TM9100 Precision Magnetometer Calibration Device

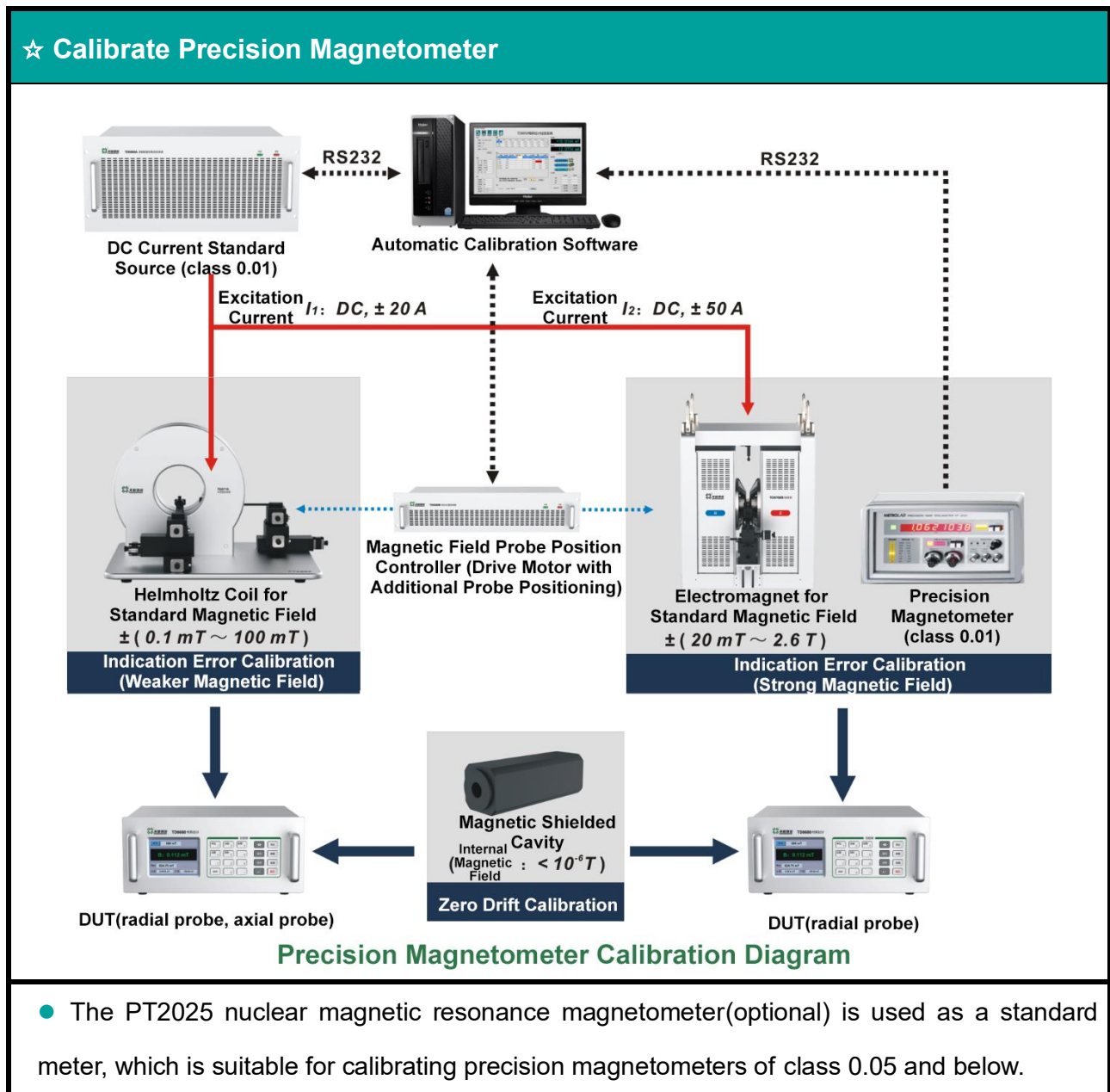***The figure above is for reference, actual delivery may very slightly**

1. Summary

TM9100 is a set of high-precision, multi-functional and intelligent magnetic parameter measurement standard device. It consists of high-precision DC current standard source, standard electromagnet, standard Helmholtz coil, precision magnetometer, magnetic shielding cavity, automatic calibration software, etc. It is suitable for metrology laboratories to establish precision magnetic field measurement and inspection standards and carry out calibration work for Tesla meters or PT2025 nuclear magnetic resonance magnetometers of class 0.05 and below. Reference standard: *JJF 1832-2020 "(1 mT ~ 2.5 T) Magnetometer Calibration Specifications"* (***TUNKIA participated in the drafting***).
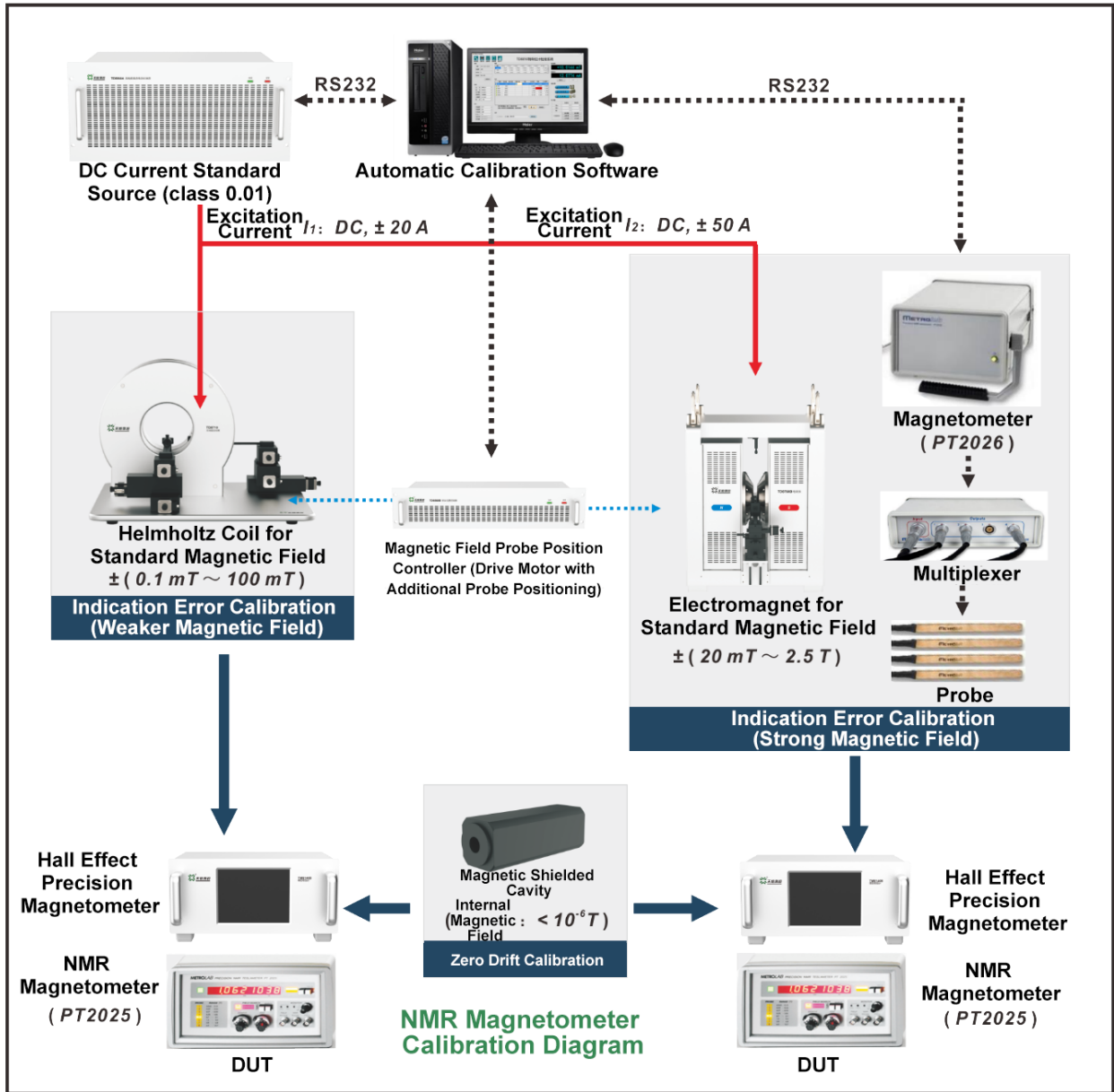
2. Features

● Equipped with dual-channel bipolar excitation current standard source.

● The stability of the current source reaches 20 ppm/min.

● The accuracy of the current source reaches class 0.01, and the annual error change is better than 50 ppm.

● The magnetic field coil can generate a standard magnetic field of ± (0.1 mT～100 mT).

● The electromagnet can generate a highly stable magnetic field of ± (20 mT～2.6 T).

● Optional PT2025 or PT2026 NMR magnetometer as a standard meter.

- Both the magnetic field coil and the electromagnet are equipped with intelligent probe position adjustment devices.

- Supports fully automatic switching of multi-probe ranges of PT2026. (optional accessories)

- Equipped with a magnetic shielding cavity for calibrating the zero drift of the magnetometer.

- Equipped with a portable measurement and control console to facilitate manual control of magnetic field output.

- Equipped with specialized calibration software

3. Application

☆ Calibrate Precision Magnetometer

Precision Magnetometer Calibration Diagram

- The PT2025 nuclear magnetic resonance magnetometer(optional) is used as a standard meter, which is suitable for calibrating precision magnetometers of class 0.05 and below.

☆Calibrate NMR Magnetometer

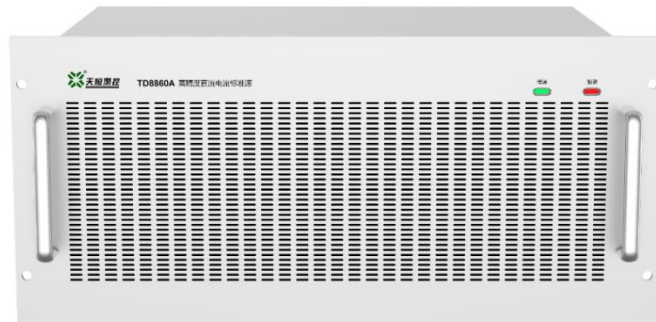**NMR Magnetometer Calibration Diagram**

- The PT2026 nuclear magnetic resonance magnetometer is used as a standard meter, which is suitable for calibrating the PT2025 NMR magnetometer.
- Also suitable for calibrating precision magnetometers of class 0.05 and below.

4. Equipment Composition

☆ High Precision DC Current Standard Source

- This current source is a high-precision bipolar current standard source that can output dual-channel DC current to excite the magnetic field coil and electromagnet respectively. Each current output has high accuracy and stability, and the measurement uncertainty reaches class 0.01.

- The current output stability is better than 20 ppm/min, and the annual error change is better than 50 ppm.

- The current source can be continuously adjusted through program control, and has a small adjustment fineness, which facilitates the calibration of the pointer magnetometer.

- It has a large power output and can drive magnetic field coils or electromagnets to work for a long time under full load.

Specifications	
Dual Current Range	50 mA、200 mA、1 A、5 A、20 A、50 A
Output Range	± 1 mA～± 50 A
Adjustment Fineness	0.001%*RG
Short Term Stability	20 ppm/min
Optimal Measurement Uncertainty	0.006%*RD[①] + 0.004%*RG[②]
Full Scale Linearity	< 10 ppm
Annual Error Variation	< 50 ppm
Maximum Load Voltage	180V

| Protection Function	Open circuit protection, overload protection function
Power Supply	*AC (380 ± 38) V,(50 ± 2) Hz,* Max. power consumption: *< 10 kVA*
Note: ① RD is the reading value, ② RG is the range value.	

☆ TM9100-HC Standard Magnetic Field with Helmholtz Coil

- A standard magnetic field of ± (0.1 mT ~ 100 mT) can be generated by excitation with a high-precision DC standard current source.

- Calibration of a DC magnetometer with a radial or axial probe.

- The stability and accuracy of a magnetic field depends entirely on the excitation current, and can be directly regarded as a standard magnetic field.

- Two sets of probe position intelligent adjustment devices are installed on the coil, which drive the probe to move and rotate in the Y/Z axis by a precision stepper motor, and determine the best test point by intelligent adjustment and positioning of software.

- The coil is not only suitable for DC magnetometer calibration, but also suitable for various research institutes, colleges, enterprises to conduct electromagnetic interference simulation experiments, material magnetic detection experiments, etc., which is widely used.

Specifications	
Excitation Current	± (5 mA～20 A)
Magnetic Field Range	± (0.1 mT～100 mT)
Magnetic Field Uniformity	The uniform field within 20 mm is better than 300 ppm
Magnetic Field Linearity	The magnetic field is proportional to the excitation current
Temperature Influence	The coil constant K changes little with temperature
Inner Hole Diameter	200 mm
Size	680 mm × 700 mm × 450 mm (W x D x H)
Weight	Approx 120 kg

## ☆ TM9100-EM Electromagnet for Standard Magnetic Field
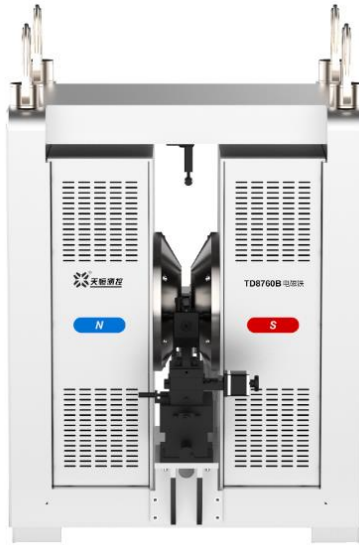
- Two specifications of polar are optional, which can generate a stable magnetic field of up to 2.6 T.

- Optional PT2025 or PT2026 nuclear magnetic resonance magnetometer as a standard meter.

- There is a good linear relationship between magnetic field and current, and the stability of the magnetic field depends on the excitation current.

- Equipped with an intelligent probe position adjustment device, which can intelligently adjust the positioning through software to determine the best test point.

- The input power/magnetic field ratio of the electromagnet is small, and it can work stably for a long time without water cooling.

Specifications		
Excitation Current	± (5 mA～50 A)	
Polar	*280 mm-140 mm*	*280 mm-200 mm*
Magnetic Field Range	± (20 mT～2.6 T)	± (20 mT～2.5 T)
Magnetic Field Uniformity	Uniformity within 5 mm is better than 150 ppm	2.1T: Uniformity within ±10 mm is better than 250 ppm 2.1T: Uniformity within ±20 mm is better than 1000 ppm 2.5T: Uniformity within ±5 mm is better than 250 ppm

		2.5T: Uniformity within ±10 mm is better than 1000 ppm
Air Gap	*15 mm*	*16 mm*
Size	*700 mm × 1100 mm × 1000 mm* (W x D x H)	
Weight	Approx 2000 kg	

☆ **Automatic Range Switching Device (Optional)**
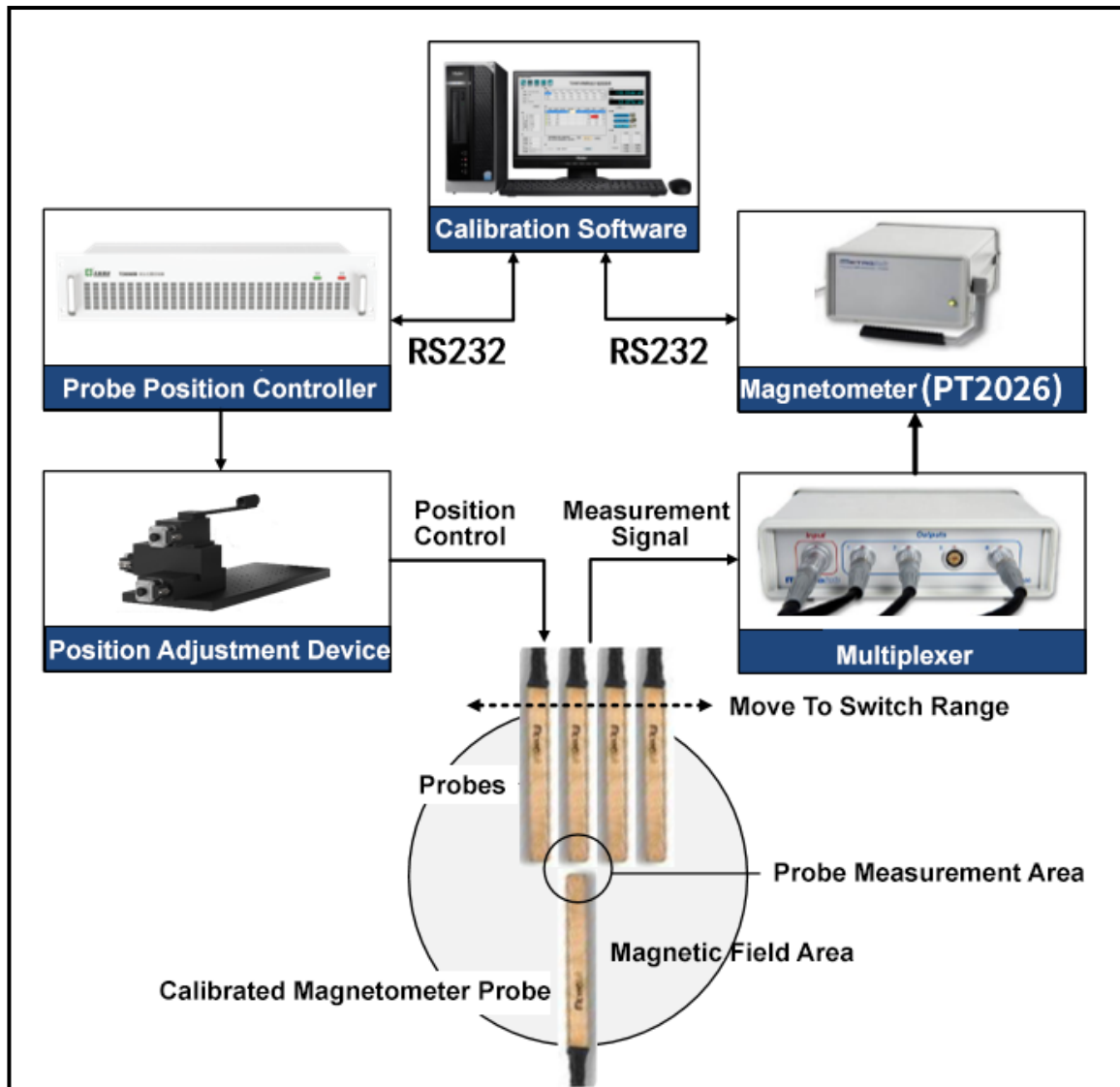
- The PT2026 NMR magnetometer has multiple probes with different ranges.

- Use this device to fix four range probes at the same time to cover the measurement range of the magnetometer being calibrated.

- The device will automatically control the corresponding probe to switch to the central test area based on the calibration point.

- Equipped with a multiplexer, which can automatically switch probes to avoid manual plugging and unplugging of probes, which effectively avoid errors caused by manual switching and greatly improve calibration efficiency.

☆ TM2800 Magnetic Shielded Cavity

- The shielding frame is made of a shielding material with high magnetic conductivity, which removes the effects of the geomagnetic field.

- The internal magnetic field $<10^{-6}$ T, which can be directly regarded as zero magnetism when calibrated.

- Small, lightweight (about 1kg), compact and easy to carry.

- The device is suitable for calibrating the zero point of a standard or calibrated magnetometer.

☆ Magnetic Field Probe Position Controller
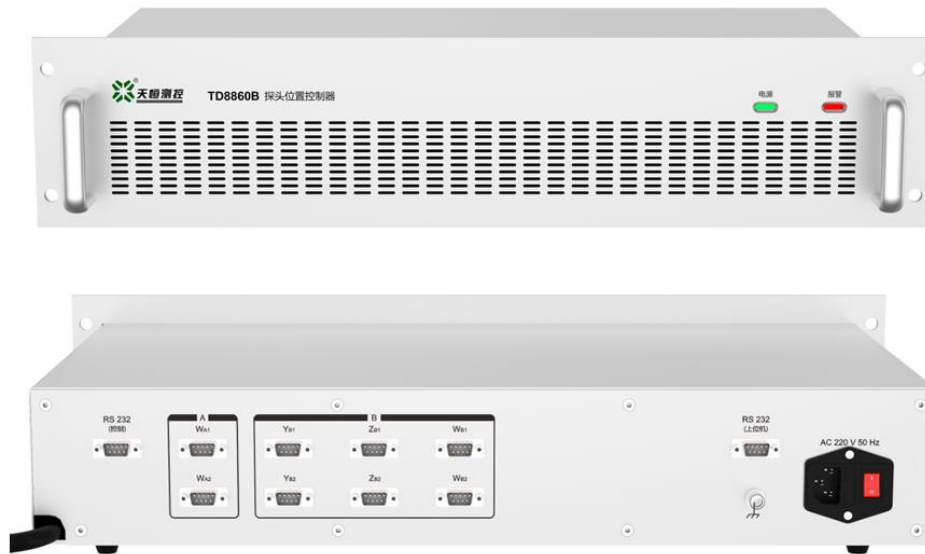
- The device has 13 RS232 interfaces, 12 of which are used to control a total of 12 precision stepper motors on four sets of probe positioning systems (two sets each of magnetic field coils and electromagnets).

- The other RS232 is used for computer communication. The stepper motor is controlled through software or wireless mouse remote control to drive the Hall probe to move or rotate in the Y/Z axis and W angle to determine the best magnetic field test point.

- The four sets of intelligent probe position adjustment devices are all made of non-magnetic materials.

Axis	Range Of Stroke/Angle	Adjustment Fineness
Y	50 mm	0.1 mm
Z	60 mm	0.1 mm
W	± 12°	0.1°

☆ Special Calibration Software
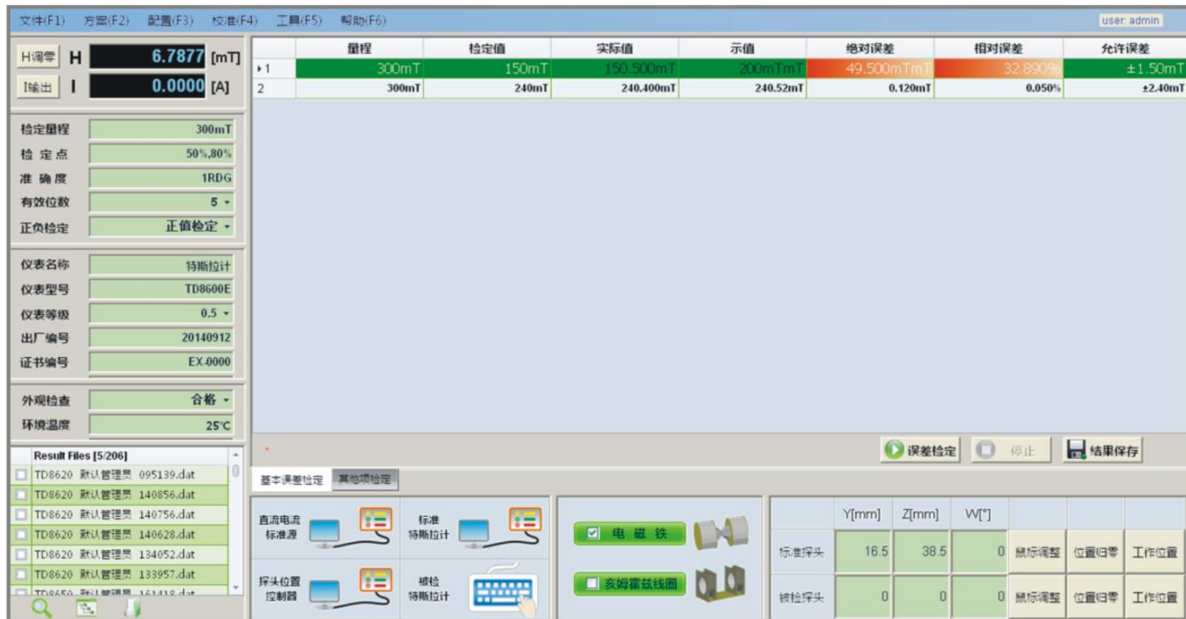
- The software automatically recognizes whether an accessory is communicating properly with the PC, and visually displays in the configuration interface.

- The selected excitation mechanism is visually displayed in the interface of the software and can be freely switched.

- The calibration parameter units: mT, G, kG, Oe, kOe, A/m, kA/m.

- The software controls the Y axis, Z axis, and W axis of the standard probe and the probe to adjust the best test point of the probe, or enter the wireless mouse control mode.

- Automatically prompts you to switch between the range and the calibrated value of the input, and automatically enters the standby state if no input is entered within 2 minutes.

- Automatically calculates zero drift, which exceeds the permissible zero drift and is marked in red.

- An error is automatically calculated and compared to the permissible error, warning you with a red light for an excess value.

- Test data can be generated and exported as a calibration report.

5. General Specifications

Power supply	AC (380 ± 38) V, (50 ± 2) Hz
Temperature performance	Working temperature: (23 ± 5)°C
	Storage temperature: -20°C～70°C
Humidity performance	Working humidity: 40% ~ 80% R·H no condensation；
	Storage humidity: < 80% R·H, no condensation

6. Configuration List

S/N	Name	Quantity	Configuration	Note
1	High-precision DC current standard source	1	Standard	Can output dual-channel DC current
2	TD8770 Helmholtz coil for standard magnetic field	1	Standard	± (0.1 mT～100 mT)
3	TD8760B standard magnetic field electromagnet	1	Standard	Two specifications available
4	TM2800 magnetic shielding cavity	1	Standard	Internal magnetic field: <10^{-6}T
5	Magnetic field probe position controller	1	Standard	Contains multiple RS232 interfaces
6	Fully automatic calibration software	1	Standard	Software CD included
7	Complete set of test leads and power cords	1	Standard	
8	Precision magnetometer	1	Optional	PT2025 or PT2026
9	Range automatic switching device	1	Optional	Used with PT2026
10	Workbench	1	Optional	Third party products
11	Computer	1	Optional	Third party products
12	Printer	1	Optional	Third party products

Note: The above is for reference only, the specific configuration list is subject to the technical agreement.