

ELECTRICAL SAFETY TESTING SOLUTIONS

IEC 60601-1 Winding Temperature Rise Tester

Resistance-Method Temperature Rise Measurement for Electrical Windings

Designed to determine the average temperature rise of electrical windings from the change in winding resistance before and after operation. The tester supports testing in accordance with IEC 60601-1 and GB 9706.1-2020, providing a reliable solution for safety evaluation of transformers, motors and electromagnetic components used in medical electrical equipment.



Key Information

Measurement Principle	Resistance method
Resistance Range	0 ~ 10000 Ω
Resistance Accuracy	$\pm 0.1\%$
Temperature Range	0 ~ 125 $^{\circ}\text{C}$
Temperature Accuracy	$\pm 0.5^{\circ}\text{C}$
Load Current Capacity	30 A
PC Software	Included



Typical Applications



Transformer Windings

Medical power and isolation transformers



Motor Windings

Pumps, fans, actuators, positioning mechanisms



Electromagnetic Coils

Solenoids, actuator coils and electromagnetic assemblies

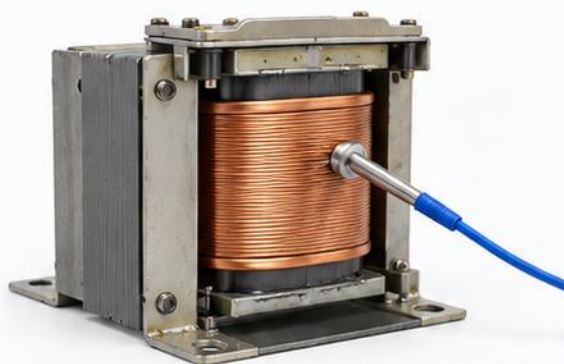
Winding Temperature Rise Measurement Principle

Resistance Method for Electrical Windings

The temperature rise of electrical windings can be determined from the change in winding resistance before and after operation. This method provides the average winding temperature and is widely used in standards such as IEC 60601-1 and GB 9706.1-2020.

Surface Temperature Measurement

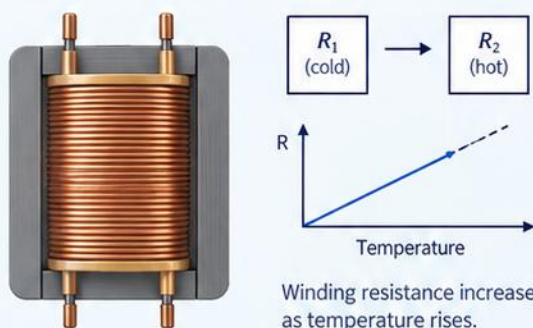
A thermocouple measures the temperature at a specific surface location of the device.



Measures temperature at the sensor location.

Resistance Method

The winding temperature is determined from the change in winding resistance, which reflects the average temperature of the winding conductors.



Determines average winding conductor temperature from resistance change.



Copper Winding Calculation

$$\Delta T = \frac{R_2 - R_1}{R_1} \times (234.5 + T_1) - (T_2 - T_1)$$

ΔT	Winding temperature rise (°C)
R_1	Initial winding resistance (Ω)
R_2	Hot winding resistance (Ω)
T_1	Initial ambient temperature (°C)
T_2	Final ambient temperature (°C)



Applicable Standard



IEC 60601-1

Clause 11.1.3 (Temperature measurement)

GB 9706.1-2020

Temperature-measurement requirements



Note

For aluminium or other winding materials, confirm the applicable temperature coefficient and calculation method before testing.

03 Technical Specifications & System Architecture

IEC 60601-1 Winding Temperature Rise Tester

Accurate Measurement
for Safer Medical Devices

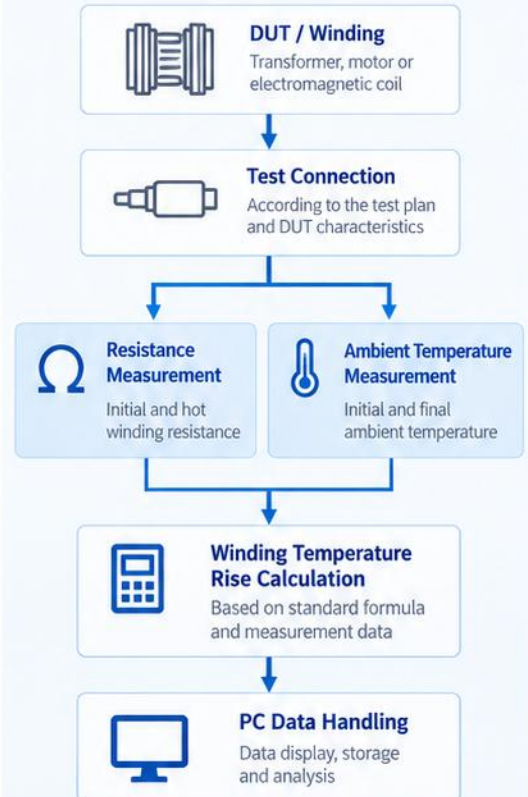


Technical Specifications

Parameter	Specification
Resistance Measurement Range	0 – 10000 Ω
Resistance Measurement Accuracy	$\pm 0.1\%$
Temperature Measurement Range	0 – 125 $^{\circ}\text{C}$
Temperature Measurement Accuracy	$\pm 0.5^{\circ}\text{C}$
Load Current Capacity	30 A
Measurement Principle	Winding temperature determination by resistance change
PC Software	Included
Applicable Standards	IEC 60601-1; GB 9706.1-2020



System Architecture



Key Capability

 0 – 10000 Ω Resistance Measurement Range	 $\pm 0.1\%$ Resistance Measurement Accuracy	 0 – 125 $^{\circ}\text{C}$ Temperature Measurement Range	 $\pm 0.5^{\circ}\text{C}$ Temperature Measurement Accuracy	 30 A Load Current Capacity
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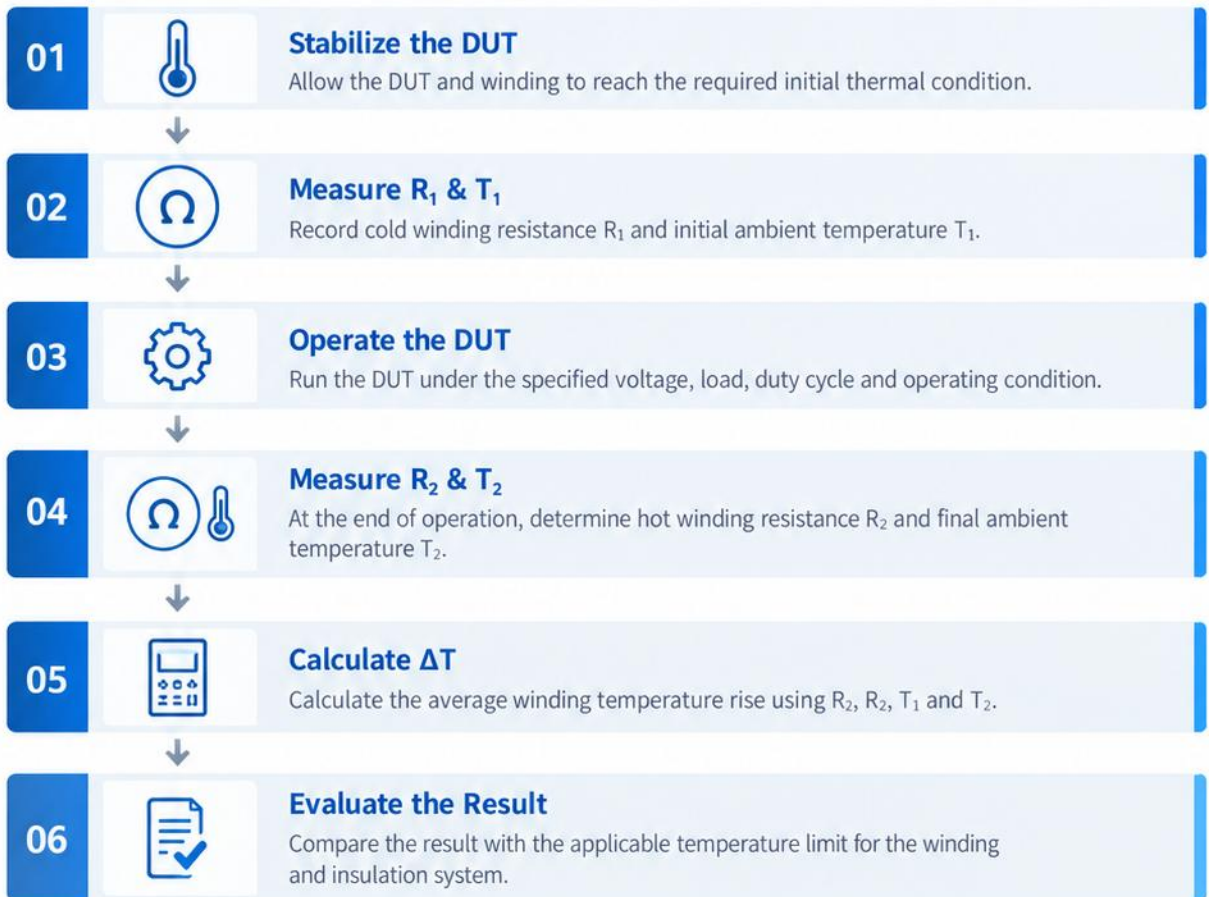
Configuration Boundary

Measurement channels, switching arrangement, acquisition timing and DUT connection method should be confirmed for the final test configuration.

Typical Winding Temperature Rise Test Workflow

Resistance-Method Test Sequence

The winding temperature rise test is performed by measuring the change in winding resistance before and after operation, together with the ambient temperature. The figure below shows a typical test workflow.



Minimize Measurement Delay After Power-Off

The winding begins cooling immediately after power removal. Where hot resistance is measured after switch-off, measurement should be performed as quickly as practicable. If required, take several resistance readings at short intervals to support estimation near the instant of power removal.



Note: The acceptance limit is defined by the applicable standard and DUT construction, not by the tester itself.

05 Applications & Measurement Considerations

Winding Temperature Rise Testing for Medical Electrical Equipment



Typical Applications

Widely used for temperature rise testing of windings in medical electrical equipment.



Medical Power & Isolation Transformers

Power transformers, isolation transformers and other magnetic components used in medical equipment.



Motor Windings

Pumps, fans, actuators and positioning mechanisms in medical devices.



Electromagnetic Coils

Solenoids, actuator coils and electromagnetic assemblies used in medical equipment.



Measurement Considerations

Important factors to ensure accurate and reliable test results.

01 Average Temperature, Not Local Hot Spot



The resistance method determines the average temperature of the winding conductor, not the local hot spot temperature. It is complementary to surface temperature measurements (e.g. thermocouples).

02 Confirm Winding Material



The calculation constant 234.5 is applicable to copper windings. For aluminium or other winding materials, the correct temperature coefficient and calculation method must be used.

03 30 A Capability Boundary



30 A refers to the specified load-current capacity of this tester. It should not be interpreted as a resistance measurement current or a universal operating current range for all DUTs.

04 Connection & Switching



The measurement channels, current path, switching arrangement and energized measurement capability (if required) should be confirmed based on the DUT and final system configuration.



Typical Users

Supporting R&D, compliance and quality verification.



Medical device laboratories

In-house safety testing and design verification



Certification & inspection laboratories

Compliance testing and type approval



Manufacturer compliance labs

Production quality control and incoming inspection



R&D and verification teams

Product development and performance validation

06

PC Software, Configuration & Traceability

Measurement Support and Laboratory Documentation

WINDING
TEMPERATURE RISE
TESTER

6.1 PC Software



Measurement Support

Display resistance, temperature and related measurement data.



Test Data Recording

Support recording of test measurement data.



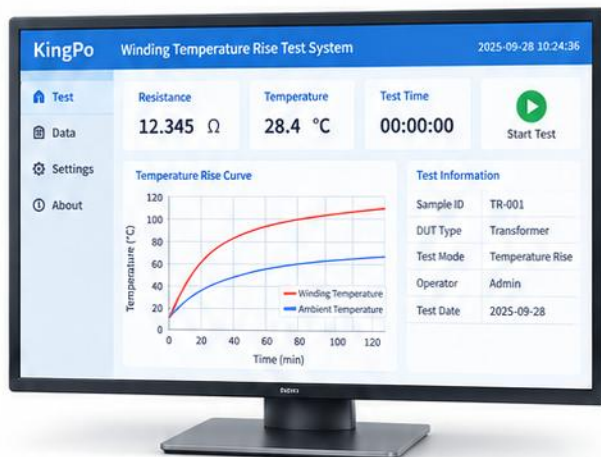
Result Review

Review recorded data and trend information.



System Configuration

Software functions depend on the final system configuration.



Software Interface Illustration
(The interface is for reference only)

6.2 Standard Configuration

Item	Quantity
Winding Temperature Rise Tester	1 unit
PC Software	1 set

6.3 Calibration & Traceability



Traceability documentation can be provided for applicable measurement functions to support equipment acceptance, laboratory quality management and routine compliance testing. A verification or calibration certificate can be provided as applicable.

6.4 Technical Inquiry and Configuration Support

To provide a suitable solution for your testing needs, please share the following information:



Applicable standard

e.g. IEC 60601-1,
GB 9706.1-2020



DUT type

e.g. transformer,
motor, coil



Expected winding resistance

e.g. 0.1 Ω – 1 kΩ



DUT voltage & operating current

e.g. 230 V, 5 A



Winding material

e.g. copper,
aluminium, etc.



For special requirements such as automatic switching, energized winding measurement or additional software functions, confirm the final configuration before quotation.

