FÖHR

FÖHR TTR80A
Transformer Turns Ratio Tester

Contents

I. Overview

1.1 Product Overview

The FÖHR TTR80A transformer ratio test device is a fully automatic tester. It integrates the testing functions of turn ratio, voltage ratio, vector relationship, winding connection, polarity, tap position, and excitation current. This tester is a lightweight and portable instrument, with both the tester and its accessories housed in a multi-functional engineering plastic case that is resistant to cold, heat, sealing, waterproof, and shockproof, making it convenient for field tests. This test device can be used to test single-phase and three-phase transformers, both with and without taps. The instrument can be controlled throughout using a dedicated APP downloaded on an Android phone or tablet, allowing for the storage and upload of test data for easy review.

1.2 Main Functional Features

▪ Capable of PT ratio and polarity testing.

▪ Equipped with blind test function to accurately measure the transformer's ratio and connection group when the connection group of a three-phase transformer is unknown.

▪ Capable of testing autotransformers, Z-type transformers, and phase-shifting transformers.

▪ Added tap mode settings to accommodate transformers with high voltage at high tap positions and low voltage at high tap positions.

▪ Added low-voltage side tap settings to accommodate transformers with taps on the low-voltage side.

▪ Graphical display settings for more intuitive readings.

▪ Simultaneous measurement of three-phase ratios during three-phase transformer testing for faster testing speed.

1.3 Panel Description

1. Grounding Terminal: Before conducting any tests, please safely ground the grounding terminal to avoid the risk of electric shock.

2. Power Socket and Switch: The power input port for the entire device, used to connect or disconnect the test power supply.

3. High-voltage side connection terminals: There are three-color (yellow, green, red, and black, with the black one being counted as part of the color indication context here for understanding the connection mapping, though technically it's a single additional color column beyond the three primary phase colors) binding posts, corresponding to connection with the A, B, C, N phases of the high-voltage side of the transformer being measured.

4. Low-voltage side connection terminals: There are three-color (yellow, green, red, and black, similarly, the black one is included in the context for connection mapping explanation) binding posts, corresponding to connection with the a, b, c, n phases of the low-voltage side of the transformer being measured.

5. High-Voltage Side Terminals: Yellow, green, and red terminals for connecting to the A, B, and C phases of the high-voltage side of the transformer under test.

6. Low-Voltage Side Terminals: Yellow, green, and red terminals for connecting to the a, b, and c phases of the low-voltage side of the transformer under test.

7. RS232 Communication Interface: Interface for computer communication.

8. Printer: Prints test results.

9. USB: Connects to a USB flash drive for data export.

10. Display Screen: 7-inch high-definition color touchscreen LCD with adjustable backlight for displaying the operation menu and test results.

II. Precautions

2.1 Usage Instructions

Only qualified and trained operators should operate the tester. Operators must read and understand this manual before operating the tester. Operators must follow the instructions in this manual and adhere to the precautions during the use of the tester. If the device malfunctions, it should be immediately powered off and returned to Huazheng for repair.

2.2 Labeling

Warning: Please refer to the user manual.

Caution, risk of electric shock.

2.3 Safety Precautions

▪ This equipment is intended solely for the purposes described in this manual. Please strictly adhere to the information provided in the "Precautions" section.

▪ All terminals of the tester and high-voltage electrical power systems pose potential electric shock hazards. Take all practical safety precautions to prevent contact with live parts of the equipment and associated circuits.

• Use appropriate barriers, barricades, or warnings to ensure that personnel not directly involved in the work stay away from testing activities.

• Do not connect the tester to equipment that is in a powered-on state.

• Do not use in rainy or explosive environments.

• Before testing, reliably ground the grounding terminal on the device panel to prevent hazards.

2.4 Operating Precautions

▪ Before conducting any tests, please ensure the grounding post is safely grounded to prevent electric shock hazards.

▪ Before testing, carefully check the wiring to ensure there are no reverse connections, short circuits, or incorrect connections.

▪ For measurements of Y/yn, YN/d, D/yn, D/zn, Y/zn, and autotransformers, there is no need to connect the neutral points. For measurements of single-phase transformers and potential transformers (PT), use the high-voltage side yellow and black test clips, as well as the low-voltage side yellow and black test clips.

▪ Z-type transformers can only be used for voltage ratio measurement.

▪ For transformers with multiple tap points, input the tap level, rated tap, tap type, rated high voltage, and rated low voltage so that the test results can automatically calculate the error values and the position of the tap switch. Once the rated data is input, when testing each tap point, the error value of that point and which tap point it is can be automatically calculated without the need to change the input parameters.

▪ If the number of short-circuited turns is very small, a fault may not be detected solely through a turns ratio test; the problem can be identified by testing the excitation current.

2.5 Precautions for Operating Power Supply

The tester is equipped with a three-wire power cord. It should operate within the following working voltage range:

85-264VAC, 47-63Hz.

Before connecting the power supply, ensure that the operating voltage of the tester matches the input voltage. The control circuit of the tester is protected by a fuse. The fuse is located in the power socket and switch module, installed on the tester panel, and can be replaced by the operator.

Before replacing the fuse,

disconnect the power input plug from the power outlet.

III. Technical Parameters

Test Range: Transformation Ratio -- 0.9 to 10000, Current -- 0 to 2000mA, Angle -- 0 to 360°

Ratio Accuracy:

5V Range: ±(0.1% + 2 digits) (0.9-50), ±(0.2% + 2 digits) (51-200), ±(0.5% + 2 digits) (201-600)

80V Range: ±(0.1% + 2 digits) (0.9-500), ±(0.2% + 2 digits) (501-2000), ±(0.5% + 2 digits) (2001-10000)

Current Accuracy: ±(1% of reading + 0.5 mA)

Angle Accuracy: ±0.2°

Output Voltage: Selectable 5V or 80V

Resolution: Ratio -- Minimum 0.0001, Current -- 0.001mA, Angle -- 0.01°

Test Voltage: AC 5V @ 1A, AC 80V @ 80mA

Operating Power Supply: 100V～240V AC, 50/60 Hz

Ambient Temperature: -10°C to 40°C

Relative Humidity: ≤85%, non-condensing

Dimensions: Main Unit: 360290170(mm), Cable Box: 360290170(mm)

IV. Test Preparation

4.1 Selection of Test Location

• Choose a location that is as dry as possible for testing.

• Keep away from flammable materials.

• Ensure good ventilation in the test area.

• The test area should be a flat surface.

• Set up appropriate safety barriers to protect operators.

For all tests described in this manual, care should be taken to ensure that any and all unused clamps are isolated from each other, the ground, and personnel.

4.2 Wiring

Connections should be made in the following order, and the reverse order should be followed for disconnection after testing. Ensure that the switch is in the "O" (OFF) position, disconnect the power cord first, then the ground wire, and finally the test leads.

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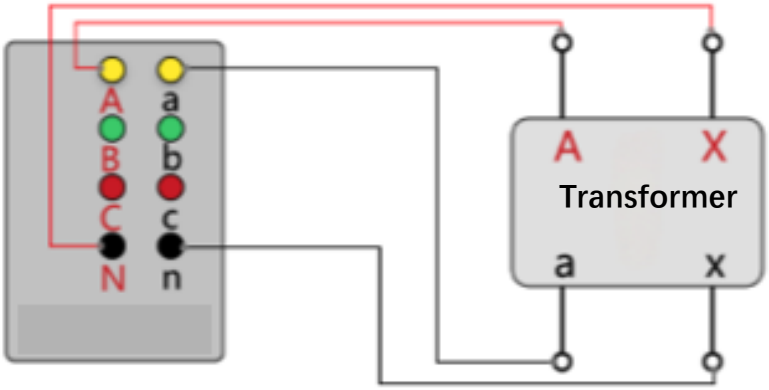
1. Grounding Cable

Use a grounding cable to directly connect the grounding post of the tester to the earth. Ensure that the transformer case also has a low-impedance connection to the grounding potential.

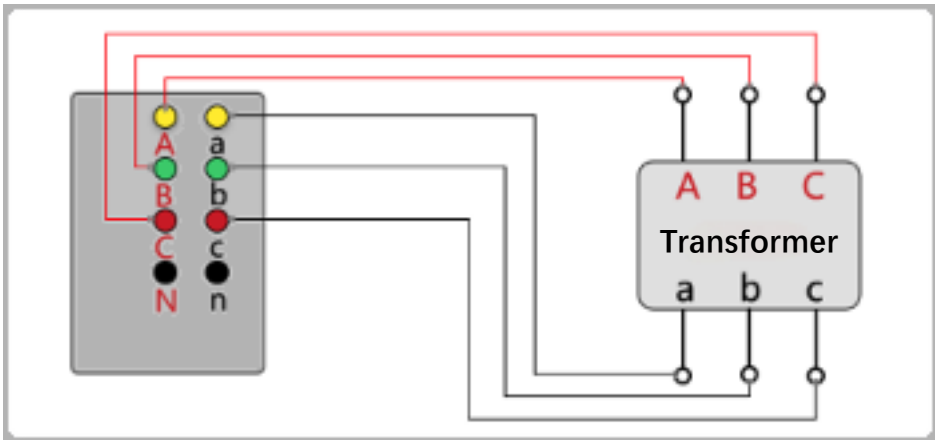
2. Connecting Test Leads

Connect the primary and secondary test leads to the tester. Ensure that all plugs are securely and safely connected to the tester with reliable contact.

The wiring diagram for single-phase transformation ratio testing is shown in the figure below: (Unused test leads can be left hanging)



The wiring diagram for three-phase transformation ratio testing is shown in the figure below:



3. Connecting Power Supply

Ensure that the input power supply meets the requirements, make sure the switch is in the "O" (OFF) position, and connect the power cord to the tester.

4.3 Android APP Software

The testing instrument can be controlled via the touchscreen or operated from an Android mobile phone that has been connected and on which the APP software has been installed.

(1). Installation of APP Software

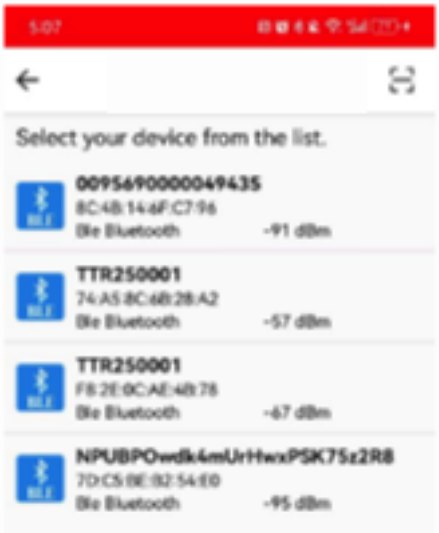
Install the APP software named hz_device_vX.x.x.apk, where vX.x.x represents the version number.

(2). Connecting to the Device

Click on the APP ”ICON” to enter the main interface, as shown below:

Click on the button 

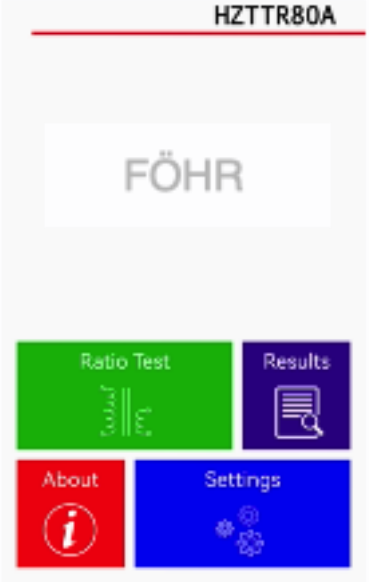
to jump to the device scanning interface, as shown below:



Click on the device name you want to connect to in the list. Alternatively, click on the icon  in the top-right corner to jump to the QR code scanning page, and scan the QR code on the testing instrument to establish a connection. After a successful connection, the 

button will change to 

button , as shown below:



V. Operation

5.1 Power-on and Interface Introduction

Input AC power, switch the power switch to the "I" position, and turn on the tester. A startup screen with the company logo will appear, followed by the main interface.

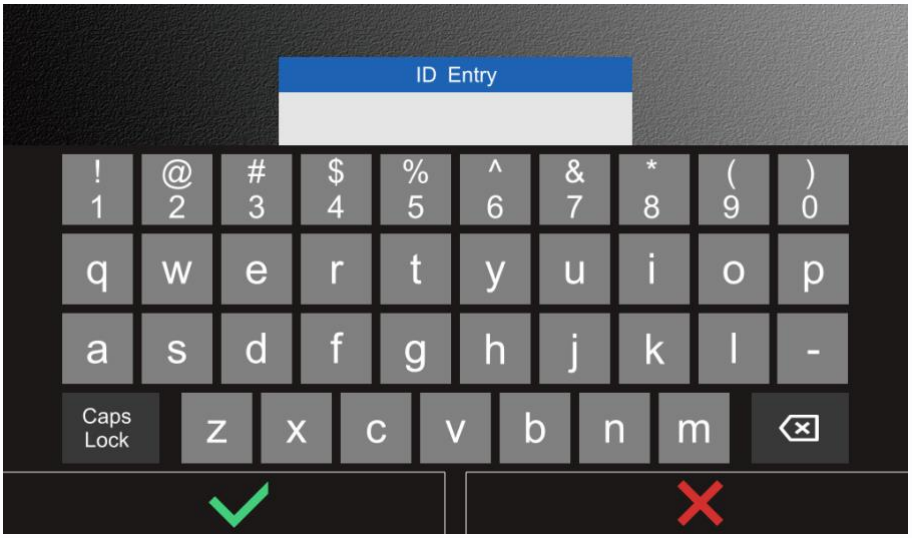
5.2 Introduction to Operation Buttons and Input Keyboard

1. Buttons

Button	Description	Button	Description
	Confirm Accept changes		Home Return to the main interface
	Cancel Discard changes		Back Return to the previous interface

2. Input Keyboard

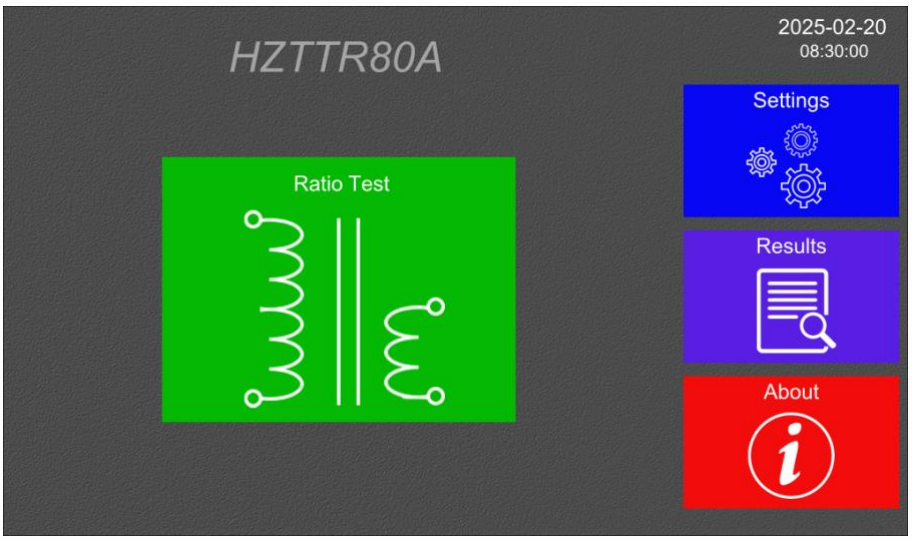
This keyboard can be accessed in the measurement parameter setting interface and the time setting interface for data entry.



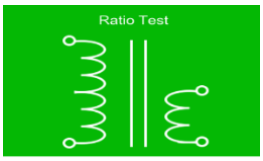
This keyboard can be accessed in the measurement parameter setting interface for entering the ID number of the test specimen.

5.3 Main Interface

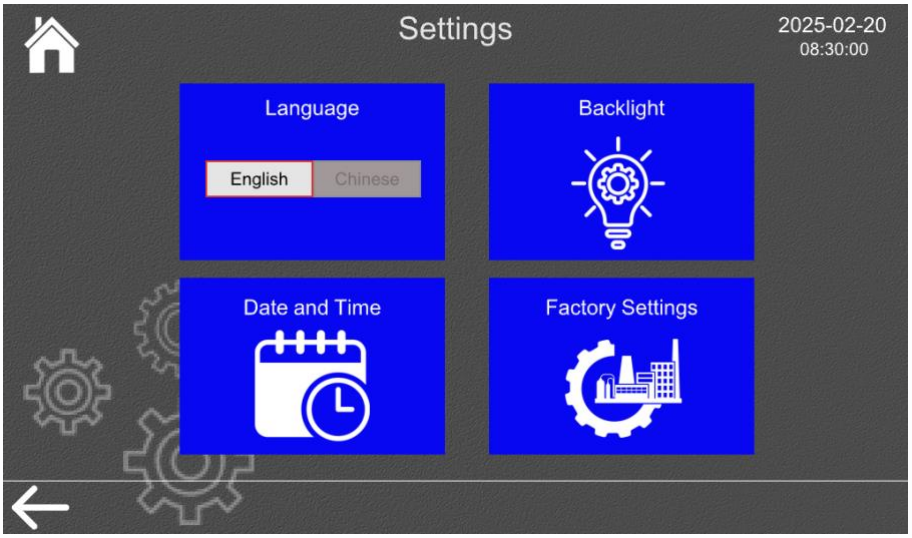
The main interface appears after the tester is started. All main functions can be initiated from the main interface.



Button functions are as follows:

Button	Description
	Transformer Ratio Test First, enter the measurement parameter setting interface.
	Settings Configuration of language, backlight, time, and manufacturer parameters.
	Result Display Display of saved measurement results.
	About Version information of software and hardware, Bluetooth information, and help.

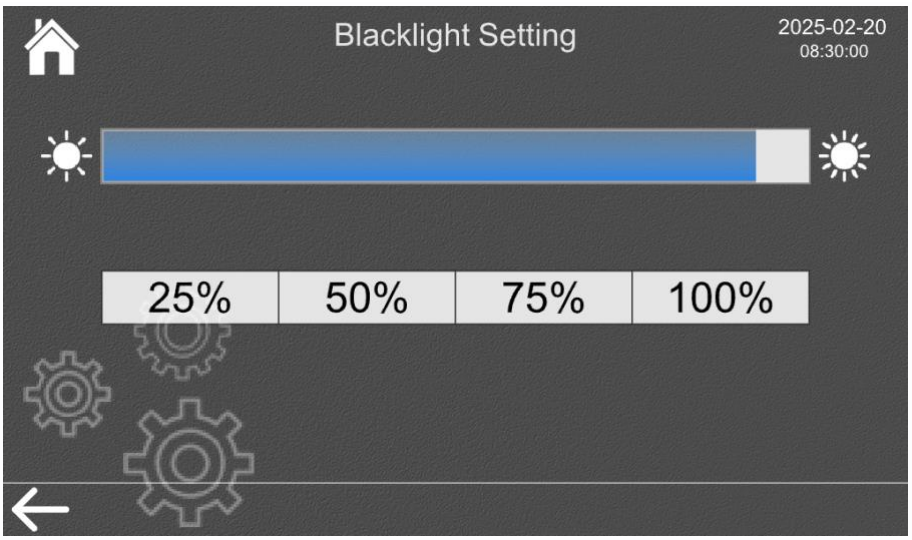
5.4 System Settings Interface



To switch from English to Chinese, simply click the Chinese button; to switch from Chinese to English, click the 英语 button. Other button functions are as follows:

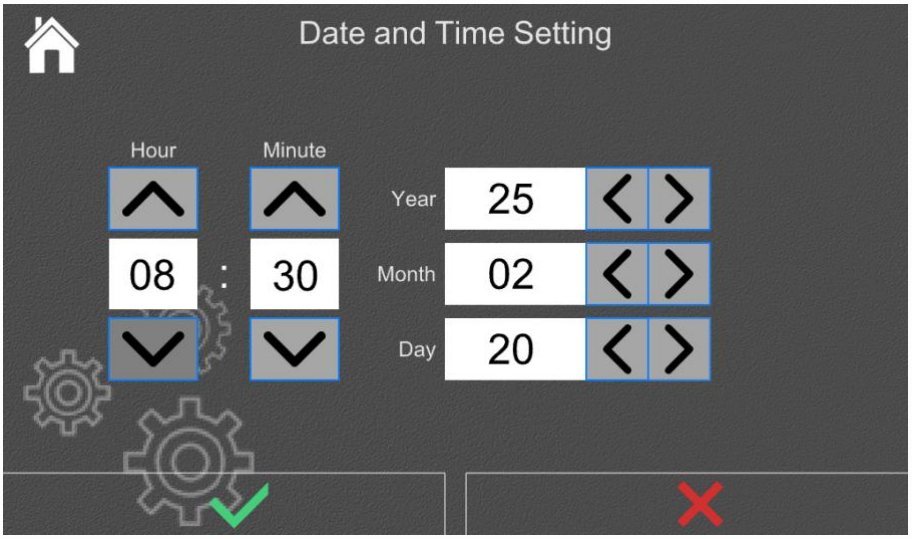
Button	Description
	Backlight settings
	Time settings
	Manufacturer settings

5.4.1 Backlight Settings



You can slide slider to set the backlight value, or click 25%, 50%, 75%, 100% to set fixed backlight values. The backlight value can be adjusted from 25% to 100%.

5.4.2 Time Settings



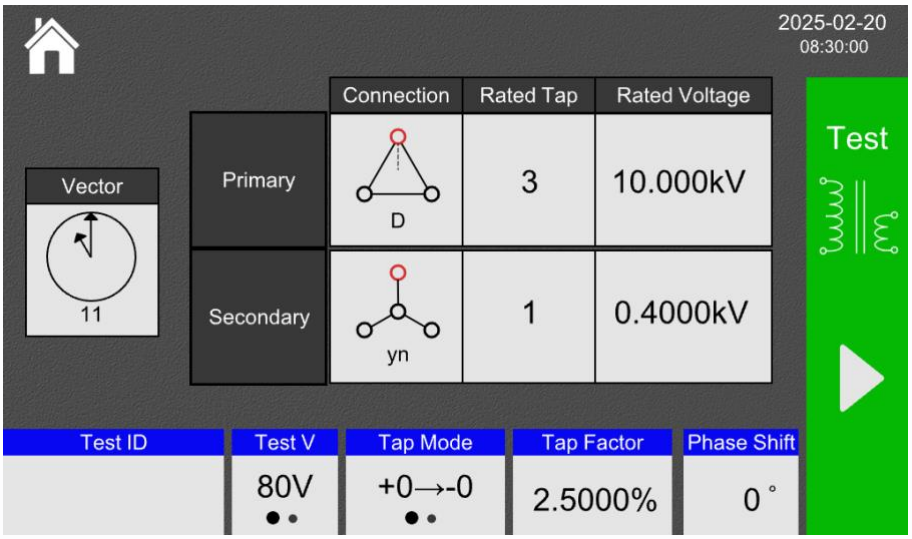
You can click the four buttons  to set the time, or click the edit area to access the input keyboard for setting the time.

Options	Setting Range
Year	2000 - 2099
Month	1 - 12

Day	1 - 31
Hour	0 - 23
Minute	0 - 59

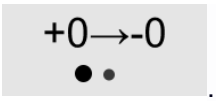
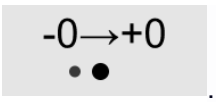
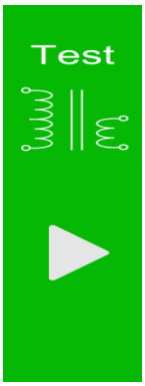
5.5 Measurement Parameter Setting Interface

Before measurement, the correct parameters must be set.

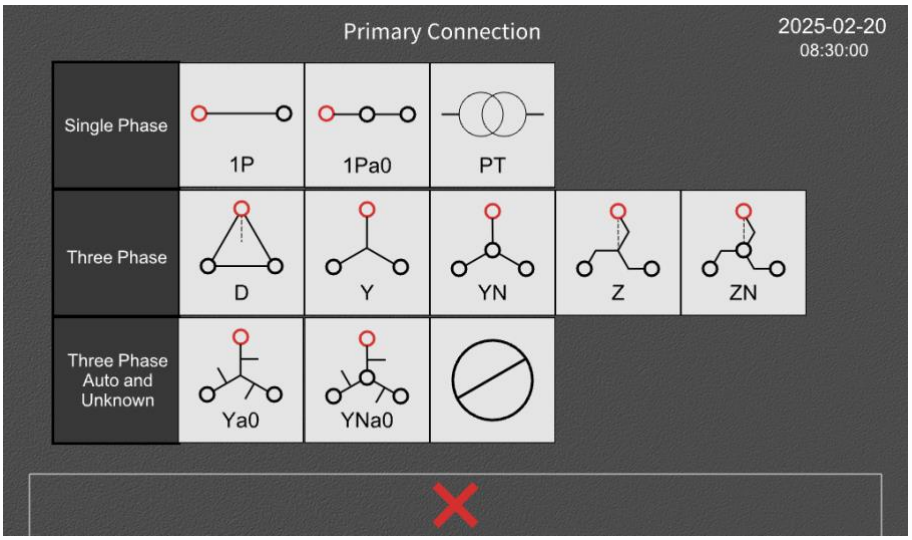


5.5.1 Parameters and Buttons

Options	Description
High-voltage connection	Set the connection mode for the high-voltage side; for detailed selection settings, please refer to section 5.5.2.
Low-voltage connection	Set the connection mode for the low-voltage side; for detailed selection settings, please refer to section 5.5.3.
Connection group number	Set the transformer's group number; for detailed selection settings, please refer to section 5.5.4.
High-voltage rated tap	For transformers with taps on the high-voltage side, please enter the correct position of the rated tap. Incorrect input will affect the judgment of the tap position. If there are no taps or the taps are on the low-voltage side, please enter "1".
Low-voltage rated tap	For transformers with taps on the low-voltage side, please enter the correct position of the rated tap. Incorrect input will affect the judgment of the tap position. If there are no taps or the taps are on the high-voltage side, please ignore this setting.
Rated high-voltage	Please enter the rated high-voltage value from the transformer nameplate correctly. Incorrect input will affect the error calculation. For transformers with taps on the high-voltage side, please enter the rated high-voltage value corresponding to the rated tap on the

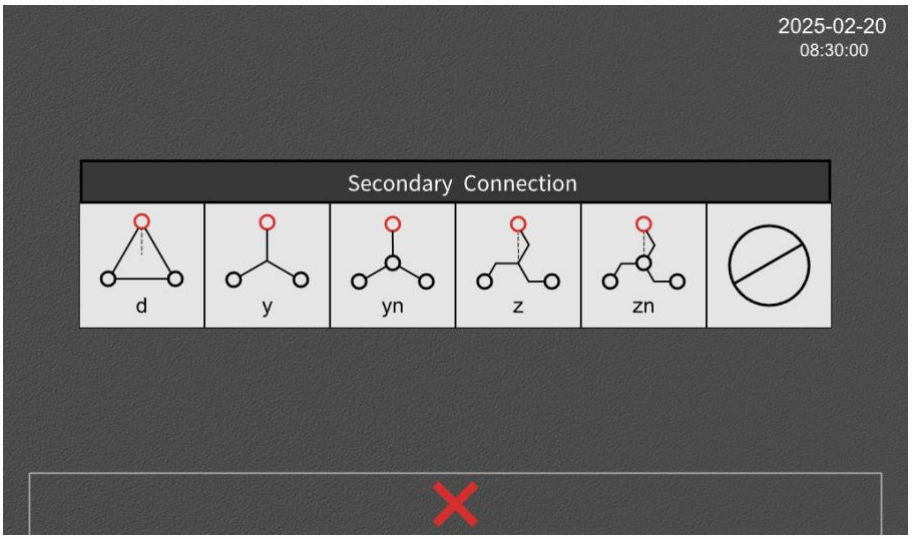
	transformer nameplate.
Rated low-voltage	Please enter the rated low-voltage value from the transformer nameplate correctly. Incorrect input will affect the error calculation. For transformers with taps on the low-voltage side, please enter the rated low-voltage value corresponding to the rated tap on the transformer nameplate.
Test voltage	Options of 80V and 5V are available.
Tap mode	For transformers with high voltage at the high tap position, select  . For transformers with low voltage at the high tap position, select  . Ignore this setting for transformers without taps.
Tap spacing	For each tap step, the percentage of transformer ratio adjustment (e.g., 1.25% should be entered as 1.25) must be input correctly. Otherwise, it will affect the judgment of tap positions and the calculation of errors. This setting item can be ignored for transformers without taps.
Test specimen number	Enter the test specimen number, up to 11 characters can be entered.
Non-30° phase vector	For phase-shifting transformers, enter the angle value of the non-30° vector. For other transformers, enter 0°. The input range is 0-360°.
	Measurement button: click to enter the measurement interface.

5.5.2 High-Voltage Connection Setting



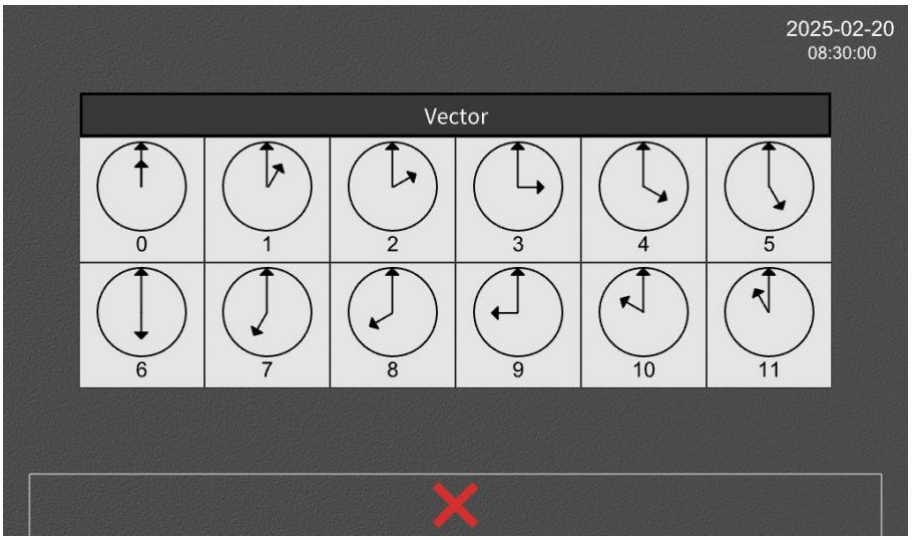
 The option is for setting an unknown connection method. Selecting this option allows for three-phase blind measurement functionality.

5.5.3 Low-Voltage Connection Setting



 The option is for setting an unknown connection method.

5.5.4 Connection Group Setting



5.6 Measurement Interface

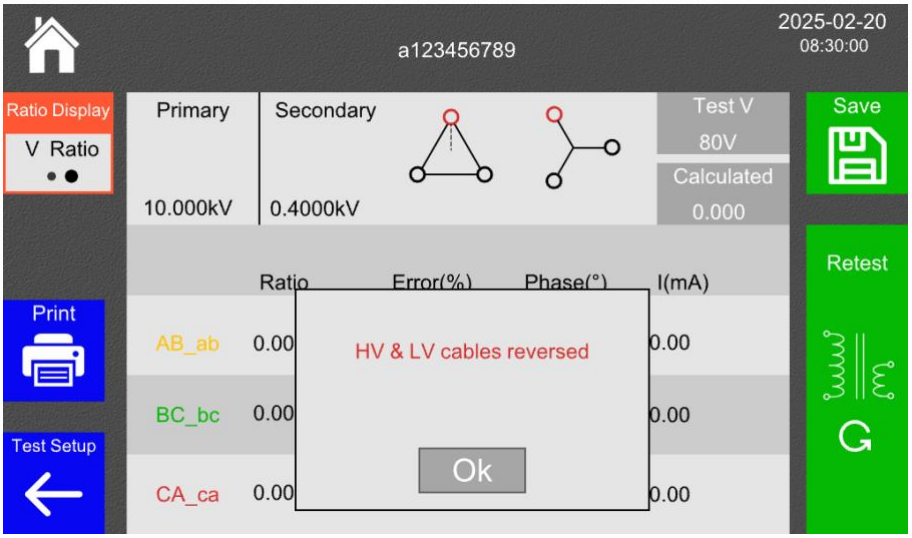
5.6.1 Test Failure

There are many reasons for test failure, including but not limited to:

• Improper test lead connections

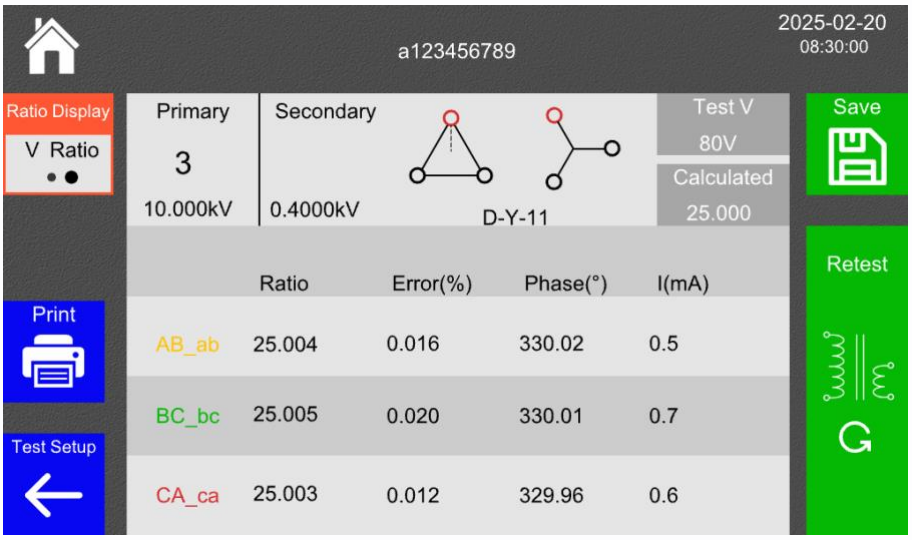
• Excessive current consumption

If the test cannot continue due to safety reasons or issues with test lead connections, a "Test Failure" prompt will appear. Read the error message and troubleshoot to determine the cause and solution.

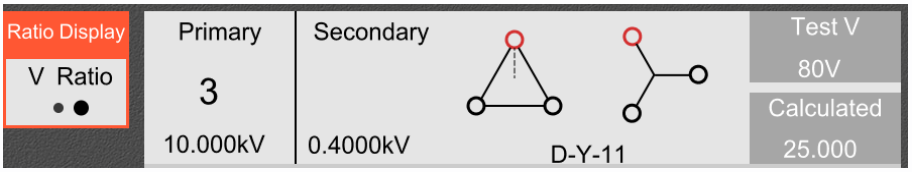


5.6.2 Test Success

When the test is successfully completed, the following interface will be displayed.



The title contains useful information about the test settings and how the transformation ratio test was performed.



Information	Description
Test Specimen Number	The test specimen number is displayed above the title.
Transformation Ratio Display	Indicates whether the currently displayed transformation ratio data is a voltage ratio or a turn ratio. Operating this button allows switching between voltage ratio display and turn ratio display. Z-type transformers cannot display the turn ratio.
High-voltage Tap Position/Low-voltage Tap Position	Displays the high-voltage or low-voltage tap position determined by the tester's calculations and judgments. Whether the high-voltage tap position or the low-voltage tap position is displayed is related to the settings for rated taps.
Rated High-voltage/Rated Low-voltage	During the measurement process, it displays the rated high-voltage and rated low-voltage values entered in the parameter setting interface. After a successful test, it displays the rated high-voltage and rated low-voltage values at the current tap position calculated by the tester. The display is related to the settings for rated high-voltage, rated low-voltage, and rated tap position.
High-voltage	During the measurement process, it displays the vector

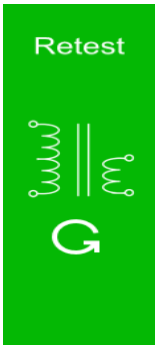
Connection/Low-voltage Connection/Group Number	relationship entered in the parameter setting interface. After a successful test, it displays the vector relationship and group number determined by the tester's calculations and judgments. The display is related to the settings for group number, high-voltage connection, low-voltage connection, and non-30° phase vector.
Test Voltage	The test voltage selected for this measurement.
Theoretical Transformation Ratio	The theoretical transformation ratio calculated based on the settings for rated high-voltage, rated low-voltage, and rated tap position.

Below the title is the data for the three-phase measurement results. If a single-phase measurement was performed, only one line of results will be available.

	Ratio	Error(%)	Phase(°)	I(mA)
AB_ab	25.004	0.016	330.02	0.5
BC_bc	25.005	0.020	330.01	0.7
CA_ca	25.003	0.012	329.96	0.6

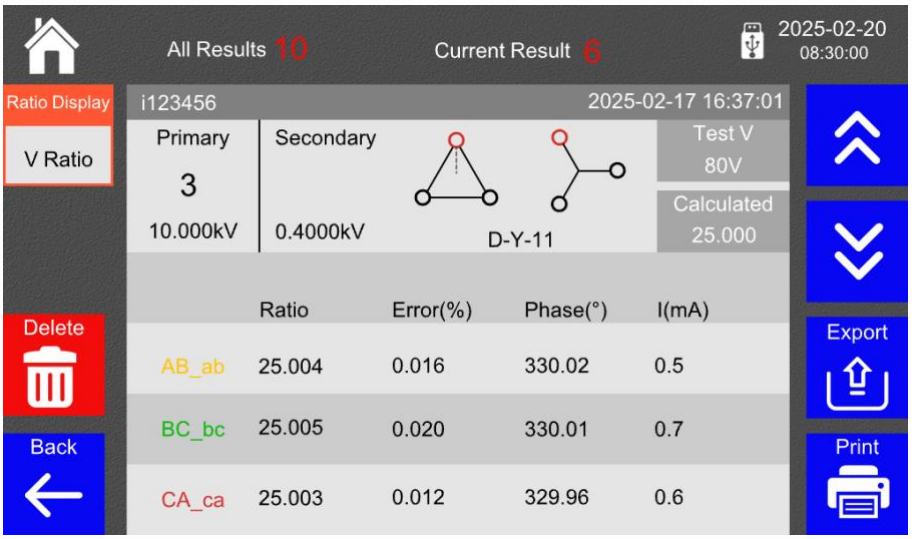
The button functions in this interface are as follows:

Button	Description
	Save Save the measurement results, which can be viewed in the data browsing interface.
	Print Use the printer installed on the tester panel to print the current measurement result data.
	Back Return to the parameter setting interface.

	Remeasure Adjust to the next tap position and continue the measurement.

During the measurement process of the tester, the input/output terminals, test posts, etc., may be live. Do not touch exposed contacts and parts to avoid the risk of electric shock. Please follow the instructions carefully!

5.7 Data Browsing Interface



The data browsing interface is almost identical to the measurement interface. At the top of the interface, it displays the total number of stored measurement data results and the current group number being displayed. The tester can store up to 200 groups of measurement data. The button functions are as follows:

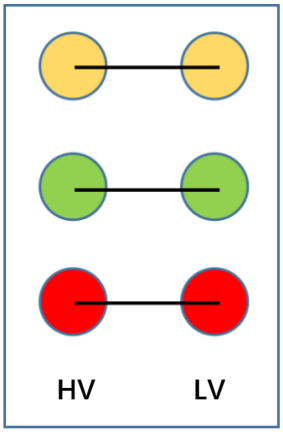
Button	Description
	Transformation Ratio Display: Indicates whether the current transformation ratio data displayed is a voltage ratio or a turn ratio.

	Previous Set Switch to the display of the previous set of measurement result data.
	Next Set Switch to the display of the next set of measurement result data.
	Export Measurement Results Insert a USB flash drive. When the USB drive icon appears next to the time at the top of the interface, you can export the measurement result data to the USB drive in the form of a text file.
	Print Use the printer installed on the tester panel to print the measurement result data.
	Delete Delete the measurement result data of the current set.
	Back Return to the previous interface.

VI. Troubleshooting and Maintenance

If any abnormalities occur during the use of the tester, please follow the steps below for troubleshooting:

1. If the measurement data is abnormal, please check if the wiring is correct. If it is still abnormal, you can perform a self-test using the following method. The wiring is shown in the figure below:



After connecting the wires, select any three-phase connection method for testing. If the measured value is approximately 1.0000, the instrument is functioning normally; otherwise, there is an issue with the instrument. If no shorting wire is available, you can also short-circuit the high-voltage side yellow, green, and red wire clamps to the corresponding low-voltage side yellow, green, and red wire clamps.

2. If the tester does not respond when turned on and the display screen is not lit, please check if the power fuse inside the panel is blown.

3. If it is confirmed to be an internal fault of the tester, please contact our company immediately, and we will resolve it as soon as possible.

VII. Packing list

No.	Item	Qty
1	Host	1
2	Test Cables	1
3	Power Cord	1
4	Operation Manual	1
5	Certificate of Conformity	1
6	Fuse	2
7	Printing Paper	1
8	Packing List	1
9	Ground wire	1

Made in China
HEMB Co., LTD
Add: No.3, Building 9, High-tech Digital Valley, No. 3099, Xiangyang North Street,Baoding ,Hebei , China

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