

## **Electrical Steel Testing**







Product Catalog

Tunkia Co., Ltd.

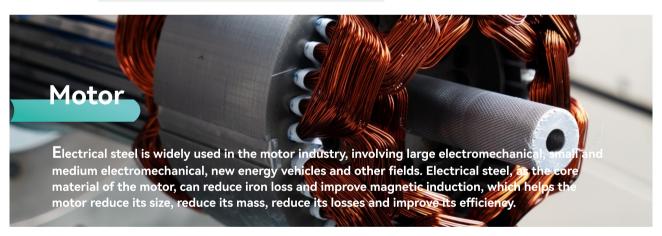
长沙天恒测控技术有限公司



## **About Electrical Steel**

Cold-rolled electrical steel is divided into oriented electrical steel and non-oriented electrical steel according to the orientation of the internal grains. The grains of grain-oriented electrical steel are basically oriented in one direction and have a high silicon content. They are mainly used in transformer manufacturing. Non-oriented electrical steel has chaotic grain distribution and low silicon content, and is mainly used in motor manufacturing.

Electrical steel is an important soft magnetic alloy that is indispensable in the electric power and electrical appliance industries. It is widely used in the electric power and telecommunications industries to manufacture generators, motors, transformers, transformers and other equipment. It is widely used in the electric power industry, rail transit, electrical appliance industry, and new energy. plays a very important role in emerging industries such as automobiles.





## TUNKIA product system covers the whole production process of Electrical Steel

Production, Classification





Silicon Steel Magnetic Properties Online Testing System

**Batch Testing** 





Automatic Measurement System For Magnetic Properties Of Electrical Steel Sheets



Semi-finished Products (Iron Core)



Electrical Steel Core Magnetic Measurement Device



Finished
Product
(Transformer)



Transformer Core Loss Test System





Calibration System For Electrical Steel Sheet Measuring Device

Traceability Of
Magnetic Measuring Instrument



- > 3 International Standards Revision
  - 18 National Standards Revision
  - **24** Metrological Specifications Revision

International Standard	IEC 63300:2023	Test methods for electrical and magnetic properties of magnetic powder cores
	IEC 60404-17:2021	Methods of measurement of the magnetostriction characteristics of grain-oriented electrical steel strip and sheet by means of a single sheet tester and an optical sensor
	IEC 61007:2020	Transformers and inductors for use in electronic and telecommunication equipment - Measuring methods and test procedures
National Standard	GB/T 3655-2022	Methods of measurement of the magnetic properties of electrical steelstrip and sheet by means of an Epstein frame
	GB/T 13789-2022	Methods of measurement of the magnetic properties of electrical steel strip and sheet by means of a single sheet tester
	GB/T 19346.3-2021	Methods of measurement of amorphous and nanocrystalline alloys part 3: AC magnetic properties of Fe-based amorphous strip using a single sheet specimen
	GB/T 19345.1-2017	Amorphous and nanocrystalline alloys part 1:Fe-based amorphous soft magnetic alloy strips
	GB/T 10129-2019	Methods of measurement of magnetic properties of electrical steel strip and sheet at medium frequencies
	GB/T 19289-2019	Methods of measurement of resistivity, density and stacking factor of electrical steel strip and sheet
	GB/T 39042-2020	Measurement of the magnetic properties of electrical steels by means of a single sheet testerH-coil method
	GB/T 3656-2022	Methods of coercivity measurement of magnetic iron and magnetically soft alloy by pulling out procedure
	GB/T 3656-2022	Methods of measurement of the magnetic properties of magnetically soft metallic and powder materials at frequencies in the range 20 Hz to 100 kHz by the use of ring specimens
	YB/T 4731-2019	Reverse bend test method for electrical steel strip and sheet







31 Invention Patents

29 Utility Model Patents

13 Design Patents



**76 Software Copyrights** 



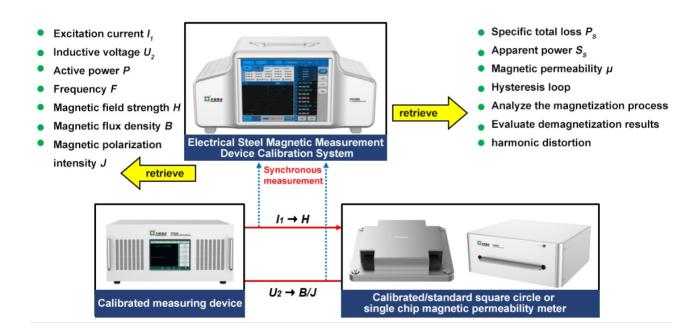
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### **TH8010**

## Electrical Steel Magnetic Measurement Device Calibration System



TH8010 is an instrument specially used for traceability calibration of electrical steel magnetic measuring devices. Its absolute measurement uncertainty is at least 3 times higher than the accuracy of the current mainstream commercial magnetic measuring instruments in the world (excluding errors caused by SST and EPS). The magnetic parameters can be traced back to basic electromagnetic physical quantities, and the performance of the electrical steel magnetic detector can be comprehensively analyzed.



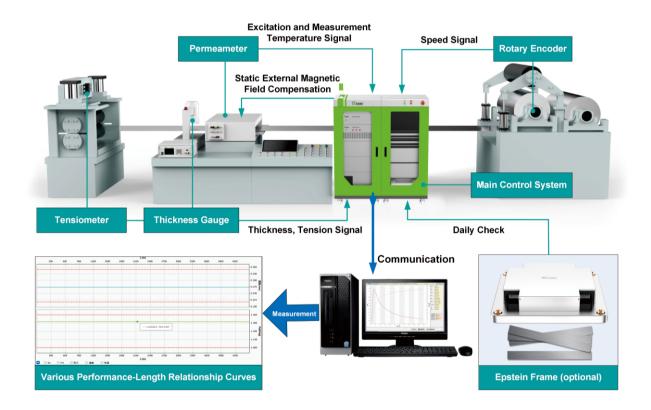
- Supports various electrical parameter measurements within the frequency range of DC to 10 kHz.
- Supports three measurement modes: average, peak, and effective value.
- The voltage/current accuracy reaches class 0.01, and the power reaches class 0.02.
- It can also ensure accurate measurement of iron loss under high frequency, low power factor and high magnetic induction
- Calibrate the magnetic measuring device using the square circle method or monolithic method manufactured on the principle of M.C method (current measurement method).
- Calibrate the electrical steel magnetic measurement device manufactured using the H-coil method (magnetic field coil method) principle.
- Combined with a highly stable excitation power supply, to establish a high-precision magnetic measurement system.

### **TD9100**

## Online Testing System for Magnetic Properties of Silicon Strip



TD9100 is a system dedicated to online real-time testing of magnetic properties of cold-rolled silicon steel. Through rapid magnetization and measurement of steel strips running on the production line, combined with real-time collected thickness, speed, stress and other signals, it is converted into iron loss, Measurement results of magnetic field strength, magnetic flux density, etc. 7\*24-hour automatic uninterrupted detection provides accurate and effective testing and evaluation help steel mills to carry out quality control, model selection, and improvement of process level.



- The measurement of magnetic field strength has two options: current method (M.C method) and magnetic field coil method (H-Coil method).
- The iron loss measurement cycle is shortened to 100 ms.
- Testing Ps or Bm of steel strip, and drawing hysteresis loop, P-L or  $\delta$ -L curves.
- The software can set the upper and lower limits of loss or thickness, and the test data will give a warning if the test data exceeds the limit.
- Standard square ring can be configured for daily verification of instrument loss, magnetic field strength, and magnetic flux density measurement accuracy.

## **Electrical Steel Sheet Magnetic Properties Automatic Measurement System**



TS3200 is a fully automated measuring system for electrical steel magnetic property frame (EPS) with high degree of automation, high reliability, high efficiency, traceability and easy maintenance. It is compatible with loading, weighing, inserting, Epstein frame magnetic property measurement, stacking coefficient measurement, tape sealing, and unloading, etc. It is a one-stop solution to solve the problem of electrical steel from inspection to device traceability.

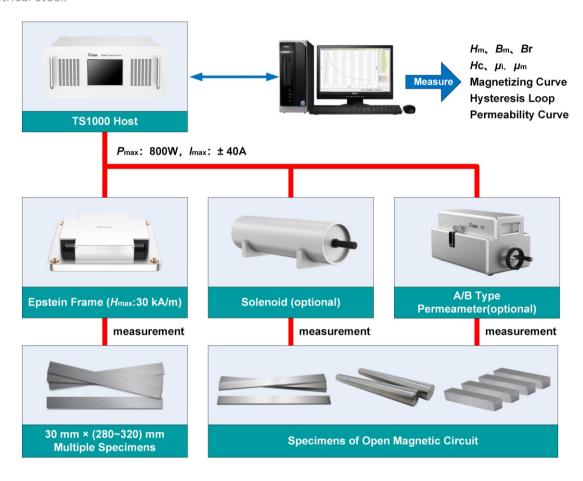


- Fully automatic loading-calibrating-data uploading-unloading.
- Can run 24 hours non-stop.
- · Supports AGV, conveyor belt, manual loading.
- Typical measurement speed: 350 pairs/ 24 hours.
- Testing frequency: 40 Hz~ 1 kHz optional.
- Ensures personal, functional and information security.
- Reliability, fault tolerance, scalability, easy maintenance.
- Data fusion and sharing, data comparability and consistency.
- The device is equipped with calibration interface and calibration operation space.

## DC Magnetic Properties Measuring System for Electrical Steel



TS1000 is a special instrument for measuring the DC magnetic properties of electrical steel. It consists of excitation and measurement host, Epstein frame, solenoid (optional), A/B type Permeameter(optional), computer software, etc. It is suitable for comprehensive analysis of DC magnetic characteristics of electrical steel.

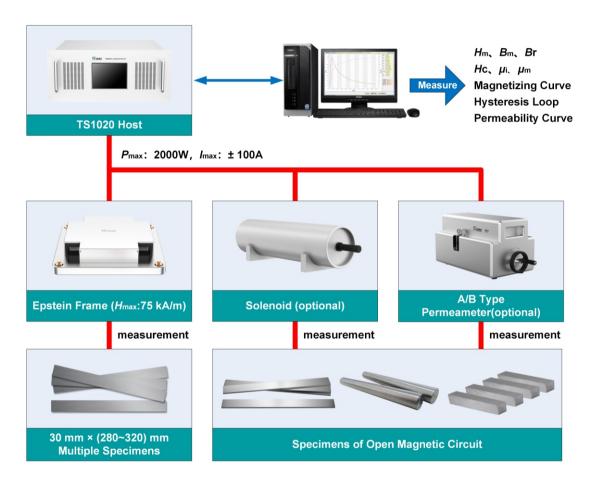


- Electrical parameters calibration function.
- Maximum magnetization field reaches 30 kA/m (700 T Epstein frame).
- · Slowly reduce amplitude demagnetization for specimen.
- Ultra-wide range of current continuously and stably regulated.
- Software controlled automatic measurement.
- Automatic calculates magnetic parameters and curves.
- Modular design, easy to upgrade and maintain.

## DC Magnetic Properties Measuring System for Yoke Steel



TS1020 is a special instrument for measuring the DC magnetic properties of yoke steel. It consists of excitation and measurement host, Epstein frame, solenoid (optional), A/B Type Permeameter(optional), computer software, etc. It is suitable for comprehensive analysis of DC magnetic characteristics of yoke steel.

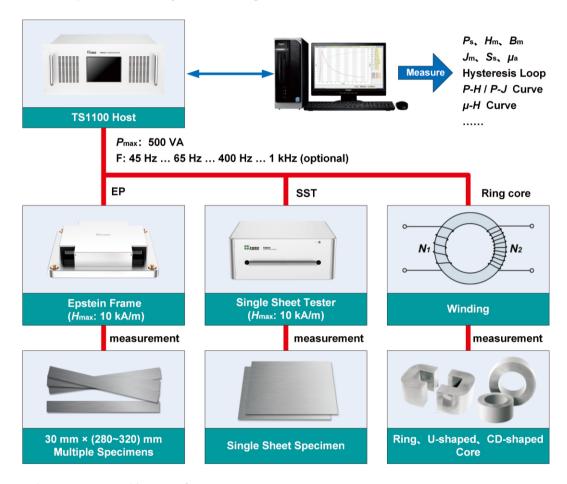


- · Electrical parameters calibration function.
- Maximum magnetization field reaches 75 kA/m (700 T Epstein frame).
- Slowly reduce amplitude demagnetization for specimen.
- Ultra-wide range of current continuously and stably regulated.
- Software controlled automatic measurement.
- Automatic calculates magnetic parameters and curves.
- · Modular design, easy to upgrade or maintenance.

## AC Magnetic Properties Measuring System for Electrical Steel



TS1100 is a special instrument for measuring the AC magnetic properties of electrical steel. It consists of excitation and measurement host, Epstein frame, Single Sheet Tester (optional), computer software, etc. It is suitable for comprehensive analysis of AC magnetic characteristics of electrical steel or core.

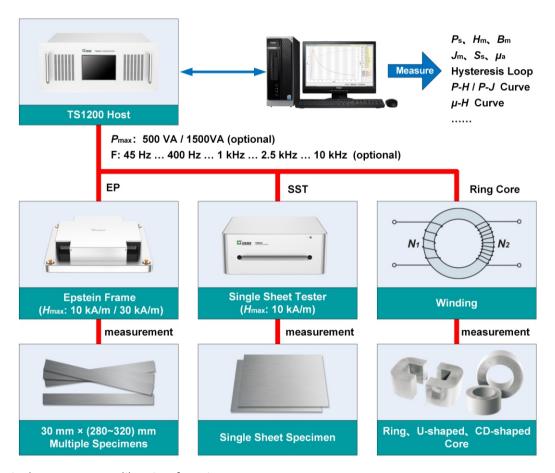


- · Electrical parameters calibration function.
- Measurement Frequency Range: 45Hz~1kHz
- Measurement of magnetic field by M.C.
- Maximum magnetization field reaches 10 kA/m (700 T Epstein frame).
- · Slowly reduce amplitude demagnetization for specimen.
- Software controlled automatic measurement.
- · Automatic multi-point measurement.
- The software has been configured with multiple measurement schemes
- Automatic calculates magnetic parameters and curves.

## AC Magnetic Properties Measuring System for Electrical Steel



TS1200 is a special instrument for measuring the AC magnetic properties of electrical steel. It consists of excitation and measurement host, Epstein frame, Single Sheet Tester (optional), computer software, etc. It is suitable for comprehensive analysis of AC magnetic characteristics of electrical steel or core.

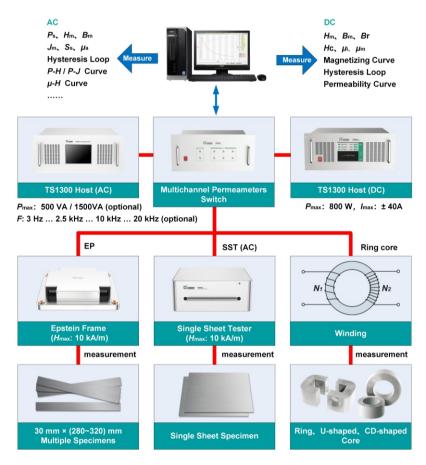


- Electrical parameters calibration function.
- Measurement Frequency Range: 45Hz~10kHz
- Measurement of magnetic field by M.C and H-Coil (optional).
- Maximum magnetization field reaches 30 kA/m (700 T Epstein frame).
- 2 ~ 63 harmonics influence measurement (optional).
- Slowly reduce amplitude demagnetization for specimen.
- Software controlled automatic measurement.
- Automatic multi-point measurement.
- Automatic calculates magnetic parameters and curves.

## AC/DC Magnetic Properties Measuring System for Electrical Steel



TS1300 is a special instrument for measuring the AC/DC magnetic properties of electrical steel. It consists of excitation and measurement host (AC and DC), Epstein frame, Single Sheet Tester (optional), computer software, etc. It is suitable for comprehensive analysis of AC magnetic characteristics of electrical steel or core.

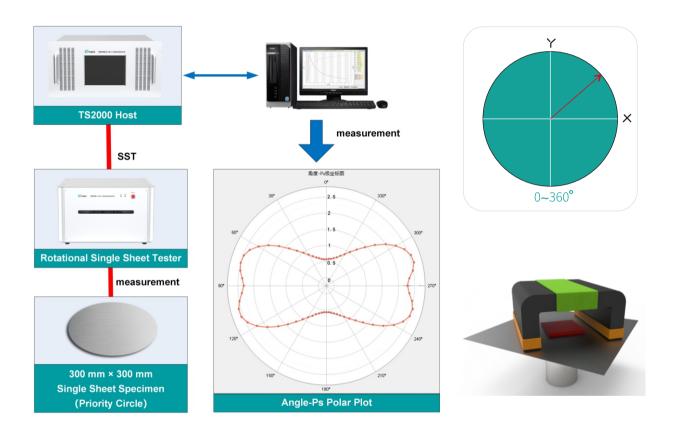


- Electrical parameters calibration function.
- Measurement of magnetic field by M.C and H-Coil (optional).
- Maximum magnetization field reaches 30 kA/m (700 T Epstein frame).
- The maximum frequency can be selected to 20kHz.
- 2 ~ 63 harmonics influence measurement (optional).
- The software has been configured with multiple measurement schemes.
- · Automatic multi-point measurement.
- Ultra-wide range of current continuously and stably regulated.
- Switch the Permeameter by software without repeated wiring.

## Rotational Magnetic Properties Measuring System for Electrical Steel



TS2000 is a special instrument for measuring orientation (full angle) magnetic properties of electrical steel sheet. The magnetic properties of the specimens can be measured within a certain frequency range from  $0^{\circ}$  to  $360^{\circ}$ .

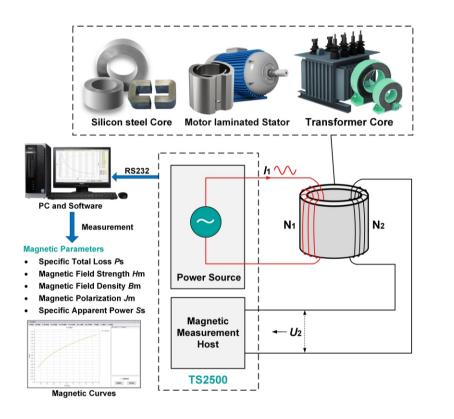


- Electrical parameters calibration function.
- Operators only need to insert a single specimen into the Permeameter to test.
- · Measurement of magnetic field by M.C and H-Coil
- · Slowly reduce amplitude demagnetization for specimen.
- · Software controlled automatic measurement.
- The software has been configured with multiple measurement schemes
- · Automatic calculates magnetic parameters and curves.
- · Modular design, easy to upgrade or maintenance.

## Magnetic Properties Measuring System for Electrical Steel Cores



TS2500 consists of excitation and measurement host, automatic measurement software. It can automatically measure the iron loss and other magnetic parameters of the motor stator core or other types of electrical steel core within a certain frequency range





- Electrical parameters calibration function.
- Testing frequency: 50Hz or 60Hz (400Hz, 1kHz is optional).
- Testing mode: setting H to measure B or setting B to measure Ps.
- · Testing in full frequency range with good accuracy and repeatability.
- · Automatically testing with professional software.
- · Automatically calculating magnetic parameters and curves.
- · Complete curves drawing and data management functions.
- Multi-strand wire is customizable to simplify winding process.

## Iron Loss Fast Tester for Electrical Steel Sheets



TS2600 is an instrument used to quickly measure the AC magnetic properties of electrical steel sheets. It can quickly measure Ps of electrical steel sheets.



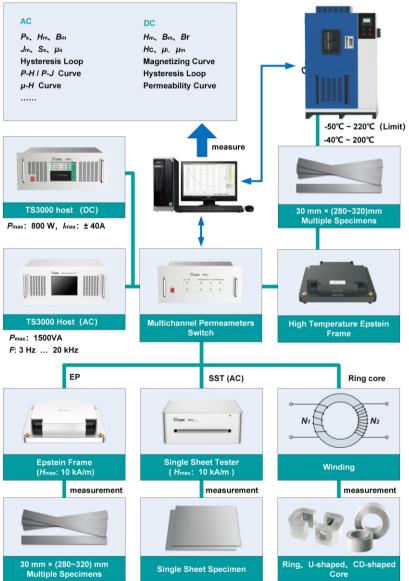
- Measurement Frequency Range: 45Hz~400Hz
- It can quickly measure the loss of multiple points.
- It can display a variety of magnetic parameters, including Ps, Jm, Hm.
- The user only needs to press the sheet tester under specimens to measure.
- Supports one-click storage and viewing of measurement data, including test date and time.
- Equipped with large size LCD touch color screen.

## Magnetic Properties Multifunction Measuring System for Electrical Steel



TS3000 is a special instrument for measuring the AC/DC magnetic properties of electrical steel under different temperature conditions. It consists of excitation and measurement host (AC and DC), several high temperature Epstein frames, single sheet tester (optional), Permeameter programcontrolled switching device, temperature controller, automatic measuring software, etc.



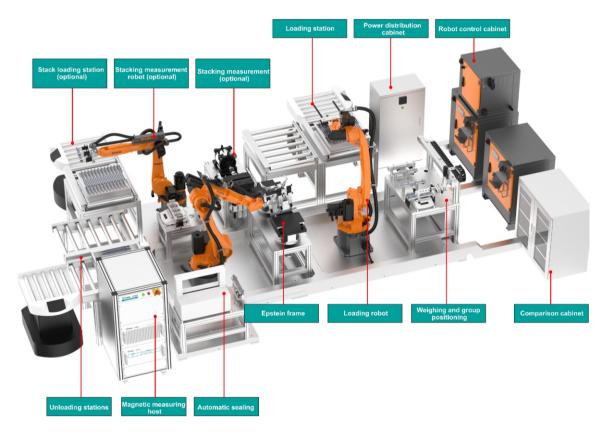


- Electrical parameters calibration function.
- Measurement of magnetic field by M.C and H-Coil (optional).
- Maximum magnetization field reaches 30 kA/m (700 T Epstein frame).
- The maximum frequency can be selected to 20kHz.
- 2 ~ 63 harmonics influence measurement (optional).

## **Electrical Steel Sheet Magnetic Properties Automatic Measurement System**



TS3200 is a fully automated measuring system for electrical steel magnetic property frame (EPS) with high degree of automation, high reliability, high efficiency, traceability and easy maintenance. It is compatible with loading, weighing, inserting, Epstein frame magnetic property measurement, stacking coefficient measurement, tape sealing, and unloading, etc. It is a one-stop solution to solve the problem of electrical steel from inspection to device traceability.



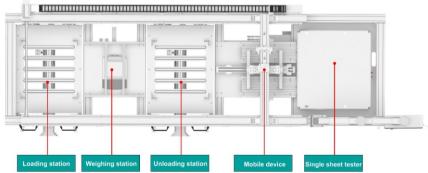
- Fully automatic loading-calibrating-data uploading-unloading.
- Can run 24 hours non-stop.
- · Supports AGV, conveyor belt, manual loading.
- Typical measurement speed: 350 pairs/ 24 hours.
- Testing frequency: 40 Hz~ 1 kHz optional.
- · Ensures personal, functional and information security.
- · Reliability, fault tolerance, scalability, easy maintenance.
- Data fusion and sharing, data comparability and consistency.
- The device is equipped with calibration interface and calibration operation space.

## Automatic Measurement System for Magnetic Properties of Electrical Steel Sheets



TS3210 is a fully automatic measurement system for large single piece of electrical steel with magnetic properties (SST) with high automation, high reliability, high efficiency, traceability and easy maintenance. It has the functions of loading, weighing, inserting chips, measuring the magnetic properties of large single chips, and unloading materials. TS3210 is a one–stop solution to the traceability problem of electrical steel from detection to device, and improve the detection capability and efficiency of electrical steel.





- Fully automatic loading-measuring-data uploading-unloading.
- Can run 24 hours a day continuously.
- Normally manual loading is used, but AGV and other loading methods can be customized.
- Typical measurement speed: 16 pieces/hour.
- Ensure personal safety, functional safety, and information security.
- · Reliability, fault tolerance, upgradeability, and easy maintenance.
- · Data fusion and sharing, data comparability and consistency.
- The equipment has a calibration interface and calibration operation space.
- Optional code reader (optional accessory) enables automatic code scanning.

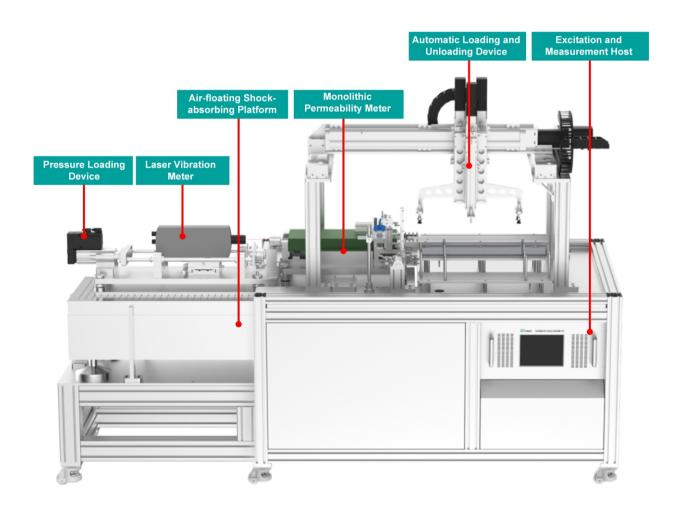
## **Electrical Steel Magnetostriction Measurement Device**



TS3300 is a device specially used to measure the magnetostriction coefficient of electrical steel sheets in the magnetization direction during the AC magnetization process.

The device consists of excitation and measurement devices, single sheet tester, pressure loading device (optional), laser vibrometer, air-floating shock-absorbing platform, automatic loading and unloading device (optional), protective cover, industrial control system and special test software.

This system can measure the magnetostriction coefficient  $\lambda$ , specific total loss Ps, specific apparent power Ss, magnetic polarization Jm, magnetic field strength Hm, amplitude magnetic permeability  $\mu$ a and other magnetic parameters of electrical steel under conditions such as different frequencies, magnetic field strengths, magnetic polarization strengths (or magnetic flux density), harmonics (optional), no stress or applied compressive stress (optional), suitable for research and development and quality testing of electrical steel. Reference standard: IEC 60404–17.



## Surface Insulation Resistance Measuring System for Electrical Steel



TS1700 is a special instrument for measuring the insulation resistance of electrical steel sheet. The instrument supports manual turning over to measure the interlayer resistance of electrical steel. The reference standard is IEC60404–11.



- Built-in DC stabilized power supply and precision current measurement unit, the measurement uncertainty is up to 0.1%.
- It consists of 2 auger bits, 10 metal rods with contacts, and pressure devices.
- It can drive the sample to move back and forth to find multiple different test areas and obtain multiple sets of test data. 1 to 5 groups of test points can be set.
- Equipped with standard resistance circuit board for daily verification of the system.
- Set test parameters through LCD touch screen, observe test status and results, easy to use.

# Surface Insulation Resistance Automatic Measuring System for Electrical Steel

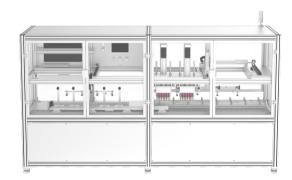


TS1710 is a special instrument for measuring the surface insulation resistance (single-sided) or interlayer resistance (double-sided) of electrical steel sheets. The reference standard is IEC60404-11.



Silicon Steel Sheet (1000 mm ~ 1200 mm) x 200 mm



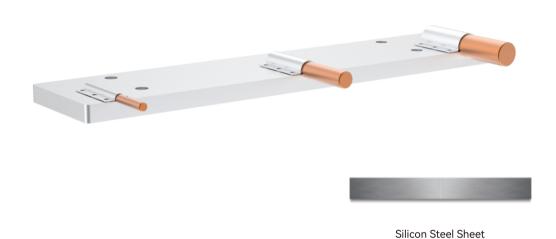


- Fully automatic loading materials turning over testing data uploading unloading.
- Automatically measure five different test areas, the front and back sides do not overlap.
- 24 hours of uninterrupted operation.
- The conventional method is manual loading, and AGV and other loading methods can be customized.
- Built-in precision DC stabilized power supply and precision DC current measurement unit.
- Equipped with standard resistance circuit board for daily verification of the system.

## Silicon Steel Sheet Coating Adhesion Tester



It is a device specially used to test the coating adhesion of silicon steel sheets. It consists of a fixed bracket, 10mm, 20mm and 30mm brass cylinders. It can be used for coating adhesion rating on electrical steel. It can be widely used in iron and steel metallurgical plants, transformer/motor manufacturers, etc. It is an indispensable equipment for performance testing of electrical steel.



 $30 \text{ mm x } (300 \pm 20) \text{ mm}$ 

- Device: It is a smooth-surfaced brass cylinder with diameters of 10mm, 20mm, and 30mm, and a tolerance of -0.5mm ~ +0.1mm. All three cylinders are fixed on the same bracket.
- Specimen: Cut a representative specimen parallel to the rolling direction at a distance of not less than 40mm from the edge of the steel strip (piece), and the coating of the specimen must not be damaged. The size of the specimen width is 30mm±0.2mm, length is 280mm~320mm. If there are special requirements, the supply and demand parties will negotiate and determine.

## Stacking Factor Measuring System for Electrical Steel Sheets



TS1780 is a special instrument for measuring the stacking factor of electrical steel sheet. It is mainly composed of precision electronic balances, metal splints, pressure pump, length measuring devices, and computer software. Reference standard: IEC 60404-13, GB/T 19289-2019, ASTM 719/719M, etc.



Silicon Steel Sheet 30 mm ~ 300 mm





- The pressure pump applies a pressure of about 1Mpa to the stacked sample.
- Accurately measuring the height of the two diagonal points of the stacked sample, and automatically transmits it to the computer.
- Multiple sets of sample information can be entered in advance to realize batch testing.
- Measuring the sample length, width, stacking height, mass, density and other data, and calculating the stacking coefficient f.
- After the software test is completed, the test report can be export or printing.

## **Bending Testing System for Electrical Steel Sheets**



TS1800 is a special instrument for bending testing of electrical steel sheet. It can test the performance of electrical steel sheet under plastic deformation in repeated bending. Reference standard: IEC TR 63114, YB/T 4731–2019.

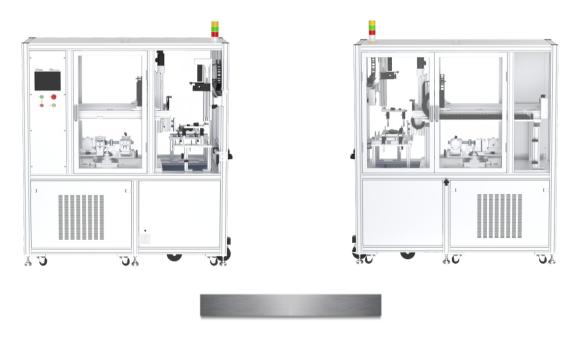


- Quick clamping of electrical steel sheet.
- The device can be easily fixed on the desktop by tightening screws and a vise at the bottom.
- The bending radius of the lower clamp is 5 mm, and the bending radius is not less than ±90°.
- The upper spring can exert stable tension on electrical steel sheet.
- The number of bends can be displayed.

## Bending Automatic Testing System for Electrical Steel Sheets



TS1810 is a special instrument for bending automatic testing of electrical steel sheet. It can fully automatically test the performance of electrical steel sheet under plastic deformation in repeated bending. Reference standard: IEC TR 63114, YB/T 4731–2019.



Silicon Steel Sheet  $30 \text{ mm x} (300 \pm 20) \text{ mm}$ 

- Fully automatic loading testing data uploading unloading.
- The bending times can be set in the range of  $0 \sim 9999$ .
- The counter displays the bending times in real time, and stops automatically after reaching the set
- It can automatically judge whether the bent specimen is cracked or broken (optional).
- · 24 hours of uninterrupted operation.
- The conventional method is manual loading, and AGV and other loading methods can be customized.

## **Epstein Frame**







- The Epstein frame is an accessory of magnetic properties measuring system for electrical steel, E.g. TS1000 / TS1020 / TS1100 / TS1200 / TS1300 / TS3000.
- The size of the tested specimens is 30 mm (W) × (280 ~ 320) mm (L).
- There are regular, medium frequency, high frequency, high temperature and other Epstein frame.
- · Magnetic field measurement methods: M.C and H-coil.
- The built-in coil of air flux compensation conforms to IEC60404-2 or IEC60404-10 standards.
- The cutting and placement of specimens shall comply with IEC60404-2.



**TS7500** 

## **Single Sheet Tester**





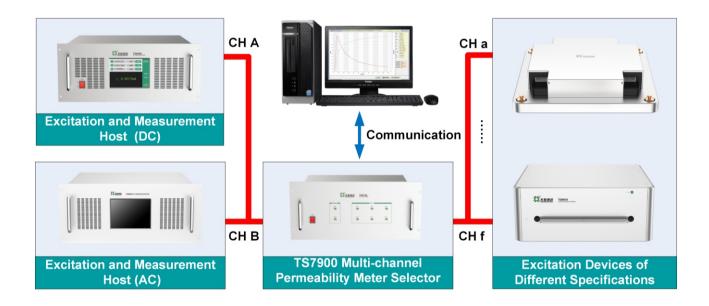
- The single sheet tester is an accessory of magnetic properties measuring system for electrical steel, E.g. TS1100 / TS1200 / TS1300 / TS3000.
- The single sheet tester can measure the magnetic properties of single sheet specimens of various sizes.
- Single sheet tester with basic edition, upgrade edition and multiple sizes is available.
- Magnetic field measurement methods: M.C and H-coil.
- The upgraded single sheet tester adds yoke loss winding and demagnetization winding.
- The cutting and placement of specimens shall comply with IEC60404-3.

## Multi-channel Permeability Meter Selector



It is an optional accessory for magnetic property measurement devices of electrical steel or soft magnetic materials. The excitation winding terminals and measurement winding terminals of multiple magnetic measurement devices (DC device or AC device) or excitation devices (Epstein square coil, single-chip permeability meter, etc.) can be connected to the device through wires, and free software switching.

It is convenient for users to complete different types of magnetic property measurement tests and improve measurement efficiency. A maximum of 2 channels of magnetic measurement devices and 6 channels of excitation devices can be connected.



## Wiring Converter for Electrical Steel Magnetic Measuring Instrument



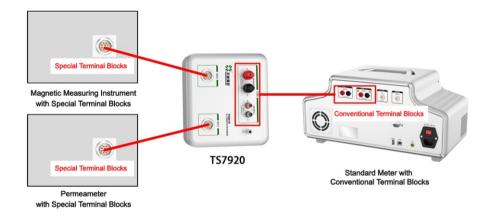




• It can be used as a wiring converter for magnetic measuring instruments with dedicated electrical terminal blocks. For connecting magnetic testers with special terminals to standard meters or permeameter with conventional terminals.

#### **TS7920**

# Adapter for Calibration of Electrical Steel Magnetic Measuring Instrument



• It can be used as an adapter for calibrating magnetic measuring instruments with dedicated electrical terminal blocks and be used to interconnect high-level magnetic measurement standards such as TH8010 with magnetic measuring instruments and its permeameter with special terminal blocks.



## **ACADEMIC ORGANIZATIONS**

IEC/IC68 China Representative

IEC/TC51 Expert IEC/TC66 Expert IEEE PES Power and Energy Society

China Metrology Technical Committee on Electromagnetic

Chinese Society for Measurement

China Instrument
Manufacturer
Association

China Semiconductor Industry Association (CSIA)

China Electrical Equipment Industry Association

Chinese Society for Electrical Engineering

China Metrology Technical Committee for Photovoltaic Measurement Instruments

Electrical Steel Branch of the Chinese Society for Metals

Non-Crystalline Alloy Application Branch of the Chinese Society for Metals

China Smart Metering Infrastructure Alliance Chinese Technical Committee for Standardization of Electrical Instruments and Meters

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## **KEY CUSTOMERS**

#### **Metrology Field**







National Institute of Measurement and Testing Technology



Korea Research Institute of Standards and Science

**Power Industry** 



Vietnam Metrology Institute



Cambodia National Metrology Center



Beijing Institute of Metrology



and Testing Technology



South China National Centre of Metrology



and Testing Technology



Metrology Science



Metrology Science

State Grid Corporation of China



China Huadian Corporation



China Southern Power Grid Company Limited



China General Nuclear Power Group



China Energy Investment



China Resources Power Holdings Co., Ltd.



China Huaneng



Guohua Power Branch of China Shenhua Energy Co., Ltd.



China State Power Investment Corporation



China Datang Corporation



Corporation Power Holding Co., Ltd.

State Development & Investment China Energy



Engineering Group Co., Ltd

#### **Industrial Inspection**



China Baowu Steel Group Corporation Limited



Shougang Group



Group Corporation



RYD



TESLA



HUAWEI



GREE





















MultiDimensiong Technology Co., LTD.

#### China Railway Engineering Group Limited



CRRC Corporation Limited

TBEA Corporation Limited

PTTX Corporation Limited

Chint Group

Shanghai Electrical Apparatus Research Institute (Group) Co., Ltd.

### **University Research**



Chinese Academy of Sciences



University of Oxford



University of Cambridge



Tsinghua University



Peking University



City University of Hong Kong



The University of Sydney





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In view of the continuous updating and upgrading of the products, in case of any change in the technical indicators here, the actual contract shall prevail.