6210/6220/6223/6225/ 6240/6243

DC bias current test system

User Manual

V1.01

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Here are some important points to note, please read carefully:

1. Before using a DC bias current source, please read the instruction manual carefully.
2. For more detailed information, please refer to the instruction manual of the DC bias current source.
3. We have taken all reasonable care in preparing this manual, but if you find any unclear or incorrect areas, please contact the sales and marketing department of MICROTEST, and we will be happy to assist you.
4. The contents of this manual are subject to change without notice.
5. The contents of this manual are protected by copyright and may not be copied, reprinted, or altered without permission.

Safety Instructions

Professional Use: This product is designed for use by individuals with professional knowledge.

Safety Classification: This instrument is classified as IEC Safety Category 01.

General Safety Precautions: At all stages of operation, it is essential to observe the following general safety precautions. Using the instrument in ways not explicitly specified in this manual may affect the protective functions provided by the instrument. MICROTEST is not responsible for the consequences of customers not adhering to these guidelines.

Important Information Storage: This manual is part of the product and contains important information. Please keep this manual in a safe location near the instrument for easy reference. Ensure that the manual is in good condition before operating the instrument.

This instrument uses the following symbols:

	Power On
	Power Off
	Power On Status
	Power Off Status
	When the user's incorrect operation or use may lead to user injury or instrument damage, this symbol appears on the instrument, indicating that the user must consult the user manual for specific instructions.
WARNING	Caution: Actions or conditions that may result in severe or fatal injury to the user and provide preventive measures that can be taken.
CAUTION	Caution: Actions or conditions that may result in minor injury to the user or damage to the instrument or user data and provide preventive measures that can be taken.
	Electric Shock, Danger
	Grounding Point of the Utility Power System
	Please do not dispose of electronic equipment as unclassified municipal waste. Please use dedicated collection facilities or contact the supplier from whom you purchased this instrument.
	Indicates that the product complies with regulations required by the European Union directives.
NOTE	Contains useful information and tips.

Safety Guidelines

WARNING

1. The DC bias current source needs to be equipped with an LCR Meter/Impedance Analyzer to provide inductors with magnetic saturation current (Isat) and temperature rise current analysis (Irms).
2. When using two DC bias current sources simultaneously and stacking them, it is recommended to install a green 6 cm grounding wire. For example: When stacking 6243+6243, please install a 6 cm grounding wire. However, 6223+6243 cannot be stacked for use.
3. To prevent electric shock or fire, please use the power cord specifically for the instrument. The main power plug must be inserted into a socket with a protective ground terminal. Do not use extension cords without protective grounding and do not use this power cord with other instruments.
4. Use the correct power source to ensure that the power supply voltage matches the rated supply voltage of the instrument and does not exceed the maximum voltage range of the power cord.
5. Do not operate the instrument in an environment where flammable gases or vapors are present. This is extremely dangerous.
6. Do not place any heavy objects on the instrument, and strictly prohibit static discharge on the instrument.
7. Use exclusive accessories for the DC bias current source. Do not use them if the accessories are exposed or damaged.
8. The instrument's measurement category is Class II. Do not use it for Class III or Class IV measurements.
9. When the instrument malfunctions, please send the instrument back to the original factory for repair by a professional.
10. In case of an accident, you can immediately unplug the power cord.

NOTE

Applicable Standards:

Safety: EN 61010-1:2010+A1:2019

UKCA : BS EN 61010-1:2010+A1:2019 , BS EN 61010-2-030:2021+A11:2021

EMC: EN 61326-1:2021*

UKCA : BS EN IEC 61326-1:2021*

EMC: EN IEC 61000-3-2:2019+A1:2021* , IEC 610

UKCA : BS EN IEC 61000-3-2:2019+A1:2021* ,BS EN 61000-3-3:2013+ A2:2021*

EMC : EN 55011:2016+A2:2021

UKCA :BS EN 55011:2016+A2:2021

The measurement category and its requirements are as follows:

The DC bias current source belongs to the II 600V measurement category.

• The Category II measurement category is applicable to measurements made directly connected to low-voltage installations.

Operating Environment:

1. Location: Indoor, free from direct sunlight, dust-free, almost no conductive pollution, and at an altitude below 2000 m, pollution degree 2.

2. Operating temperature and humidity range: 10°C to 40°C, 20 to 90% RH (non-condensing).

3. Storage temperature and humidity range: -10°C to 60°C, 20 to 90% RH (non-condensing).

NOTE

To obtain the most accurate measurement results, please strictly use the instrument under specific environmental conditions as follows:

1. Ambient Temperature:

Ensure that the ambient temperature is maintained within a range of 23±5°C. This temperature range helps to ensure the measurement stability of the instrument.

2. Temperature Coefficient Correction:

If you must use the instrument in locations where the ambient temperature is between 13 to 18°C or 28 to 40°C, a temperature coefficient correction should be added to the specified accuracy. This

is to ensure consistent measurement results under different temperature conditions.

3. **Anti-static Measures in Low Humidity Environments:**
   If the instrument is installed in an environment where the humidity is below 30%, please use measures such as anti-static mats to prevent static disturbances.

Cleaning the Instrument:

• Disconnect the power cord before cleaning.

• It is recommended to use a soft cloth, microfiber cloth, or soft brush for cleaning, with damp wiping, using a mixture of mild detergent and water. Do not spray any liquids.

• Do not use organic solvents such as acetone, methanol, or chemicals with strong components like acetic acid.

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Chapter 1 Product Overview

This chapter will comprehensively introduce the main features, application scope, advantages, and value of the DC bias current source. It will include detailed technical specifications (such as dimensions, weight, power requirements, etc.), and provide important guidelines for calibration and maintenance, to help you fully understand the product. Finally, we will detail the product accessories and packaging contents, giving you a complete understanding of the product.

1.1 Features

- Maximum frequency response of 3/ 10/ 30MHz (depending on the model).
- Magnetic saturation curve [displaying the decrease in inductance (%) for easier observation].
- Current and frequency sweep graphical analysis.
- Temperature rise scanning feature, addressing the issue of high-temperature damage to the test subject.
- DCR (Direct Current Resistance) measurement functionality.
- Capable of continuous maximum power output for extended periods.
- Bidirectional current switching feature.
- Measurement of magnetic permeability coefficient (μr).
- Direct control through the LCR Meter via the Handler interface.
- Maximum output bias current of 10/ 20/ 40/ 120 / 320 A.

1.2 Application Areas

Magnetic Components: Power amplifier inductors, common mode inductors, inductive sensors, communication transformers, electronic transformers, PCB flat transformers, filter inductors.

Application Modules: Electric vehicle onboard systems, electric vehicle turbocharging systems, DC-DC power supply modules.

Magnetic Materials: Ferrite absorbing materials, alloy magnetic materials for residential and commercial buildings: Used for monitoring and measuring electricity consumption in homes, stores, offices, and other locations, aiding in the management of electricity costs and energy usage.

1.3 Technical Specifications Explanation

DC Bias Model	6210	6220	6223	6225	6240	6243
LCR+DC Bias Frequency Response	100Hz-3MHz	100Hz-3MHz	100Hz10MHz	100Hz30MHz	100Hz-1MHz	100Hz-10MHz
Maximum Output Current	—	120A (6 Units)	120A (6 Units)	—	320 (8 Units)	320 (8 Units)
Standalone Output Current	10A	20A	20A	20A	40	40
Current Accuracy	0.000A-1.000A 1%+5mA 1.001A-5.000A 2% 5.001A-20.000A 3%					
Power Consumption (Bias Standalone)	320W Max.	320W Max.	320W Max.	320W Max.	640W Max.	640W Max.
Fixed Power Output	●	●	●	●	●	●
Positive and Negative Current Switching	●	●	●	—	●	●
Magnetic Saturation Current Scan	●	●	●	●	●	●
Temperature Rise Current Scan	●	●	●	●	●	●
Frequency Curve Scan	●	●	●	●	●	●
Direct Current Resistance Measurement	●	●	●	●	●	●
Impedance	**6632**					

Analyzer Model		
Frequency (Hz)	10HZ-1M/3M/5M/10M/20M/30M/50MHz	
AC Test Signal Level	10mV-2Vrms	
DC Test Signal Level	1V(Fixed)	
Output Impedance	25Ω、100Ω (Switchable)	
Measurement Parameters and Display Range	R, X	±0.000mΩ-9999.99MΩ
	|Y|	0.00000μS-999.999kS
	G, B	±0.00000μS-999.999kS
	θRAD	±0.00000-3.14159
	θDEG	±0.000°-180.000°
	Cs, Cp	±0.00000pF-9999.99F
	Ls, Lp	±0.00nH-9999.99kH
	D	0.00000-9999.99
	Q	0.00-9999.99
	Δ	±0.00%-9999.99%
	Rdc	0.00mΩ-99.9999MΩ
	εr' εr''	0-100000
	μr' μr''	0-100000

1.4 General Specifications

Power Requirements	Voltage: 88-264Vac Frequency: 47-63Hz
Power Consumption	Power Consumption: 300VA (6225/ 6223/ 6220/ 6210), 600VA (6243/ 6240)
Interface	Interfaces: RS-232, Handler
Startup Method	Startup Methods: Automatic, Manual, RS-232, GPIB, Handler
Operating Environment	Operating Environment: Temperature: 10-40℃, Humidity: 20-90%RH
Dimensions (WHD)	Dimensions: 337×145×525mm (6210/6220/6223), 356×147×497mm (6225), 435×145×525mm (6240), 435×145×644mm (6243)
Weight	Weight: 15Kg (6225/ 6223/ 6220/ 6210), 20Kg (6243/ 6240)

1.5 Regarding Calibration

To ensure that the measuring instrument obtains accurate measurement results within the specified accuracy range, it is recommended to perform a calibration once a year.

1.6 Maintenance

When the instrument requires maintenance, please contact MICROTEST for repair services. Remember not to disassemble or replace parts on your own to avoid any danger.

To ensure the safety of the instrument during transportation, please adhere to the following precautions:
- Before transportation, remove all attachments or optional accessories from the instrument to avoid damage.
- Use the original packaging materials provided at the time of delivery and ensure double packaging for additional protection. Please note that we are not responsible for any damages that occur during transportation.
- If you need to send the instrument for repair, please clearly describe the fault when sending it in. This will help us provide better support to you. Maintain your instrument and ensure its safety during transportation and repair processes.

Chapter2 Product Introduction

This chapter is dedicated to providing a comprehensive introduction to the front and rear panels of the DC bias current source instrument. We will detail their appearances and delve into the practical applications of each operational feature, offering customers a clear guide to make operating the instrument more effortless. Special attention is given to making the interface intuitive and user-friendly.

In this chapter, we will guide you through an in-depth understanding of the DC bias current source, providing practical operational demonstrations to ensure you can quickly get started. We will explain the functions of each button, interface, and display screen, along with examples of practical applications, to help you better understand and master them.

Whether you are a novice or an experienced user, we believe this chapter will provide you with valuable information, enabling you to use the DC bias current source more confidently and effectively to obtain precise and reliable measurement results. We are committed to ensuring that your experience with the instrument is exceptionally smooth and that you can fully utilize this outstanding device.

2.1 Packaging Contents and Accessories

Before using the instrument, please carefully check whether the following items are included in the packaging.

Standard Accessories:

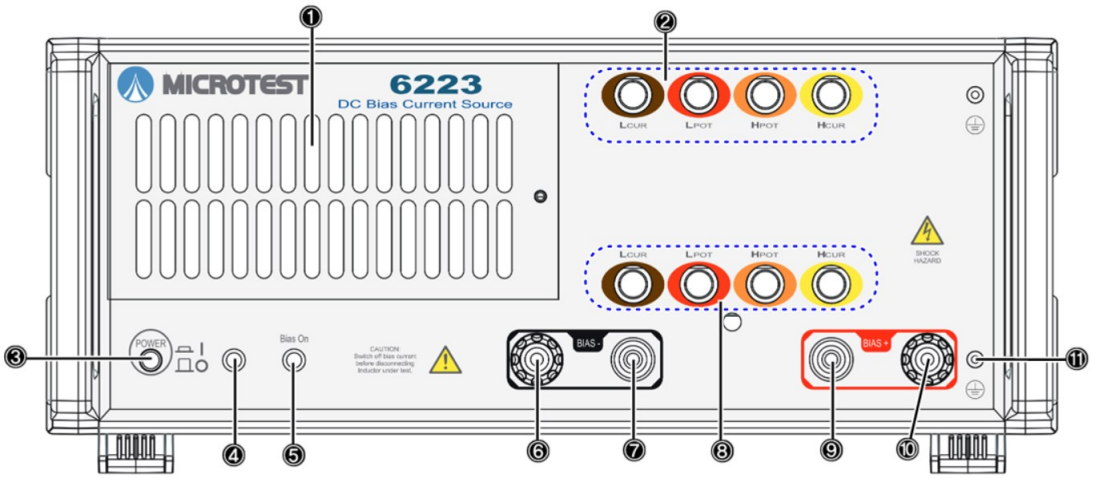
- DC Bias Current Source main unit
- Power cord *1
- Network cable *1
- Green 6 cm grounding wire
- F6210 (6243/ 6223/ 6240/ 6220/ 6210)
- Black/Red current connector clips (6210)
- F622501 (6225)

Optional Accessories

- Computer connection software
- F6220 SMD fixture
- F6240 SMD fixture
- 6223 / 6210 / 6220 connector clips (short/long)
- 6243 / 6240 connector clips (short/long)
- BNC+BNC connection cable

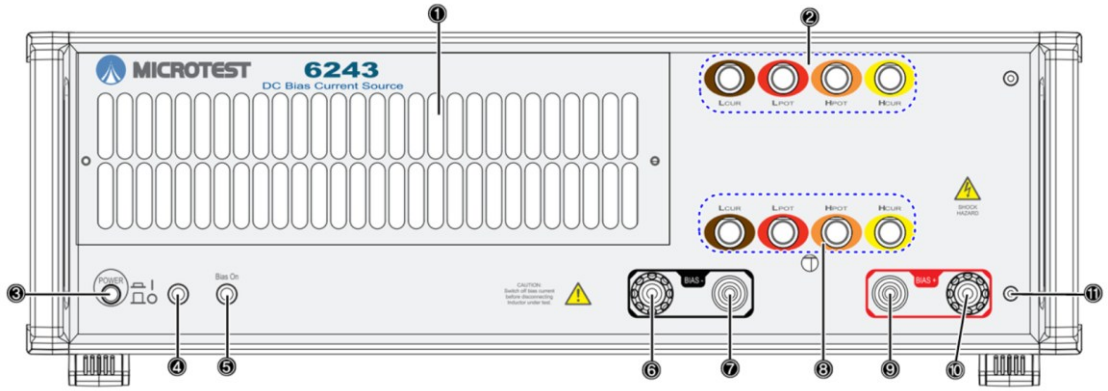
2.2 Names and Functions of Each Component

Front



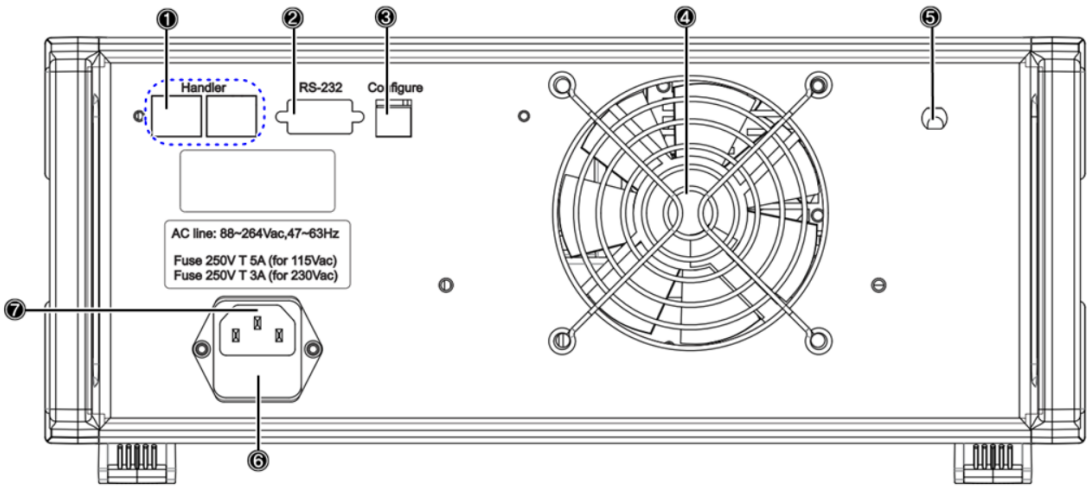
Number	Name
1	Air Filter
2	Measurement Signal Input Terminal
3	Power Switch
4	Power Indicator Light (Green)
5	Overlapping Current Indicator Light (Red)
6	Overlapping Current Parallel Terminal - Black (-)
7	Current Output Terminal - Black (-)
8	Measurement Signal Output Terminal
9	Current Output Terminal - Red (+)
10	Overlapping Current Parallel Terminal - Red (+)
11	Ground Screw (used for installing a grounding wire)

Front



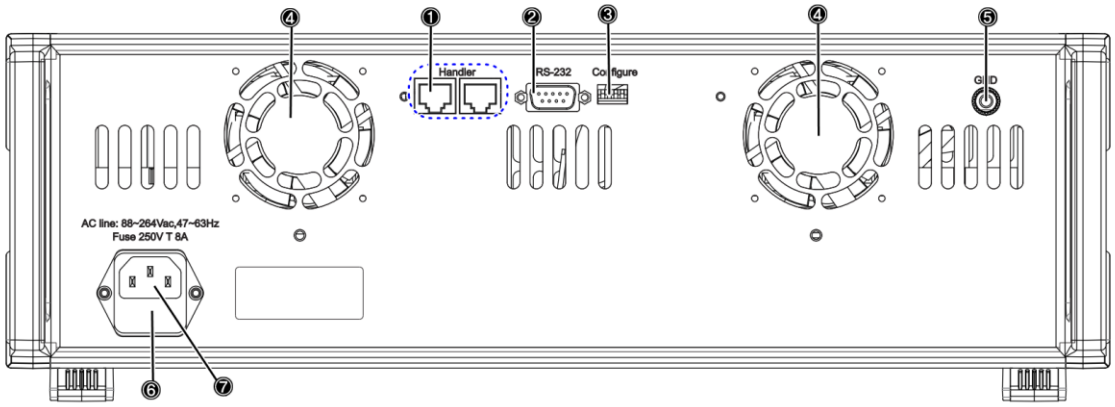
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8	Measurement Signal Output Terminal
9	Current Output Terminal - Red (+)
10	Overlapping Current Parallel Terminal - Red (+)
11	Ground Screw (used for installing a grounding wire)

Rear



Number	Name
1	Handler Interface x2
2	RS-232 Transmission Interface
3	DIP Switch
4	Fan Exhaust Vent
5	Grounding Terminal
6	Fuse Holder 110V / 3A, 220V / 5A

Rear



Number	Name
1	Handler Interface x2
2	RS-232 Transmission Interface
3	DIP Switch
4	Fan Exhaust Vent x2
5	Grounding Terminal
6	Fuse Holder 110V/230V 8A
7	Power Socket

2.3 Installation of overlapping current source (6243)

Explanation: The DC Bias Current Sources (models including 6210/6220/6223/6225/6240/6243) cannot be used independently. Before connecting the power cord to both the 6632 and the DC Bias Current Source, please first verify that the rated voltage is correct. After confirming, proceed with powering on. First, use a network cable to connect the EXT.I/O port of the 6632 Impedance Analyzer to the Handler socket of the 6243. The DIP switch of the DC Bias Current Source with a pre-installed fixture should be set to “1”. Then, use a network cable to daisy chain the next DC Bias Current Source, setting its DIP switch to “2”, and so on (refer to Figure 2.6.1).

For front panel installation, connect the 6632 and 6243 using a BNC cable. Install the black/red current connector clips and fixture. Additionally, it is recommended to connect a green grounding wire (refer to Figure 2.6.2).

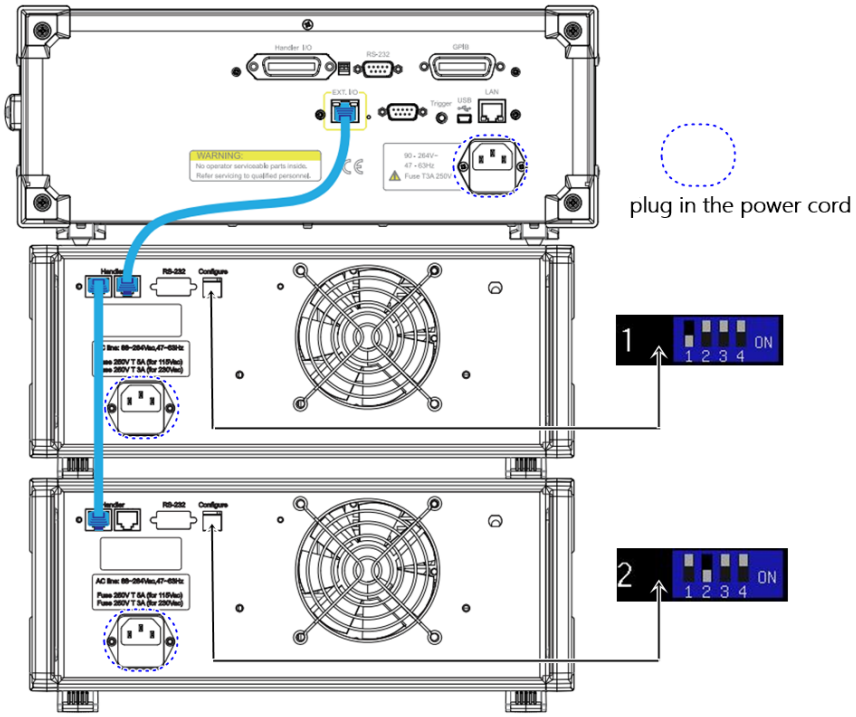


Figure 2.6.1 Rear Connection

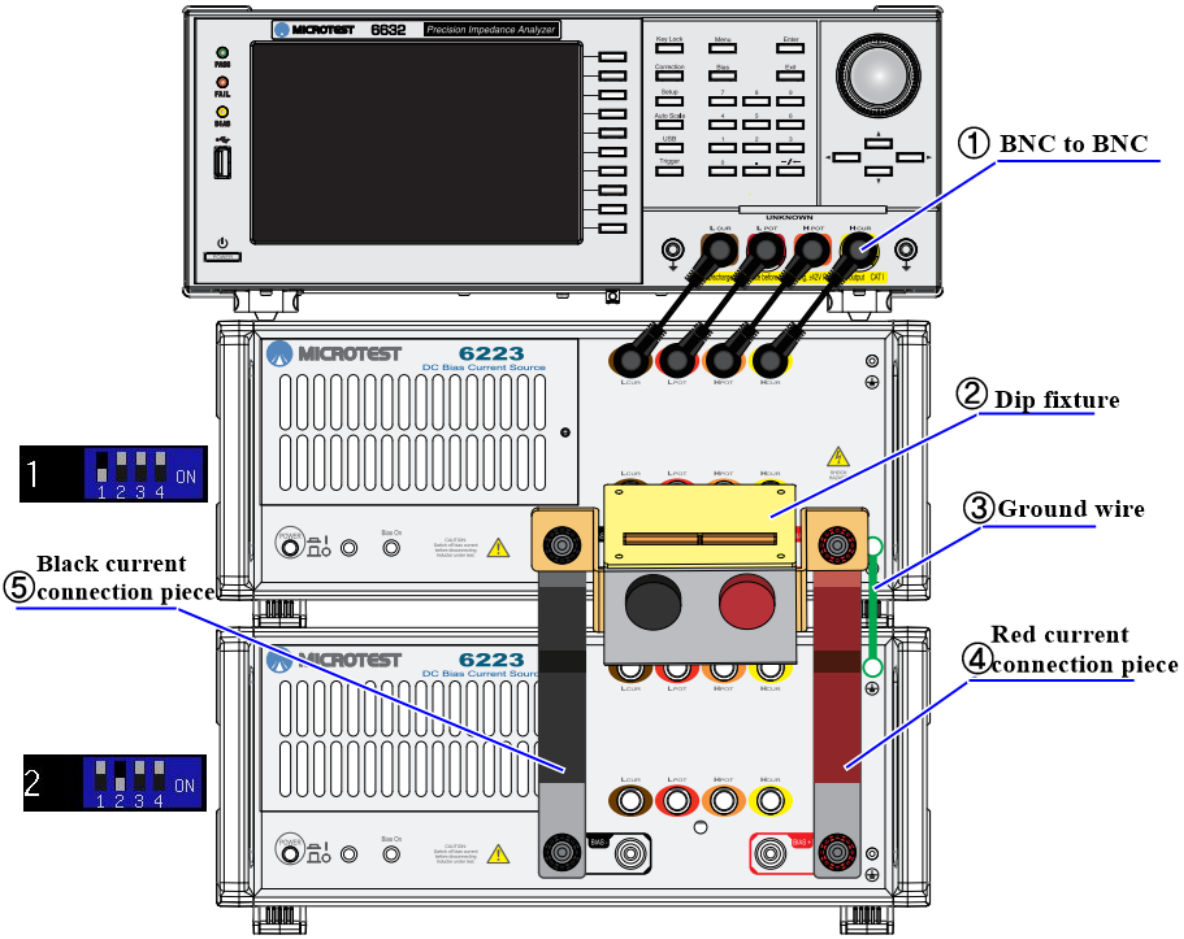


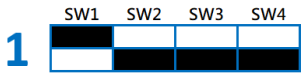
Figure 2.6.2 Rear Connection

Caution:

Before connecting to the mains power, to avoid any danger, please reconfirm that the instrument's rated voltage range matches the mains voltage. Only after this verification should you proceed to power on the instrument.

2.4 Method of Setting the DIP Switch

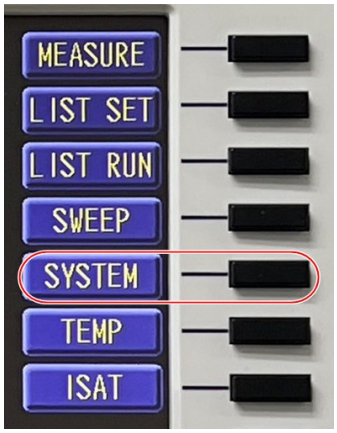
When connecting the 6240 or 6243 to the 6632 (Impedance Analyzer), it is necessary to adjust the DIP switch on the back of the 6240/6243 to the appropriate position. Up to eight units of 6240 or 6243 can be connected, and when used simultaneously, the output current can reach up to 320A. Therefore, there are eight different settings for the DIP switch. For example, when connecting the 6632 and 6243, the DIP switch setting on the 6243 should be set with SW1 down, and SW2, SW3, SW4 in the upward position.

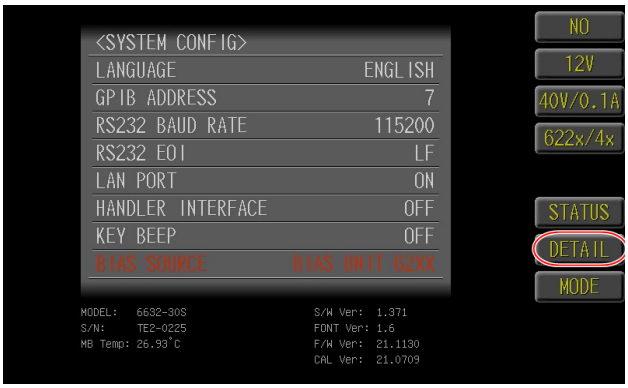


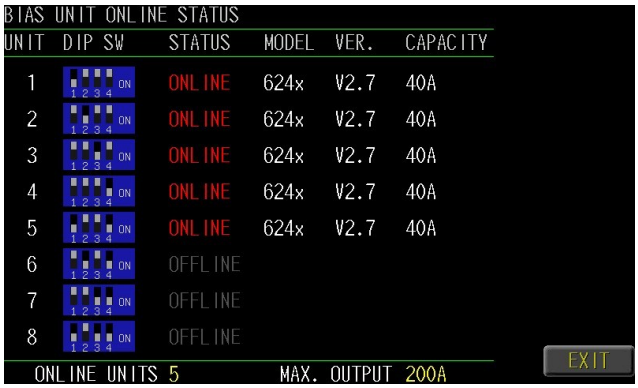
Setting Method:

On the 6632, first press the "Menu" key, and then press the corresponding system key to enter the system settings page. Use the arrow keys to move to the "Bias Source" option and select "Current Machine 6620/6240". After pressing "Details," the currently connected devices will be displayed, among which only one device should have its DIP switch set to 1.









2.5 Expansion Method

The standard accessories include a network cable, specifically for connection with the model 6632. The connection steps are as follows: First, connect one end of the network cable to the EXT IO interface at the back of the LCR METER; secondly, connect the other end to the Handler interface at the back of the machine. If two overlapping current machines need to be connected, use another network cable to connect the two machines in the same manner (refer to Figure 2.8.1).

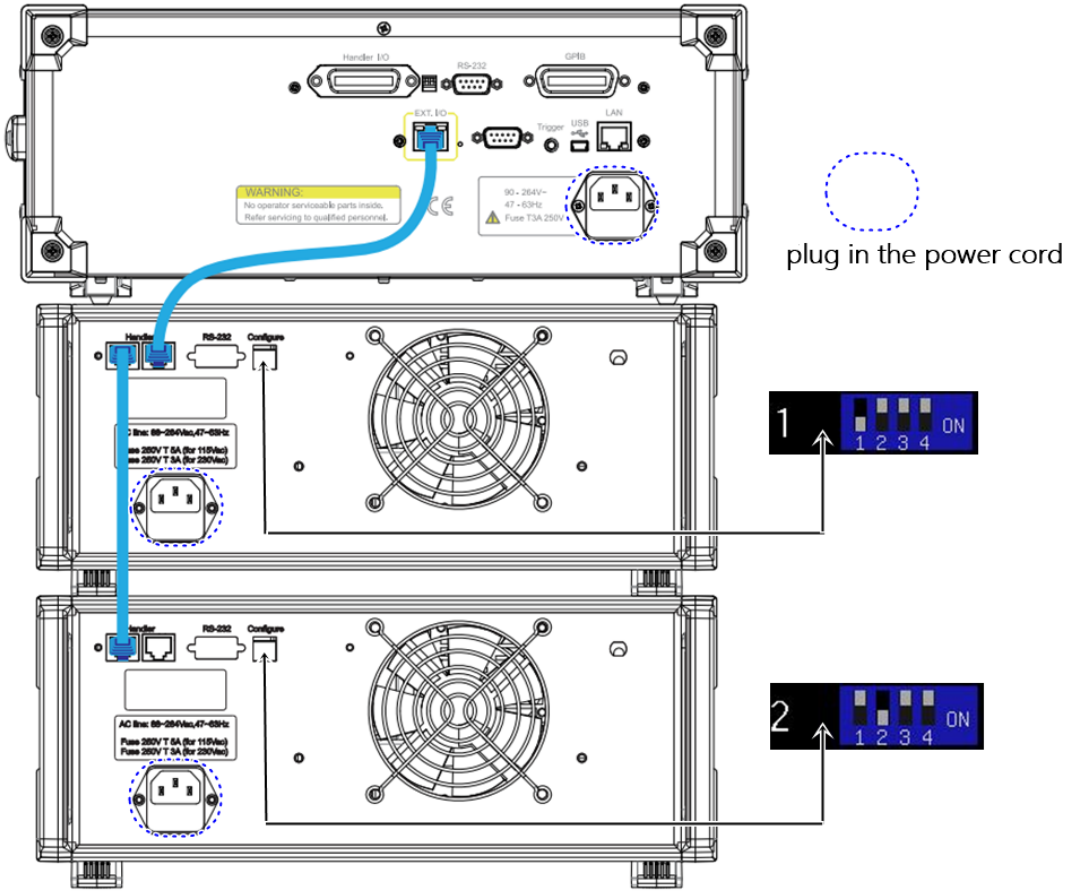
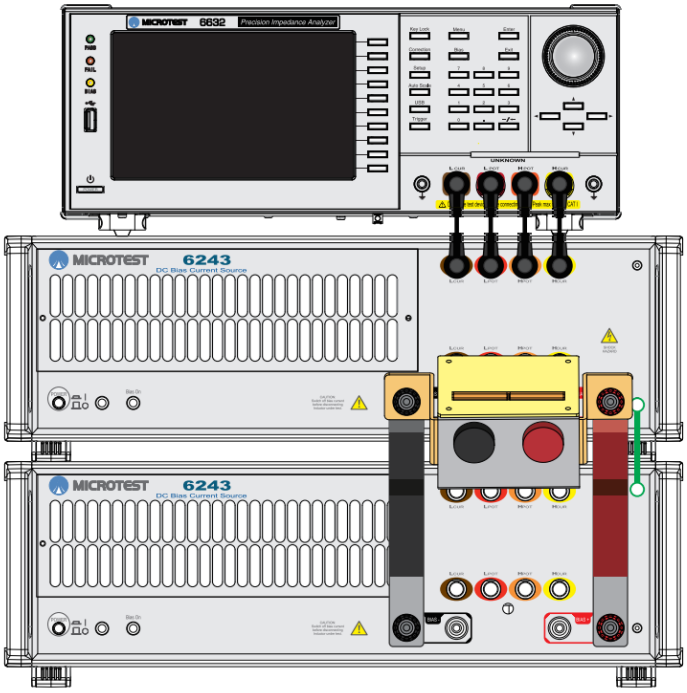
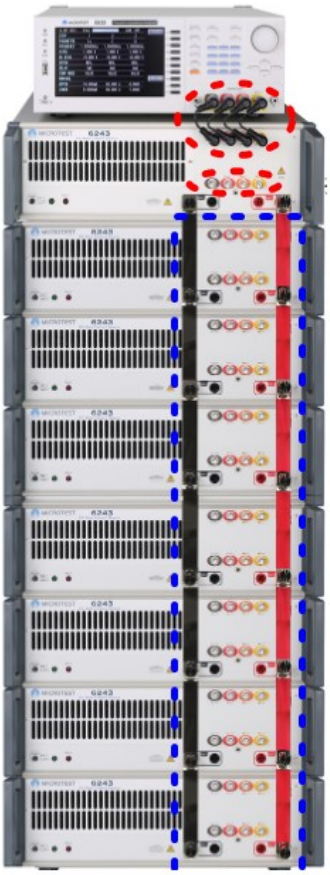


Figure 2.8.1 Expansion Method Diagram

2.6 Machine Parallel Connection Method

Use a BNC-to-BNC cable to connect the BNC port of the 6632 with the first 6243 unit. Install the Dip fixture and secure the black/red current connector clips. Additionally, it is recommended to install a green 6 cm grounding wire.





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Chapter3 Operating Instructions

1. The power source usable for this device is 88~264Vac. When plugging in the power cord, please first ensure that the input voltage matches the allowable voltage range of the instrument.
2. With the testing machine turned off, insert the high-voltage test line into the high-voltage output port. First, make sure that the high-voltage test line is not damaged or disconnected.
3. The testing machine can operate normally as soon as the power is turned on, but to achieve the accuracy specified in the specifications, please allow the machine to preheat for over 30 minutes after turning it on.
4. As this device outputs a large current during measurements, do not touch the test subject or remove the test fixture while the current is outputting, to avoid any danger.

3.1 Measurement of the Test Subject

When conducting any measurement, please first perform open/short circuit calibration. Once the 6632 and all accessories of the machine are connected, place the inductor in the fixture for measurement. Set the parameters of the 6632 in voltmeter mode, such as LS, Z, Q, RDC, and set the frequency, level, bias current, and trigger. Press the BIAS button on the 6632 to control the 6240/6243 to output current. (At this time, the BIAS light on the 6240/6243 will light up red, indicating that current is being outputted.)

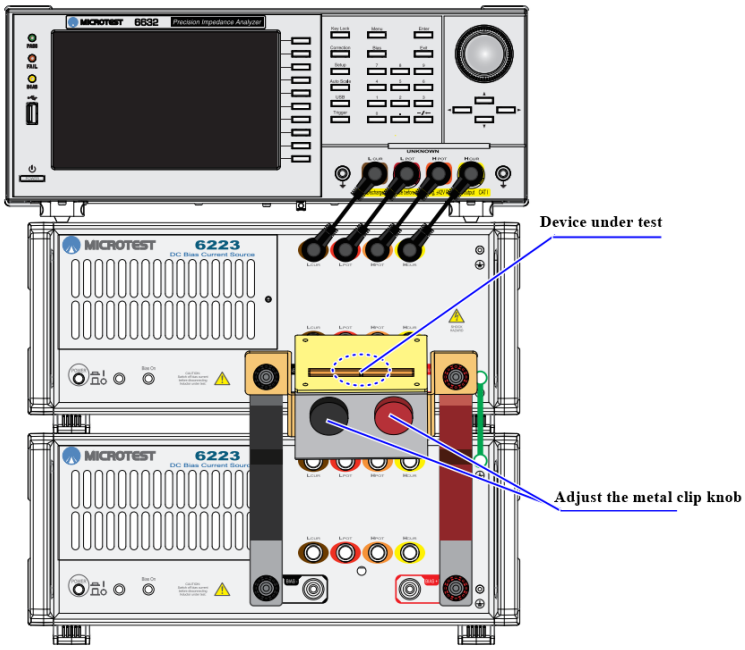


Figure 3.1.1 Device under test



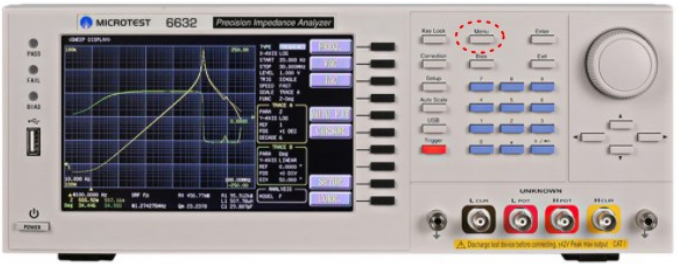
Figure 3.1.2 Measurement

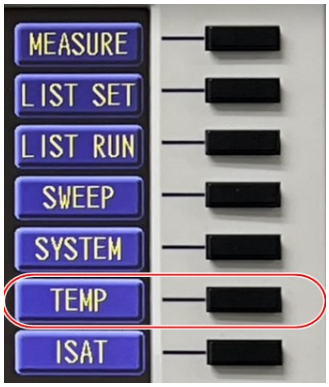


Figure 3.1.3 Outputting 40A Current

3.2 Temperature Function

On the 6632 instrument, press the Menu button and select the temperature rise option.





1. It's recommended to perform a short circuit calibration on the temperature rise page first.
2. To execute calibration, the short circuit piece must be inserted and clamped in the 6223/6243 fixture, followed by pressing the short circuit calibration button.
3. Remove the short circuit piece, insert the test subject, and then set the current, time, warning temperature, and shut-off temperature before pressing the Trigger button to start the test.

4. Current: Set between 0A to 320A (depending on the number of Bias units).

5. Time: The setting range is from 0 seconds to 60 minutes.

6. Warning at: Set a range from 0 to 200 degrees. The instrument will beep when the warning temperature is reached.

7. Shut off at: Set a range from 0 to 200 degrees. The test will stop when the shut-off temperature is reached.



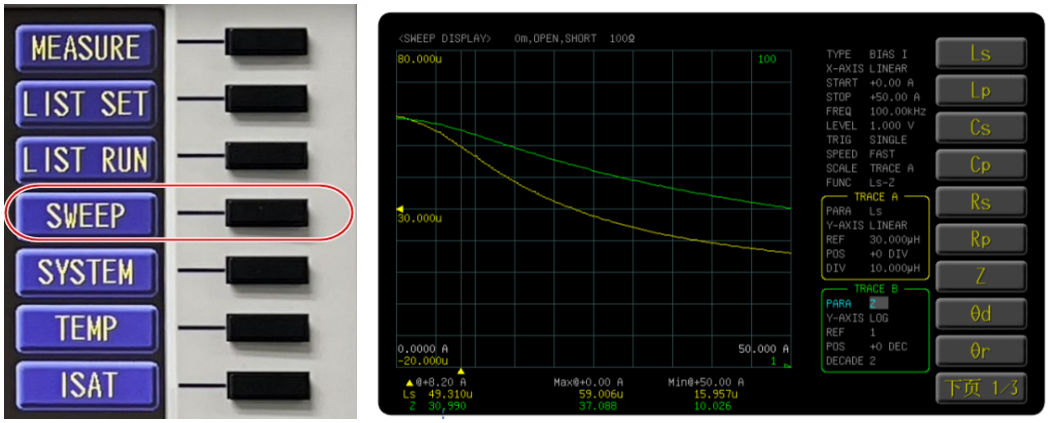
Irms (Rated current curve)



Inductor copper foil cracked due to high temperature

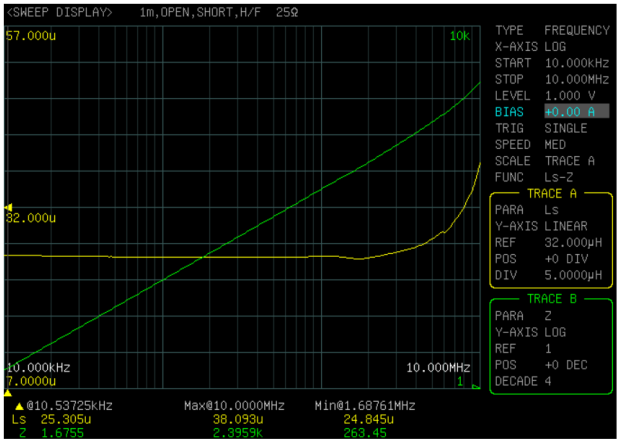
Magnetic saturation current is called I sat, and the temperature rise current is called I rms. When the transformer and the inductor pass a large current in the actual circuit operation, the magnetic field of the magnetic core will produce magnetic saturation, which will cause the inductance characteristic to decline. Therefore, the R&D engineer will set the current value of the inductance reduction allowable range.

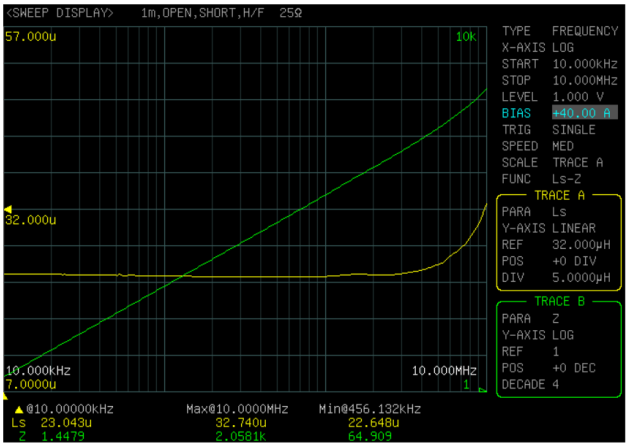
3.3 Sweep



Bias Comparison:

The left image shows the measurement without bias, and the right image shows the measurement with a 40A bias applied.





Chapter4 RS232 Interface

4.2 Interface Specifications

The device features a standard RS-232 interface, with the following specifications:

Baud Rate: 9600

Parity: NONE

Data Bits: 8 bits

Stop Bit: 1 bit

4.3 Command Format

The RS-232 function of this device allows the user to input a command string composed of "parameters + end code" to achieve remote control functionality. The end code is: LF (0x0A).

4.4 Pin Position Explanation

The RS-232 interface of this device is a 9-pin male connector, as shown in Figure 4.3.1. The functions of each pin are as illustrated in Figure 4.3.2.

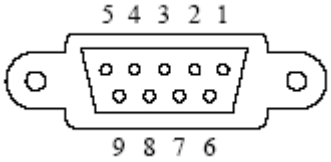


Figure 4.3.1

Pin Number		Description
1.	*	Not Used
2.	TxD	Transmit Data
3.	RxD	Receive Data
4.	*	Not Used
5.	GND	Signal Grounding
6.	*	Not Used
7.	*	Not Used
8.	*	Not Used
9.	*	Not Used

Figure 4.3.2