
➤ Aluminum Packing Box	1PCS

Maintenance and warranty

Maintenance:

1). Replacement and upkeep of battery:
a. After power on, if an icon ⊏⊐ appears on the LCD, you need to replace the battery immediately, for details please refer figures and contents on page 9 of this manual.
b. Remove the battery from the unit if it is not required for extended periods of time in order to avoid damage to the battery compartment and the erosion resulting from a battery leakage.
2. Do not store or use the unit in following circumstances:
a. Splashes of water or high levels of dust.
b. Air of high salt or sulphur content.
c. Air mixed with other gases or contents.
d. High temperature or humidity (above50℃, 90%,) or direct sunlight.
3. Do not disassemble the unit or attempt any internal alterations.
4. Never use alcohol or diluents to clean the housing for doing that will especially erode the LCD surface; just clean the unit lightly as needed with little clean water.

Warranty

1). About relative warranties please read warranty card.
2). We disclaim any liability due to: client's transportation damages; incorrect use or operation; manipulation, alterations or repair attempts; without warranty card, invoice.

Other Items

Check whether the substrate's thickness go beyond the critical thickness or not.

c. Verge effect:
You should not measure at the distortion, for example, verge, hold or inner turn angle and so on.

d. Curvature:
You should not measured at the distorted surface.

e. He reading number:
Because the data you read will not same all the time, so you should read several value at one measurement. The part difference of the coating also request measure several time especially when the surface is rough.

f. Cleanness of surface:
You should clear all the attachment before the measurement, for example, dust, grease, erode things and so on, but do not removed anything contained in the coating.

3. Instruction about the measurement result:

a. Single measurement is not credibility at statistics point. So all the value displayed by the tester are average value. The time after time measurement is complete by detect head and tester within one second.

b. To make the measurement more precision, you can measure several times, and then delete the big error one, at last use the tester's analysis function to get five statistical data: average value (AVG), MAX, MIN, standard warp (dFR), data number (NO).

c. According to the international standard, the final measure result can expressed as the following formula:

CH= A+/-2D

CH---The thickness of the coating.

A----The average value of the measure data (AVG)

D----Standard warp (dFR)

Introduction

This product using magnetic induction thickness measurement method, the thickness equipment specially designed to perform small, fast, accurate and non- destructive thickness measurement of coating and plating on steel magnetic conductor. It is widely used on manufacturing, workshop, chemistry or quality measuring range.

Feature and functions

➤ LCD display measurement result and condition directly.

➤ Using Hi-sensibility sensor for precise measure.

➤ 0 point, 2 point and basic, three different calibration modes for quick and easy to process the system tolerance calibration.

➤ Single, continually and difference, three different measure mode.

➤ Result data can record, check and delete into the unit memory.

➤ The instruments can do some simple data analysis, like maximum, minimum, mean, standard deviation, and measure times.

➤ Buzzer notice function.

➤ Unit can convert between the Imperial and Metric system unit.

➤ Low Battery notice function.

➤ Auto power off function.

➤ LCD backlight function.

Specifications

1.Measurement range and tolerance:

Range	Resolution	Tolerance
0~1800μm	0.1um/1μm	±(3%H+1μm)

Remark: H= Nominal transformation ratio

2.Condition of Objective material:

➤ Suitable for measure about non magnetic coating on magnetic conductor base material.

➤ The base material minimum curvature radius. Protruding=2mm Concave= 11mm

➤ Base material minimum diameter: 12mm

➤ Base material limit thickness: 0.5mm

3.Other Specification:

Technical parameter	Technical index
LCD display	3 digits half number display
Power supply	9V alkaline battery
Operation current	Around 18mA
Battery life	Continuously 20 hour usage
Auto off	After 1 min. haven't manipulated
LCD backlight function	After 7 sec. haven't manipulated
Operation temperature	0~40℃
Operation humidity	10~95%RH
Low battery indication	7.0V±0.2V
Product size	70x30x150mm
Weight	129g (without battery)

incidental error. If the sub-strate metal is rough, you must adjust ZERO point on the substrate metal which is not coated and has similar roughness with the target one; or you can use impregnant which cannot erode the substrate metal to dissolve the coating, and then to adjus tthe ZERO point.

f.Magnetic field:
The strong magnetic which generated by wiring can badly affect the measurement precision of magnetism method.

g.Attachment:
The tester is sensitive to the attachment which can prevent the test head contact the costing, so you must clear the attachment to sure the tester's head contact the surface target piece closely.

h.The detect head's pressure:
The pressure on the target piece can affect the measurement value, so the tester uses spring to generate a steady pressure.

i.Detect head's placement:
How the detect head placed can affect the measurement. You should be sure the detect head and the target piece's is vertical.

j.The target piece's distortion
The detect head can make the target piece of soft coating distort, if the distortion is too big, the measurement value will not correct.

2.The regulation when you are using the tester:
a.The basic metal property
The standard piece's metal magnetism and surface roughness should similar with the target one.
B.The thickness of the substrate:

Other Items

3.Other items

Attentions

1.Factors which affect the measurement precision and some
  instruction:
 a.Magnetism of substrate metal:
   The magnetism change of substrate metal affect the me-
   asure result of magnetism method (the magnetism change
   of low carbon steel can be considered lightly change of
   low carbon steel can be considered lightly in real life),
   to avoid the effect of heat treatment and cold process,
   you should choose a standard piece which have the
   same property as the target substrate to adjust the tester,
   you also can use a piece which is not coated to adjust.
 b.Thickness of substrate metal:
   Every instrument has a substrate metal critical thickness.
   Bigger than the thickness, the measurement will not be
   affected by substrate metal thickness. This tester's
   critical thickness is less than 0.5mm according to the
   production specification.
 c.Verge effect:
   The tester is sensitive to the steep change of the target
   piece you want to measure. So the measurement
 d.Curvature:
   The curvature of the target piece can affect the measur-
   ement result. This effect will increase as the curvature's
   radius reduced.
 e.Roughness degree of the surface:
   The roughness degrees of substrate metal and coating
   can affect the measurement. Rough surface will cause
   system error and incidental error. You should increase
   the measurement number at different place to reduce

Main parts explanations
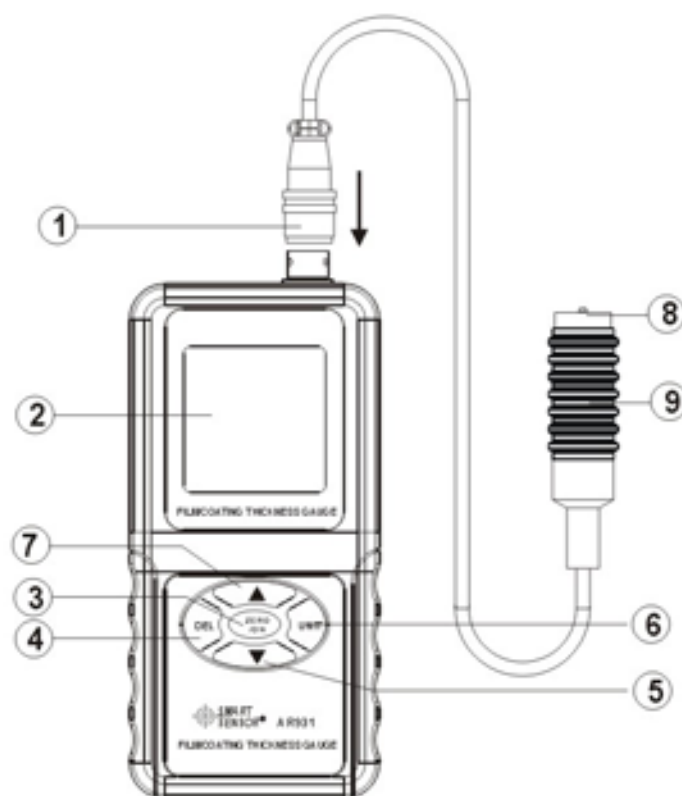
1. Connector (With direction indicator)

2. LCD display

3. ⬭ : Power on/ Set zero

4. ⬭ : Data delete key

5. ⬭: Menu (single measure SNG, Continuously

   measure CTN, Average measure Average,

   Maximum measure MAX) Search upward and

   basic calibration key

6. ⬭ : Unit convert between the metric system and

   British system

7. ⬭: Menu (single measure SNG, Continuously

   measure CTN, Average measure AVG, Maximum

   measure MAX) Search upward and delete all

   data key

8. Sensor

9. Rubber cover

▤ Note:

   Above key function descriptions just are simply
   introduction, for details please read operation
   instructions part in this manual.

Display Data Number (NO):

▤ Caution:

   a.when the measurement number is flashing, please
   press " ⬭ " key to stop it. And press "▼" / "▲"
   key to change mode.

   b.The displayed value in the operation instruction is
   merely a example to explain the operate method, you
   should follow the practice measured value.

   c.If there is nothing operation for 1 min, the tester
   willpower off auto matically.

Data analysis

The tester can analyze data automatically after have measured several group data, press "▼" / "▲" key to change mode, LCD will display average value (AVG), displayed as following picture at this time:

Display average value (AVG):

302
μm
AVG

Display Maximum value (MAX):

1089
μm
MAX

Display Minimum value (MIN):

1.3
μm
MIN

Display Standard warp (dFR):

263
μm
dFR

LCD display instruction

1. 🔋 Battery mark shows current residual battery power. has following 5 grades:
    🔋 : Battery is sufficient
    🔋 : Battery is comparative sufficient
    🔋 : Battery is nearly deficient
    🔋 : Battery is nearly exhausted, need to have a replacement
    🔋 : Battery in exhausted completely
2. Measure value dynamic bar
3. **Fe** : Measurements on steel or iron substrate
4. Measurement value display area
5. Measurement mode, Data analysis indication
6. **M** : Memory recordation status
7. **μmil** : Imperial/ Metric system unit change (1mil= 0.0254mm=25.4μm)
8. Recorded data display
9. Measuring range symbol
10. 💡 : Backlight indication, the backlight will off after 7 sec. haven't operation when measure

Need To Know Before Use

2.Operation instructions

Substrate ad standard piece

➤ Standard piece:
  a.The entire measured sample you can choose for
    standard calibration piece. Shortened form standard
    piece.
  b.The coated standard piece must choose inform
    thickness, uniformity and have a strong bonding
    non- magnetic coating.

➤ Substrate:
  a.The standard substrate's roughness and magnetism,
    must as close as the target testing material. For
    identification the substrate suitability, can compare
    standard substrate with the target testing piece
    standard substrate with the target testing piece
    substrate's measured data.
  b.If the target testing piece substrate's thickness under
    the regulated thickness range, this instrument can take
    two methods to adjust as following.
    1). Adjust on the standard piece which has the some
      thickness with the target testing piece. Property
    2). Use a standard metal gasket piece which have
      enough thickness and similar magnetic and electricity
      property or a testing piece, but must be sure that
      there is not spacing between substrate metal and
      gasket metal
  c. If e curvature is too big to adjust on plane, the coating
    standard piece's curvature should the same as the
    target testing piece's curvature.

Memory data record/ check and delete

1.Record:
  The tester will record the measurement result automat-
  ically and the measurement quantity will add 1 after every
  measurement, the quantity will increase until 15.
  If the measurement is go ahead at this time, LCD will
  merely display the measurement value, but not record it.

2.Check:
  You can press "▲" and "▼" key to look over the
  measurement value when he measurement quantity is
  flashing.

3.Delete
  a.Delete the current data: when the measurement
    value is apparently error, the record must be deleted,
    press the "▼" key to make the measurement value
    back to the above one when the measurement quantity
    is flashing, and measure again for precise value.
  b.Delete all the data: you can delete all data by press
    the " DEL " key for 2 second when the measurement
    quantity is flashing.

Coating tolerance measurement

➤ Press turn on the tester, and press "▼" / "▲" key to change the test mode, when LCD display "DIF", that mean the tester stand by in coating tolerance measurement mode.

➤ Place the sensor head to the target piece you want to measure, then press the detect head lightly to measure, the buzzer will sounded, LCD will display the absolute value which is the before value subtract the current value, LCD displayed as following picture at this time:
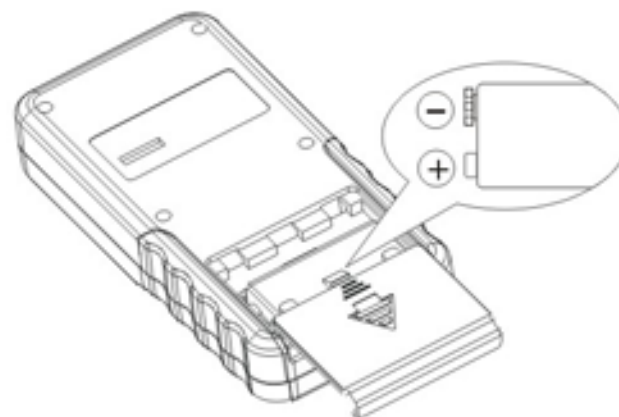

Battery installment

a. Grip tightly the unit body with your left hand; hold down the battery door with your right hand thumb to open it according to the arrow referring direction, as shown in following figure:

b. Insert the 9V battery into battery compartment, note the battery polarity, and then close the battery door, as shown in following figure:

Connect between handle sub- unit and main unit

➤ Pay attention to indicator direction

Same direction

Main unit plug   Sensor plug
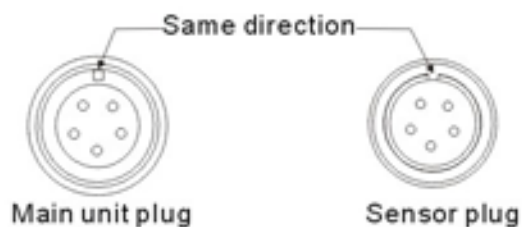
➤ Plug in and Plug-out method:

When plug in, plug-in the sensor plug into the main

unit's sensor socket with same direction. Press until

the sensor plug produces a locking sound to ensure

the connection was in a locking status.

When plug out, push up the sensor plug's metal cover

to disable the locking status. Then pull out the sensor

plug.

Continuous measurement

➤ Turn -on open the tester, and press "▼" / "▲" key to change the test mode, when LCD display CTN, tat is to say you have into Continuous measurement mode.

CTN 1 100 µm

➤ If product is in other mode , and the measure value is flashing. It can press " 🔲 " key for change measuring mode.

➤ Place the detect head to the target piece you want to measure, and then press the detect head lightly to measure, the buzzer will not sounded during the measurement, LCD will display the measure result continuously until the detect is lifted, the last measure value will be saved in the test automatically, the quantity of the data are also be memorized, LCD display 1 at the same time., LCD displayed as following picture at this time:

180 µm

CTN 1 180 µm

Operation
Explanations

➤ When the second measurement finished, CTN counter will automatic upgrade to 2. The maximum CTN counter is 15. When it is full, it will stop to increase the number.

➤ Every time detect head contact the test surface vertically, buzzer will sound at the same time, and LCD will display test result, if you want to test for another time, you must lift the detect head, and then repeat the operation above.
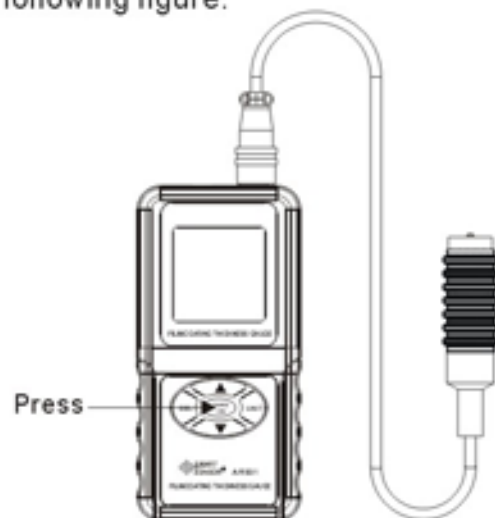
📄 Caution:
   If the detect head contact the iron basic too closed when you open the tester to self- check, LCD will display ERR.

Turn on the unit and check-up battery

➤ Press the " " key to start the unit, as shown in following figure:

Press

➤ After the entire screen displays for 1 second, the default state is acceleration mode ,if this time on the LCD screen displays the symbol ⊏⊐ or ⊏⊐ , please promptly replace the battery, as shown in following figure:

Low battery indication

Operation Explanations

Instrument calibration

   To increase the test result is more precise; please calibrate the instrument at the test place. The instrument has three different calibrations to suit the needs of the user: zero point calibration, two point calibration, and basic calibration.

➤ Zero point calibration:
   a. Carry a measurement on a standard substrate or on an uncoated substrate. LCD display a data, for example, 0.3 μm, like the following picture:

Fe substrate ⟶
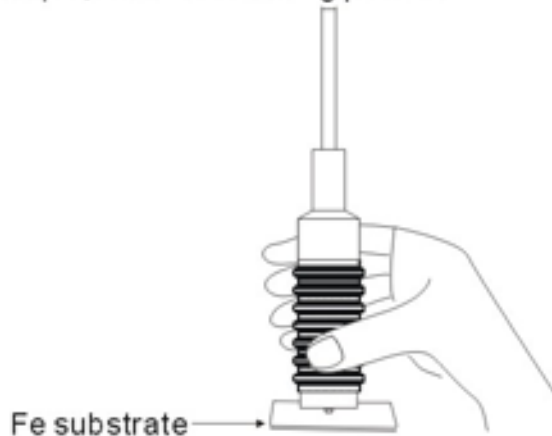
   b. Do not lift the detect head and press the ⬯ key, the buzzer will sound, that signal you have complete zero point calibrate. LCD displayed like the following picture at this time:

Single measurement

➤ Prepared target piece you want to test.

➤ Press " ⬯ " key to open the tester, the buzzer will sounded, the tester into the tolerant test mode single test mode, LCD displayed as following picture at this time:

➤ Make detect head contact the test surface vertically and press the detect head lightly, LCD display a value, for example, 109 μm, and buzzer sounded at this time, LCD displayed as following picture at this time:

Operation Explanations

Convert between the Imperial and Metric system unit.

➤ Press " (ZERO HP) " key to open the tester, the buzzer will sounded, and then press UP/ DOWN key to change the test mode, when LCD display UNT, that is to say you have into unit change mode.
The tolerant m, LCD displayed as following picture at this time:

➤ Press " (UNT) " key, you can change m to mil or you can change mil to m, LCD displayed as following picture at this time:

c. If you want to correctly adjusted, you must repeat a and b to make basic measure value less than 1 μm, this can improve measurement precision.

➤

Two point calibration:
a. Calibrate zero point first.
b. Carry a measurement on the standard piece which thickness approx. equal to the target piece. (Like 1000 μm). If the LCD display 1008 μm, like the following picture:

Fe substrate

c. Do not lift the detect head and press the " ▲ " and " ▼ " key to correct the read value, after these adjustment is complete, you can measure at this time. LCD displayed like the following picture at this time:

If you want to point calibration adjusted correctly, you can repeat b and c to improve measurement precision and reduce incidental error.

➤ Basic calibration:
It is necessary to change the basic calibration under the following conditions:
--- The top of the detect head is wear and tear.
--- After the detect head is amended.
--- Special use
--- The tester is not used or adjusted (zero adjustment) for a long time.
If the error go beyond the regulate range during the measurement, it is necessary to adjust the detect head for another time, this is named basic calibration. Though input seven adjust the detect head. The operation method of basic calibration is as following:
a. Prepare six standard pieces, and six standard base materials.
b. Hold the "▲" key and press the "⊙" key when the tester is closed until LCD displayed as following:
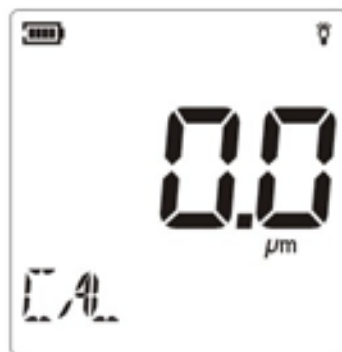
When appear the value 0.0um, you can carry zero adjustment to iron basic.
c. Lift the detect head, appear a value at 45~55, for example, 48.0, LCD displayed as following at this time:

Choose a standard piece, its thickness it at 45~55, press "▲" and "▼" key to amend the display value, make the display value accord with the standard piece's thickness, and then place the standard piece on the iron basic to adjust.
d. Lift the detect head for another time, appear a value at 95~105, for example: 100, LCD displayed as following picture at this time:
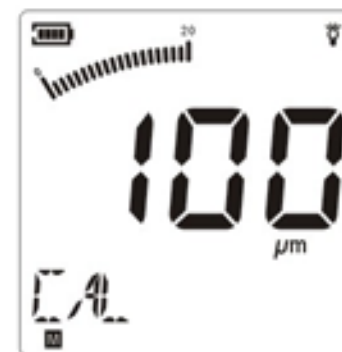
Choose a standard piece, its thickness is at 95~105, press "▲" and "▼" key to amend the display value, make the display value accord with the standard piece's thickness, and then place the standard piece on the iron basic to adjust.
e. Like this, until the last one is adjusted, the tester will close automatically and the new adjust value has been saved in the tester. The tester will work follow the new adjust value when you use it next time.

Operation Explanations