

JYR-20C/40C/50C (Single Phase)

Transformer DC Winding Resistance Tester







Table of Contents

I.	Overview	4
II.	Safety Measures	5
III.	Performance Characteristics	6
IV.	Test Range Specifications	7
V.	System Introduction	.10
VI.	Test and Operation Method	11
VII.	Attentions	. 25
VIII	. Common Problems and Their Solutions	.25
VIII	. Instrument Completeness	.26
IX.	After-sales Service	. 26

The manual is subject to change without notice. Ensure to carefully read the operation manual prior to use the instrument, it is sole responsibility of customer to secure safety.

Version of the manual: JY11.18-2022

The manual is subject to change without notice.





JYR-20C/40C/50C Technical Specification:

	JYR-20C/40C/50C									
Tester Type	20C	40C	50C							
Output current	Auto, 20A, 10A, 5A, 2A,1A, 200mA,100mA, 20mA	Auto, 40A, 20A,10A, 5A, 2A,1A, 200mA,100mA, 20mA	Auto, 50A, 20A,10A, 5A, 2A,1A, 200mA,100mA, 20mA							
Test Range (Single-phase)	$0 \sim 20 k\Omega$ (For details, refer to IV.)									
Accuracy	0.2%±0.1μΩ									
Min. Resolution	0.1μΩ	0.01μΩ	0.01μΩ							
Output Voltage	DC24V									
Operation Power	AC220V±10%, 50 Hz±1Hz									
Operation temperature	-20℃~40℃									
Relative humidity	≤80%RH, no dew									
Volume / Weight	eight L420mm×W320mm×H200mm 14.8kgs									

I. Overview

The DC resistance of a transformer is a necessary measuring item in the testing, installation, commissioning testing and electric power department's preventive testing of semi-finished products and finished products in transformer manufacturing. It can be used to effectively detect the manufacturing defects involving transformer coil material selection, welding, connection part loosening, missing strands, broken wires, etc. as well as the existing potential hazards after running. In order to meet the needs of fast measurement of DC resistance of transformers, Kingrun has developed a new generation of JYR series DC resistance test instrument using its own technological advantages. The instrument uses a new power supply technology and has features such as small size, light weight, large output current, etc. The whole instrument is controlled by SCM and automatically achieves functions such as self-check, data processing, display, etc. Moreover, the instrument has functions such as automatic discharging, discharging indication, etc. The instrument has advantages such as high test accuracy and simple and convenient operation and can achieve fast measuring of DC resistance of a transformer.

II. Safety Measures

- 1. Be sure to carefully read the operation manual before using the instrument.
- 2. The instrument operator shall have general knowledge about the use of general electrical equipment or instruments.
- 3. The instrument can be used both indoors and outdoors. However, be sure to avoid using it at the following places with rain, corrosive gas, too high dust concentration, high temperature, or direct sunlight, etc.
- 4. The instrument is a high-precision instrument; therefore, it is required to avoid severe vibration of it.
- 5. Repair, maintenance and commissioning of the instrument shall be performed by professional personnel.
- 6. The power can be turned off and the test lines can be removed after discharging alarm sound is ended upon test completion.
- 7. The transformer tap position can be switched after discharging alarm sound is ended during the test on the transformer with no-load tap-changer.
- 8. It is forbidden to dismantle and move test clips and power supply lines during test.

III. Performance Characteristics

- Fixed current output 50C (20mA-50A totaling 9 ranges); 40C (20mA-40A totaling 9 ranges); 20C (20mA-20A totaling 8 ranges); automatic current output (0.1A maximum current at the constant range; the optimal current is set automatically based on the resistance of the test product).
- 2. Wide measuring range $(0\Omega-20K\Omega)$; able to measure the inductive DC resistance of transformers, mutual inductors, etc.
- 3. Function of auxiliary judgment of data stabilization. Automatically calculate the percentage of 5", 15" or 30" resistance deviation, accurately judge the readability of data, and prevent misreading of data.
- 4. Temperature conversion according to test product materials (copper, aluminum), for convenience of comparison with historical data
- 5. Transformer demagnetizing function; able to effectively reduce transformer remanence
- 6. Functions such as perpetual calendar, storage of 99 sets of data, Chinese and English interface selection, etc.;

no data loss after shutdown. The instrument is provided with micro-printer and "U disk" interfaces.

- 7. 6" color touch LCD
- 8. Dual RS485 communication interfaces for convenience of inter-device cascading. In cooperation with the control software of the upper computer, the instrument can achieve remote control and measurement. The instrument can be fitted with an optional built-in bluetooth module to achieve bluetooth wireless communication.
- 9. Audible discharging alarm, and clear discharging indication to reduce misoperation
- 10. The instrument is protected from wrong connection of AC380V power; after the protection function is activated, an audible alarm is given to reduce the damage caused by misoperation to the instrument. The instrument also has perfect counter emf protection function and strong arc discharge resistance.
- 11. The instrument has features such as dust prevention, shock prevention, moisture prevention, high measuring accuracy, good stability and repeatability, high portability, etc.

IV. Specifications

Output current (50C): automatic, 50A, 20A, 10A, 5A, 2.5A, 1A, 200mA, 100mA, 20mA
Output current (40C): automatic, 40A, 20A, 10A, 5A, 2.5A, 1A, 200mA, 100mA, 20mA
Output current (20C): automatic, 20A, 10A, 5A, 2.5A, 1A, 200mA, 100mA, 20mA

2. Range:

Automatic	 0Ω- 200Ω
50A	 $0\Omega - 0.4\Omega$
40A	 0Ω-0.5Ω
20A	 0.0005Ω– 1.0Ω
10A	 0.001Ω-2.0Ω
5A	 0.002Ω-4.0Ω
2.5A	 0.004Ω– 8Ω
1A	 0.01Ω– 20Ω
200m A	 0.1Ω– 100Ω
100m A	 0.5Ω–200Ω
20m A	 10Ω– 20kΩ

- 3. Accuracy: $0.2\% \pm 0.1 \mu \Omega$
- 4. Minimum resolution: $0.01\mu\Omega$
- 5. Working temperature: -20~ 40°C
- 6. Ambient humidity: $\leq 80\%$ RH, no dewing

- 7. Working power supply: AC: AC220V±10%, 50Hz±1Hz
- 8. Volume: length 420mm× width 320mm× height 200mm
- 9. Net weight: 14.8kg

V. System Introduction

See Figure 1 for the instrument panel (example 40C).



Figure 1

1. Binding post terminal area

I+, and I- terminals: current output terminals for measurement.

V+, and V- terminals: voltage input terminals for measurement.

- 2. Display: large-screen true color touch LCD display; touch selection and display of menu; touch operation test and input information; showing test current value, resistance value and relevant information.
- **3.** U-disk interface: to connect a U-disk and export the data from memory.
- 4. 485-I/485-II: two standard 485 communication interfaces.
- 5. Power switch: control power on and off the whole instrument.
- 6. Power input port: AC power input port of the whole instrument, rated input voltage AC220V, frequency 50H, with fuse box, built-in burnout fuse.
- 7. Ground pole: used in instrument housing grounding, belonging to protective grounding
- 8. Printer: to print current value, resistance value and auxiliary information result

VI. Test and Operation Method

 Measuring wiring: the test product is connected to the test terminal of this machine through a special test cable. The coarse inserting piece (red) of the test cable is connected to the current terminal I+, the coarse inserting piece (black) is connected to the current terminal I-, the fine inserting piece (red) is connected to the voltage terminal V+, and the fine inserting piece (black) is connected to the voltage terminal V-. The inserting pieces shall be tightened to prevent loosening.

In addition, the ground wire is well connected. The clamp ends are respectively clamped at the two leading-out terminals of the coil resistance of the test product. The specific wiring method is shown in the following figure (Figure 2). The leading-out column without testing winding needs to be suspended independently.





 Starting up operation: connect the power line supplied with this machine to the AC power input port. Turn on the power switch. Then the LCD will be turned on. (If the input power supply AC220V is connected into AC380V by mistake, the internal protection device of the instrument will function, the internal power supply will be cut off, and the buzzer will always alarm.)

The Company's LOGO interface will be displayed on the screen. After it stays for about 3 seconds, it will be automatically skipped. Then enter the main interface for option setting, as shown in Figure 3:





3. Mode selection: the interface shown in Figure 3 is displayed on the screen. Here the needed measurement mode can be selected by touching the test mode option.

"Resistance test" mode: conventional single-phase winding resistance four-terminal test mode.

"Demagnetizing test" mode: Used to eliminate transformer remanence.

- 4. Test current selection: the interface shown in Figure 3 is displayed on the display screen. At this time, you can select the desired measurement current by touching the current selection arrow keys. Each time of touching, the display screen will display the corresponding test current and the maximum test resistance at the corresponding current circularly. (On the premise of satisfying the resistance test range, a large current shall be used as much as possible, but the rated power of the test product shall also be considered. The test at the power exceeding the rated power of the test product can cause damage to the test product. Test product high-temperature also has some influence on test data, so various factors shall be considered comprehensively.)
- 5. Parameter setting: the interface shown in Figure 3 is displayed on the screen. At this time, you can touch the "Set" button to enter the parameter setting interface, as shown in Figure 4. In this interface, you can set the test product temperature, test product conversion temperature, data stabilization judgment time interval, test product material, communication baud rate, test product number, perpetual calendar time, etc.





By touching the display area to be set, the input soft keyboard will pop up automatically; then according to the requirements of the prompt, input the corresponding information and modify the corresponding setting. After setting completion, touch the "Exit" button to return to the optional setting main interface.

6. Test: select the corresponding measurement mode and corresponding test current in the optional setting main interface, and then touch the "Start" button to enter the test process in the corresponding measurement mode.

6.1 Resistance test

After starting the test, the display screen indicates the value of the test charge current while giving the prompt "Recharging..."; in addition, the system clock starts timing and shows the test time from charging. After the test current reaches the preset current and is stable, the prompt "Under Test" is given and then the test resistance value is displayed. Observe the stability of the test current value and resistance value. The instrument conducts continuous tests (as shown in Figure 5). The instrument will indicate the percentage of the error between the current resistance data and the resistance data before stabilization judgment time interval from the beginning of showing resistance data up to stabilization judgment time interval so as to determine the stability of the channel resistance measurement data. The time interval can be set and switched among 5", 15" and 30" by touching the interval selection key. It can be set according to the historical test experience on test products. The stabilization judgment time interval setting can also be revised in the setting menu. A test report can be generated and printed out by touching the "Print" button. Touch the "Save" button to save the current test data report into the instrument memory. The "Fast" measuring mode is generally selected in instrument test; when the test resistance value fluctuates to a large extent, you can try to switch to the "Slow" mode. At this time, you can switch between "Fast" and "Slow" only by touching the speed selection button. Tapping information input will be activated by touching the "Tapping-" or "Tapping+" button; after re-touching it, change the tapping position value. When the tapping position value is 0, turn off the tapping input function. By touching the "Conversion" button, temperature conversion will be performed according to the set test product temperature, converted temperature and material, and the converted resistance value and the corresponding test product temperature and converted temperature will be displayed. After re-touching the "Conversion" button, cancel the conversion mode and return to the resistance data state without conversion. The test product temperature, converted temperature and material can be set by selecting the optional setting main interface to enter the setting menu.





After test completion, touch the "Exit" button. Then the instrument is discharged automatically to end the test and return to the optional setting main interface.

6.2 Demagnetizing test

Demagnetizing method: the demagnetizing wiring method is the same as the wiring method in "resistance test". Clamp the red test clamp and black test clamp onto the demagnetized winding respectively.

The default is automatic current output in demagnetizing test. After starting demagnetizing, the display screen is switched to the demagnetizing interface (Figure 6), and then automatic demagnetizing can be performed. This may take a period of time. Please wait patiently.

Note: there will be a repeated charging and discharging process and the buzzer will give an alarm repeatedly during demagnetizing. This is normal. Touch the "Exit" button to end demagnetizing process during demagnetizing.



Figure 6

7. View the data recorded in the memory: touch the "Record" button in the boot screen to enter the record view interface. Data can be viewed circularly. At most 99 sets of data can be stored and viewed. Touch the "Exit"

button to return to the optional setting main interface; touch the "Print" button to print the recorded data. If there is no data for view, the interface will show "No Record Temporarily".

8. Import into U Disk: press the "U Disk" function button in the optional setting main interface to import the instrument memory data into a "U disk". If there is no data for export, the interface will show "No Record

Temporarily".Please firstly insert a U disk. After inserting the U disk, the icon will be displayed on the

upper right corner of the instrument. After unplugging the U disk, the icon 🖞 will disappear. The prompt

"Being Exported" is given during data exporting. After data exporting completion, the prompt "Export Completed" is given. After export completion, the U disk can be unplugged.

Please do not unplug the U disk during "Exporting".

The name of the file imported into the U-disk is defined as follows:

Firstly create a folder taking day as the unit, e.g. DT170408.

Where "DT" is the fixed format of file beginning; "17" is the latter two digits of 2017; "04 is April; "08" is April 8. Then create a file taking HHMMSS as the unit, e.g. SJ092458.

Where "SJ" is the fixed format of file beginning; "09" is 9 a.m.; "24" is 24min;

"58" is 58s.

The export time of the created file is taken as its creation time (system default).

- 9. Language switching: the instrument uses the mode of one keyboard toggle between Chinese and English interfaces.
- 10. "Communication" function: the instrument uses a standard RS485 interface (optional wireless Bluetooth mode). Connect the RS485 interface of the instrument and the USB interface of the computer through a UT850 adapter. In cooperation with the upper computer operation and control software, the functions can be achieved, e.g. instrument communication control, test data editing and printing, etc.

VII. Attentions

- 1. Before tapping point switching during the test on the transformer with no-load tap-changer, be sure to reset. Tapping point can be switched after discharging is completed and alarm sound is ended.
- 2. During measuring of the HV side resistance of an on-load tap changing transformer, the test current shall be determined according to the tap position with the maximum resistance value, and then measuring is begun, or the automatic current range is selected for the test.
- 3. The test lines can be removed after discharging is completed and discharging alarm sound is ended.
- 4. Refer to the range in the technical index column while selecting the current; do not use the instrument in case of over-range or under-range.

Try to select a large current within the range so as to improve stability; in addition, the current bearing capacity of the test product shall also be taken into account.

5. It had better use the HV magnetic assist method to measure the LV side winding of a large-capacity iron core five-column YND11 transformer so as to save the measuring time. (For the specific method, refer to the

wiring diagram on the nameplate).

VIII. Common Problems and Their Solutions

1. The instrument cannot be started and the buzzer keeps tweeting.

In this case, firstly check whether AC380V power supply is connected or whether the supply voltage is too low.

2. The LCD screen cannot be turned on and the fan of the instrument fails to work after starting.

In this case, firstly check whether the AC220V power supply is normal; then check whether the fuse is burned out; if yes, replace it with a new one.

3. The LCD screen can be turned but doesn't have normal display or cannot display on after starting.

In this case, firstly start and shut down the instrument once.

4. Instable test data or large error

In this case, firstly check the test lines for virtual connection and loosening. If the problem cannot be solved yet, check for rustiness of the test product.

5. Always showing "Being Charged. . . ." during test

In this case, firstly check for transformer magnetic circuit problem. If the current doesn't change and is always near zero for long, check for broken circuit. In case of failure to charge at all, check whether the measurement range is exceeded.

VIII. Instrument Completeness

Host of JYR DC Resistance Test Instrument	1 unit
Special test cable	1 set
Three-core power line	1 piece
Fuse 10A	2 pieces
Certificate of approval/ warranty card	1 piece
Packing list	1 piece
Operation manual	1 copy

IX. After-sales Service

Product shall be repaired and replaced free of charge in case of product quality problem in 24 months from purchase date, guarantee and technical service are provided for whole service life of the product. In case any abnormal condition or fault is found in the instrument, please contact the company in time so that we can organize most convenient treatment plan for you.

50C /40C/20C Communication Protocol

I. Interface form: RS485/232 or Bluetooth

Baud rate: 9600 bps (default), 1 start bit, 8 data bits, non parity, 1 stop bit

- II. Functional description:
- (1) The host can control the slave station for test.
- (2) The host can achieve range setting.
- (3) The host can query the slave state at any time.
- (4) The host can control slave resetting at any time.
- III. Message format: except that the message header and the message trailer use binary codes, all other fields of the message are transmitted in ASCII code mode.

Communication format description:

Message header: 1 byte, 7EH, message trailer: 1 byte, 0DH

Slave address: 2-byte ASCII code value, high byte first, slave address 45H 46H

Data: command parameters to be actually transmitted or measuring result data; the host data are the parameter contents to be transmitted.

The host sends commands:

1	2	3	4	5	6	7	8	9			
Message header	Slave address high	Slave address low	Data and command length high	Data and command length low	Host command	Data	Data	Data	 Data	XOR checkout	Message trailer

The slave sends back data:

1	2	3	4	5	6	7	8	9			
Message header	Slave address high	Slave address low	Data and command length high	Data and command length low	Slave state	Data	Data	Data	 Data	XOR checkout	Message trailer

IV. The host sends commands: host commands include three types:

Exit Command (40H), Print Command (41H), Save Command (42H), Stop Command (43H), Fast/Slow Speed Command (44H), Test Command (45H), Data Request Command (49H), Start Command (4AH)), Baud Rate Modification Command (4BH), Reset Command (4CH).

Note: the start command and the baud rate modification command are used only in reset state, and all other commands can be used after starting test. Please confirm the instrument state before sending a command.

1. Exit: the command is 40H <return to the main menu>

The corresponding data sequence is expressed as follows: 7E 45 46 30 31 40 3C 0D

2. Print: the command is 41H.

The corresponding data sequence is expressed as follows: 7E 45 46 30 31 41 3D 0D

3. Save: the command is 42H.

The corresponding data sequence is expressed as follows: 7E 45 46 30 31 42 3E 0D

4. Stop: the command is 43H.

The corresponding data sequence is expressed as follows: 7E 45 46 30 31 43 3F 0D

5. Fast/Slow: the command is 44H <which can be used in the test process>

The corresponding data sequence is expressed as follows: 7E 45 46 30 31 44 38 0D

6. Test: the command is 45H <option test>

The corresponding data sequence is expressed as follows: 7E 45 46 30 32 45

The tested phase XOR 0D

The tested phases:

Phase A \rightarrow 0x30 phase B \rightarrow 0x31 phase C \rightarrow 0x32 ABC \rightarrow 0x33

7. Request data: the command is 49H <the only command that is returned>

The corresponding data sequence is expressed as follows: 7E 45 46 30 31 49 35 0D

Each time the host requests data, the slave will upload the current state to the host.

8. Start: The command is 4AH + mode + current

Mode:

 $30H \rightarrow single-channel$

 $36H \rightarrow$ demagnetizing <automatic by current default>

Current:

 $31H \rightarrow 50A(\text{configured for 50C only})$ $32H \rightarrow 40A(\text{configured for 40C only})$

 $33H \rightarrow 20A$ $34H \rightarrow 10A$ $35H \rightarrow 5A$ $36H \rightarrow 2.5A$ $37H \rightarrow 1A$

 $38H \rightarrow 200 \text{mA}$ $39H \rightarrow 100 \text{mA}$ $3A \rightarrow 20 \text{mA}$ (for single-phase test only)

30H →automatic

For example: the corresponding data sequence for single-phase test+ automatic current is expressed as follows:

7E 45 46 30 33 42 30 3A XOR 0D

10. Modify baud rate: the command is 4BH < baud rate can be modified in main menu state; after modification completion, please use new baud rate to link>

Note: the fixed baud rate in Bluetooth communication mode is 9600bps and cannot be modified.

 $30H \rightarrow 9600bps \quad 31H \rightarrow 4800bps \quad 32H \rightarrow 19200bps$

The data sequence for 9600bps is expressed as follows: 7E 45 46 30 32 4B 30H XOR 0D

11. Reset: the command is 4CH <forcibly reset the instrument>

The corresponding data sequence is expressed as follows: 7E 45 46 30 31 4C 30 0D

Note: it had better not use the command during resistancee test.

V. Data information uploaded by the slave to the host:

The data information states returned by the slave to the host include 8 types:

Initialization state (40H), Reset state (41H), Instrument setting state (42H), Charging state (43H), Discharging state (44H), Testing state (45H), Test stop state (46H), Current change state (47H), Historical record State (48H), Demagnetizing State (49H)

(1) Initialization state (40H): 7E 45 46 30 31 40 XOR 0D

(State during instrument resetting; operation can be performed after resetting completion.)

- (2) Reset state (41H): 7E 45 46 30 33 41 + mode+ current+ XOR 0D
- (3) Instrument setting state (42H): 7E 45 46 30 33 42 + mode+ current+ XOR 0D

(Setting state of the instrument's relevant parameters; please exit to the main menu and then operate.)

(4) Charging state (43H): 7E 45 46 30 39 43 + mode+ current+ current data + XOR 0D

Current data: 6-bit ASCII code.e.g.: 200mA → 20 32 30 30 6D 41

- (5) Discharging state (44H): 7E 45 46 30 33 44 + mode+ current+ XOR 0D
- (6) Testing state (45H): 7E 45 46 3x 3x 45+ mode + current + current data+ specific data<<u>different number in</u> <u>different mode</u>>+XOR 0D

Specific data:

<u>Current data</u>: 6-bit ASCII code.e.g.: 200mA \rightarrow 20 32 30 30 6D 41

<u>Resistance data</u>: 1-bit identification <whether data is valid> + 9-bit ASCII code data.

Identification: 30H→ data invalid, not displayed; 31H→ data valid, can be displayed

9-bit ASCII data, for example: $1.0000 \text{m}\Omega \rightarrow 31 \text{ 2E } 30 \text{ 30 } 30 \text{ 6D } \text{A6 B8}$

(7) Replacement with large current (47H): 7E 45 46 3x 3x 47+ mode + current + current data+ specific data+ XOR 0D identical with "Under Test"

- (8) Historical record state (48H): 7E 45 46 30 33 48 + mode+ current+ XOR 0D
- (The instrument is in the historial record display interface state; please exit to the main menu and then operate.)
- (9) Demagnetizing (49H): 7E 45 46 30 35 49 + demagnetizing progress+ XOR 0D

Demagnetizing progress 4-bit ASCII code for example $50\% \rightarrow 20\ 35\ 30\ 25$ $100\% \rightarrow 31\ 30\ 30\ 25$

VI. Instructions:

Operation	Parameter setting	Test	Print	Save	Stop	Exit
Initialization	no	no	no	no	no	no
Reset	yes	no	no	no	no	no
Charging	no	no	no	no	no	no
Under Test	no	no	yes	yes	yes	no
Discharging	no	no	no	no	no	no
Stop state	no	yes	yes	yes	no	yes

The PC is host; if the host doesn't send a command, the slave doesn't respond at any time.

The host is powered on, and accesses the slave (looking for the slave) or sends a command once every 400ms; in the event of failure, the host re-sends a command; if there is still a fault after sending a command three times, it is taken as communication error.

VI "Instructions" is the list of limiting upper computer operation. In the listed state, YES means yes, and NO means no.

At this time, it is needed to limit the upper computer.