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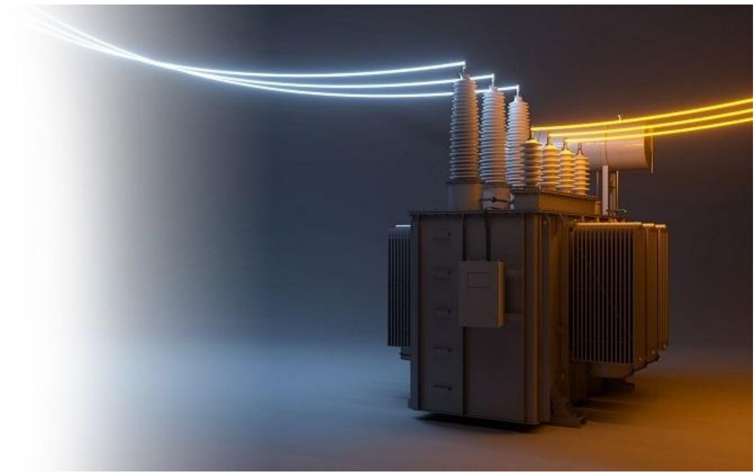
JYW-6100/6100(A)

Transformer No-load & On-load Tester



Contents

I. Brief introduction

Energy source in our country is more and more short, air pollution is more and more serious, which forwards higher requirement on energy saving of the power transformer. Loss measurement of the transformer at low power factor always makes the whole industry confused for many years, therefore it is only solved through procurement from foreign country at high price.

Data at rated parameters shall be read out during no load testing of the transformer, traditional manual voltage regulation and data reading way costs waste time and labour, which are also inaccurate.

Our company has researched this instrument under strong support of National Science and Technology Fund after difficult investigation for many years. This high technology product with own intelligent property not only reaches international advanced level for precision measurement at low power factor, its innovative data automatic locking technology is characterized with accurate locking, no artificial interference, which can improve working efficiency tens times.

The instrument applies 8.0 inch colourful liquid crystal display screen and the intelligent touching control technology, operation is more convenient.

Performance of the instrument is excellent, which is extensively applied in motor and air fan etc industries.

II. Safety measures

1) Ensure to carefully read the manual prior to use the instrument.

2) The instrument operator shall have general application knowledge about electric equipments or instruments.

3) The instrument shall avoid severe vibration.

4) The instrument must be grounded reliably, which protects against electricity shock danger.

5) After testing is complete, press down return key and switch off the power supply switch.

III. Function characteristics:

1 Measure no load loss, load loss, average value of voltage effective value, current effective value, impedance voltage, zero sequence impedance, power factor, harmonic and frequency etc parameters.

2 With three voltage testing channels and three independent current testing channels, which are in accordance with three phase power testing.

3 Meet with power measurement of the non-metallic alloy and large power transformer etc testing product with low power factor.

4 Automatically trap and accurately lock testing data.

5 Compare to similar foreign instrument, measurement scope can be switched automatically within whole current testing scope; it is not necessary to replace the current measurement module.

6 Input transformer parameter, synchronously display conversion data.

7 Suitable to power measurement of the motor and air fan etc at same time.

8 Meet with voltage and current measurement of 150Hz and 200Hz induction voltage withstand test.

9 Harmonic analysis function.

10 8.0 inch colourful liquid crystal display screen, intelligent touching control technology and operation is simple.

11 The instrument has data storage, export of U disc, data printing and computer control function.

IV. Technical index

1 Voltage measurement scope: AC 10~1000V

2 Current measurement scope: AC 0.1 ~50 A

3 Measurement accuracy: voltage: 0.1%±0.005V (frequency 40~70Hz)

0.5%±0.005V (frequency 70~200Hz)

Current: 0.1%±0.0002A (frequency 40~70Hz)

0.5%±0.0002A (frequency 70~200Hz)

Power: P×0.1%± (U×I×0.02%) ±0.05W (P is power factor, U is reading of voltage effective value, I is reading of current effective value)

4 Working power supply: AC220V±10%, 50/60 Hz

5 Working temperature: -20℃~40℃

6 Relative humidity: ≤80%RH no dewing

7 Volume: 360×360×200mm

8 Weight: 12kg

V. System description

1 Front panel of the instrument is shown as Fig. 1:

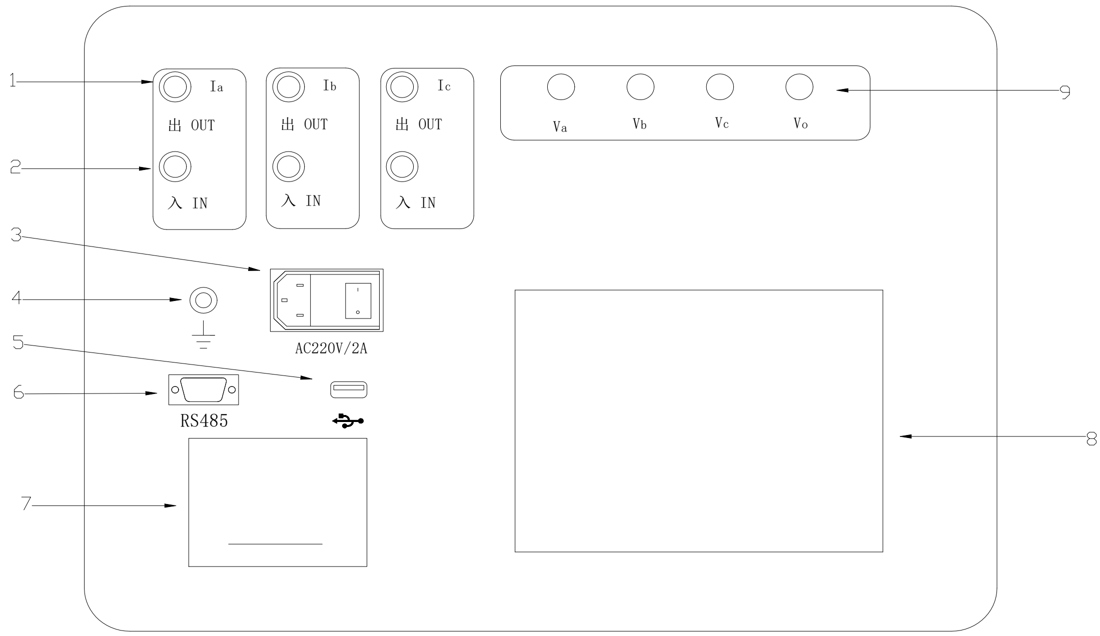


Fig. 1 Front Panel

1) Output end of testing current: connect sample.

2) Input end of testing current: connect output end of voltage regulator.

3） Power supply: input port of the power supply of the whole machine, embedded power supply, connect AC220V 50/60Hz power supply.

4） Grounding: protection grounding end of the instrument must be grounded reliably.

5） U disc interface: externally connect U disc, export testing data

6） RS485 interface: series interface, realize communication with computer.

7） Printer: print measurement data.

8） Displayer: 8 inch large screen colourful liquid crystal touch screen displayer. Display testing result and operation menu.

9） Va, Vb, Vc, Vo: voltage input end.

VI. No load testing

Non-testing end of the transformer is open circuit during no load test, the enclosure of the transformer is grounded reliably.

The grounding end of the instrument is grounded reliably.

(I) No load three watt / three-phase four-line with a neutral point testing:

1 Wiring method of no load three watt meter/ three-phase four-line with a neutral point

(1) Direct measurement of three watt meter method/ three-phase four-line with a neutral point

This wiring method is applied when voltage and current don’t exceed allowable input scope of the instrument.

Wiring method shown in Fig. 3 is applied when the three phase voltage regulator has neutral point output.

Wiring method shown in figure four is applied when the three phase voltage regulator has no neutral point output.

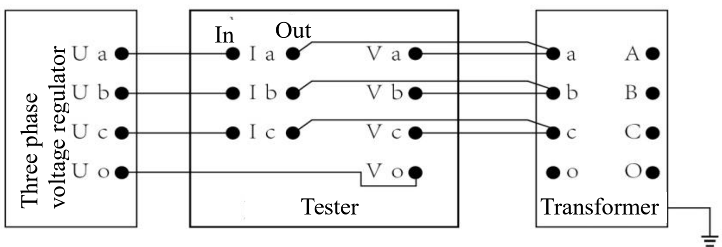


Fig. 3 Wiring Method for Direct Measurement of No Load Loss Three Watt Meter（I）

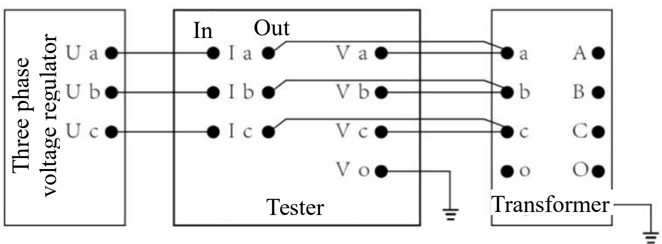


Fig. 4 Wiring Method for Direct Measurement of No Load Loss Three Watt Meter（II）

(2) External connected voltage transformer and current transformer measurement with no load loss three watt meter method/ three-phase four-line with a neutral point

When testing voltage and current exceed allowable input scope of the instrument, use this method to connect wire.

Only when testing voltage exceeds allowable input scope of the instrument, this method also must apply to connect wire. Protect high voltage against directly entering into the instrument and causing the instrument damaged.

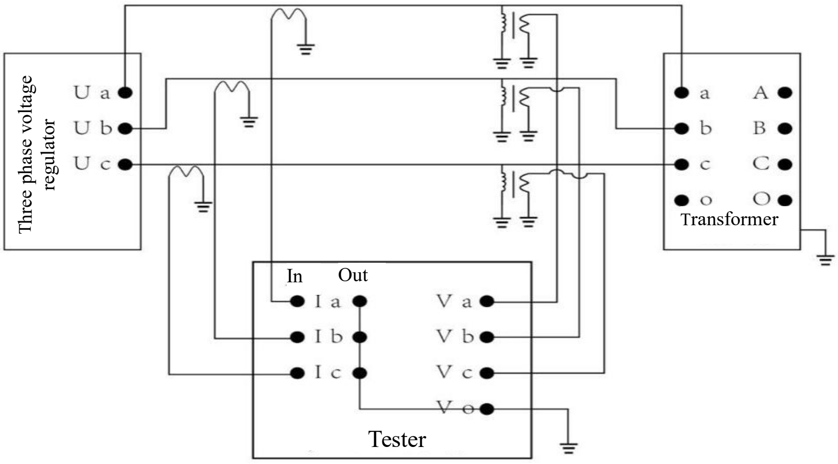


Fig. 5 Wiring Method for Measurement of External Voltage Transformer and Current Transformer With No Load Loss Three Watt Meter

(3) Measurement of external current transformer with no load loss three watt meter method

When voltage doesn't exceed allowable input scope of the instrument, this method is used when current exceeds allowable input scope of the instrument.

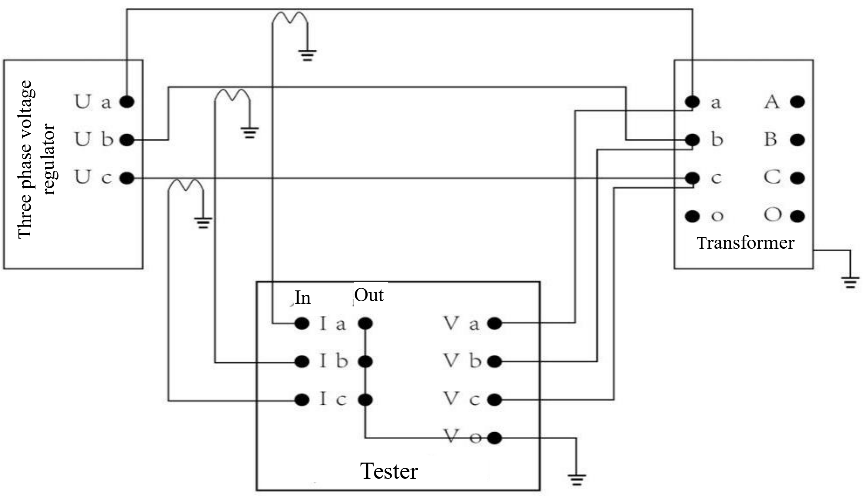


Fig. 6 Wiring Method for Measurement of External Current Transformer With No Load Loss Three Watt Meter

2 Testing menu operation method of no load three watt meter method

(1) Connect testing wire shown as above figure, inspect whether it is free of fault. Switch on the power supply and enter into main operation menu (refer to Fig. 7).

Fig. 7 Main Menu

(2) Press down "no load test" and enter into no load parameter setting interface. Refer to Fig. 8.

Click the modified parameter setting slightly, pop up the keyboard (refer to Fig. 9) , click the input digit or number directly, input is complete, press down "Enter" and return back Menu in Fig. 10.

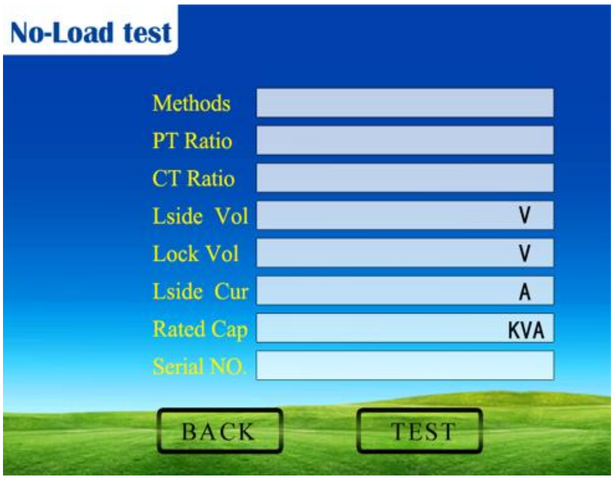


Fig. 8 No Load Parameter Setting

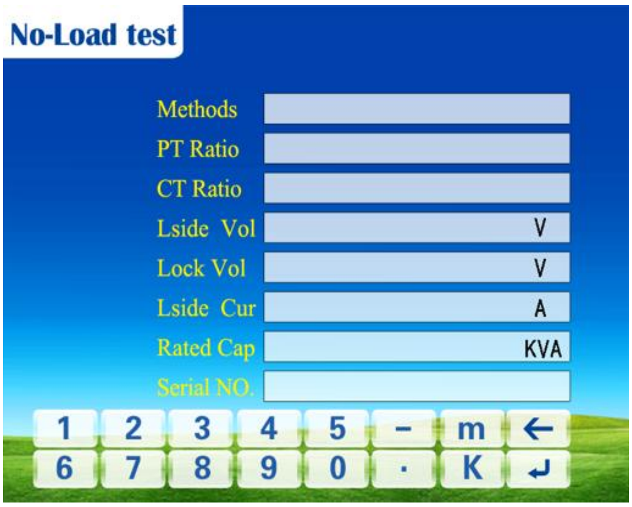


Fig. 9

Wiring way select “Three watt” test into the three watt mode test.

Select three-phase four-line with a neutral point testing, you can test neutral point voltage and current.

PT transformation ratio and CT transformation ratio are transformation ratios of external PT and CT. There is no external input “1”.

Rated voltage is low voltage rated voltage of the transformer.

Testing voltage is setting voltage of locking data during this test.

Rated current is low voltage rated current of the transformer.

Rated capacity is rated capacity of the transformer.

(3) After parameter setting is complete, press down “Testing” and enter testing interface of no load three watt meter/ three-phase four-line with a neutral point , refer to Fig. 10.

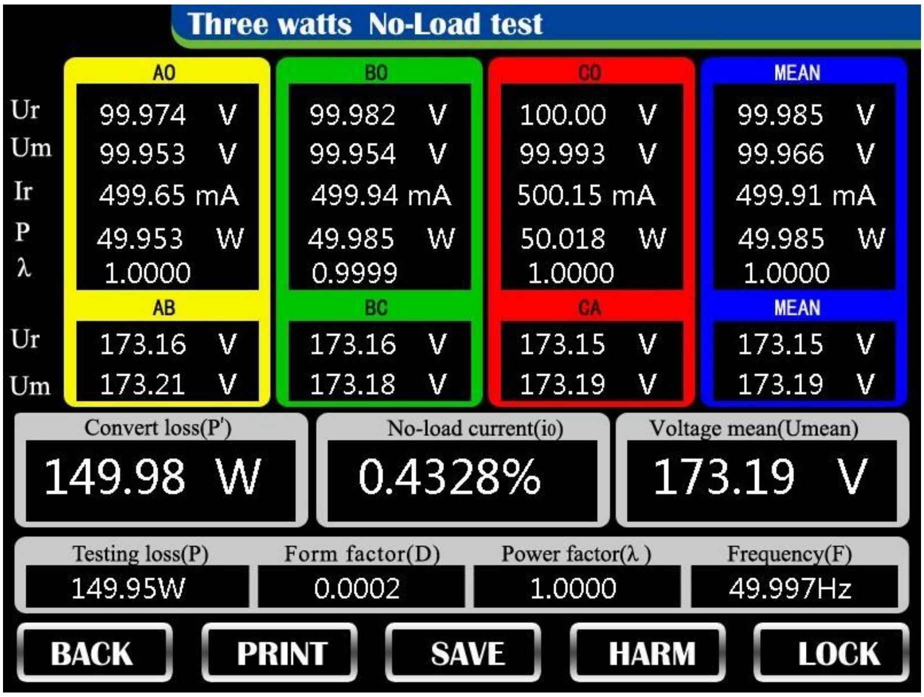


Fig. 10 Testing Interface of No Load Three Watt Meter/ three-phase four-line with a neutral point testing

“BACK”: The instrument returns back the upper level menu, and reset.

“HARM”: The instrument enters into harmonic analysis interface.

“LOCK”: The screen data is locked, the data can’t be refreshed. Now this key becomes red “Run” key, print and storage keys are activated at same time (refer to Fig. 11). Click again and resume data real-time fresh status.

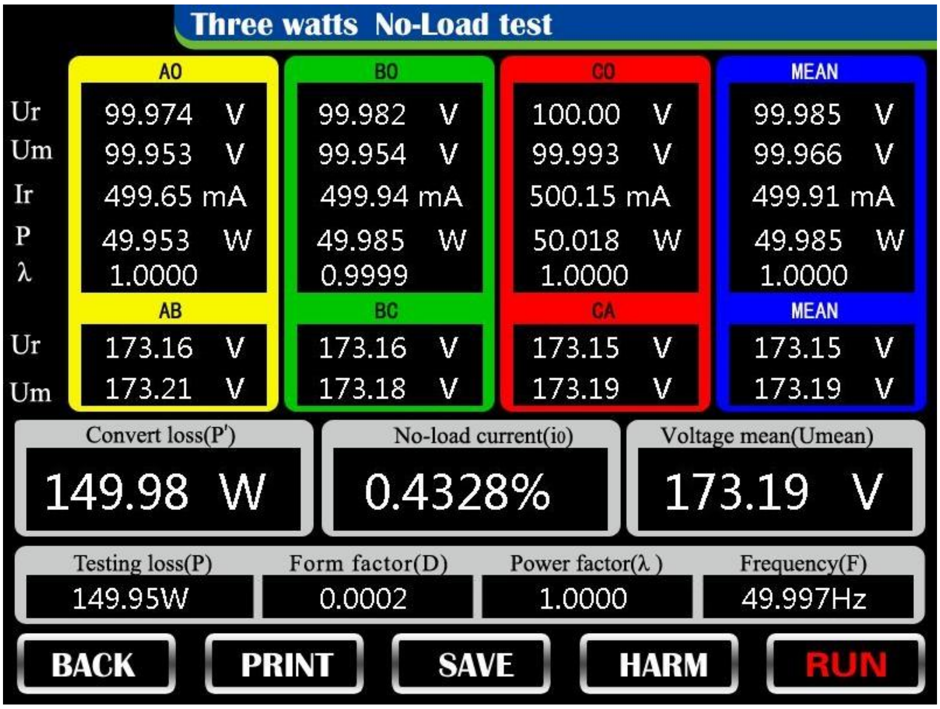


Fig. 11

Ur Effective value of voltage

Um Average value of voltage

Ir Effective value of current

P Actual measured power

φ power factor φ=P/(Ur×Ir)

AO, BO, CO express voltage and current of each phase

AB, BC, CA express line voltage values

Iorms are neutral current

Vorms are the neutral point voltage

"Average value voltage" is average of average value line voltage. It is pressure imposing reference of no load test.

"Actual measured loss" is actual measured total loss P=Pa+Pb+Pc

"Waveform factor" means distortion of waveform of voltage D=(Um-Ur) /Um

"Power factor" expresses total power factor

"No load current" io=(Ia+Ib+Ic) /3In In is rated current

"Calibration loss" is power after wave form calibration P'=P×(1+D)

(4) Adjust voltage regulator. When "average voltage" reaches voltage value of setting test. The instrument automatically seizes and locks data. The buzzer sounds and remind for long time. Interface of the instrument enters into status in Fig. 13. Now carry out data print and storage operation. Press down "Run" key, release locking status and enter into real time testing status again.

(II) No load two watt testing:

1 Wiring method of no load two watt meter

(1) Direct measurement of two watt meter method

This wiring method is applied when voltage and current don't exceed allowable input scope of the instrument.

Wiring method shown in Fig. 12 is applied when the three phase voltage regulator has neutral point output.

Wiring method shown in Fig. 13 is applied when the three phase voltage regulator has no neutral point output.

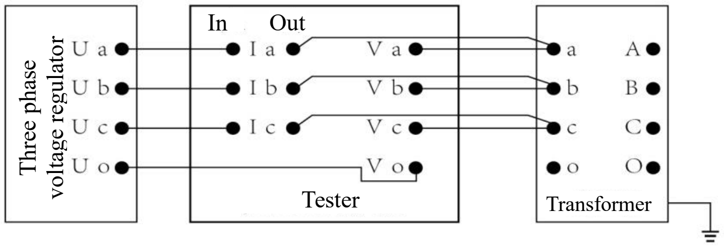


Fig. 12 Wiring Method for Direct Measurement of No Load Loss Two Watt Meter (I)

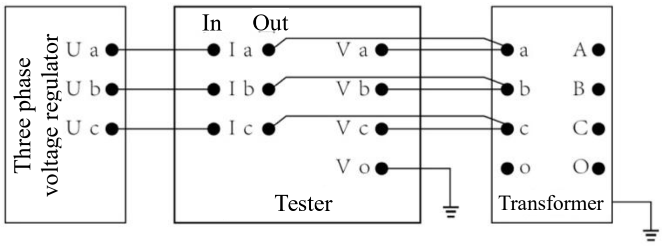


Fig. 13 Wiring Method for Direct Measurement of No Load Loss Two Watt Meter (II)

(2) External connected voltage transformer and current transformer measurement with no load loss two watt meter method

When testing voltage and current exceed allowable input scope of the instrument, use this method to connect wire.

Only when testing voltage exceeds allowable input scope of the instrument, this method also must apply to connect wire. Protect high voltage against directly entering into the instrument and causing the instrument damaged.

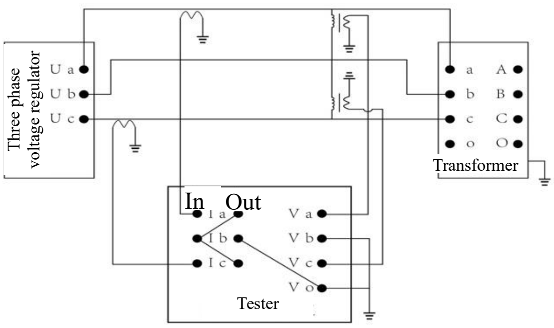


Fig. 14 Wiring Method for Measurement of External Voltage Transformer and Current Transformer with No Load Loss Two Watt Meter Method

(3) Measurement of external current transformer with no load loss two watt meter method

When voltage doesn't exceed allowable input scope of the instrument, this method is used when current exceeds allowable input scope of the instrument.

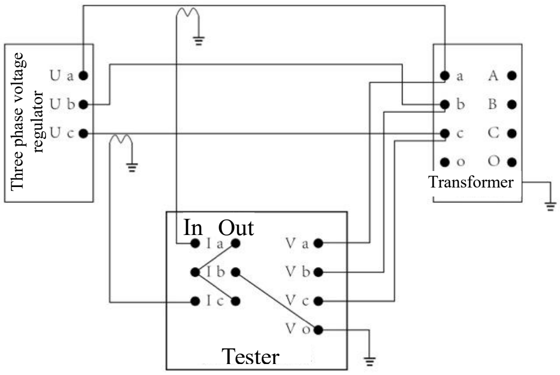


Fig. 15 Wiring Method for External Current Transformer Measurement Transformer with No Load Two Watt Meter

2 Testing menu operation method of no load two watt meter method

(1) Connect testing wire shown as above figure, inspect whether it is free of fault. Switch on the power supply and enter into main operation menu (refer to Fig. 16).

Fig. 16 Main Menu

(2) Press down “no load test” and enter into no load parameter setting interface. Refer to figure 17

Click the modified parameter setting slightly, pop up the keyboard (refer to Fig. 18) , click the input digit or number directly, input is complete, press down “Enter” and return back Menu in Fig. 10.

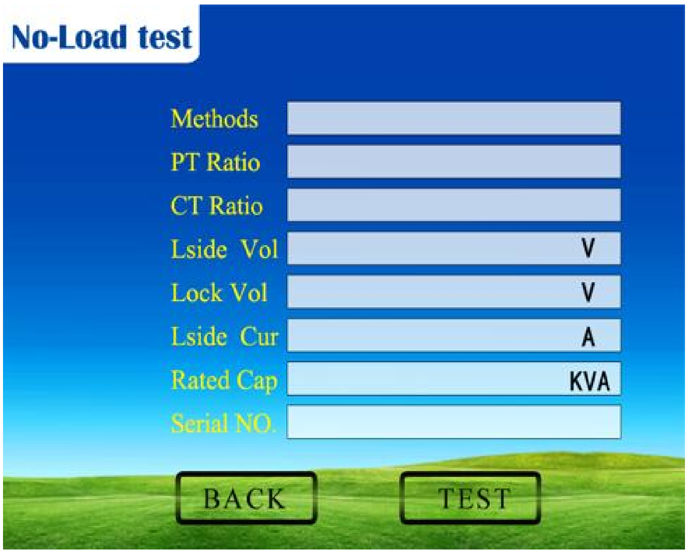


Fig. 17 No Load Parameter Setting

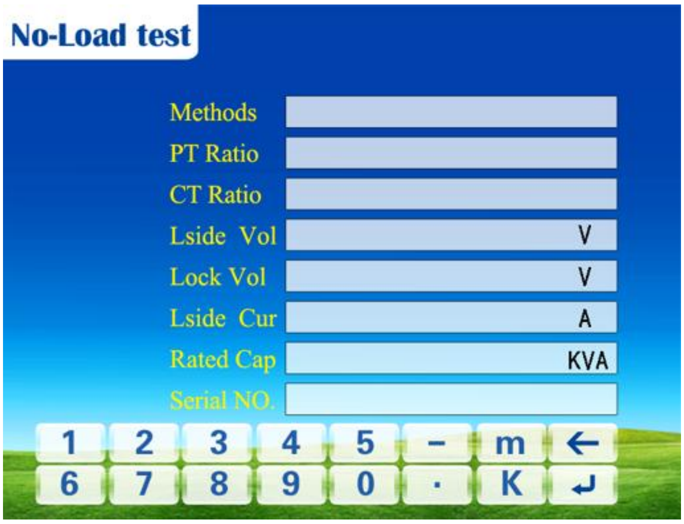


Fig. 18

Wiring way select "Two watt".

PT transformation ratio and CT transformation ratio are transformation ratios of external PT and CT. There is no external input "1".

Rated voltage is low voltage rated voltage of the transformer.

Testing voltage is setting voltage of locking data during this test.

Rated current is low voltage rated current of the transformer.

Rated capacity is rated capacity of the transformer.

(3) After parameter setting is complete, press down "Testing" and enter testing interface of no load two watt meter, refer to Fig. 23.

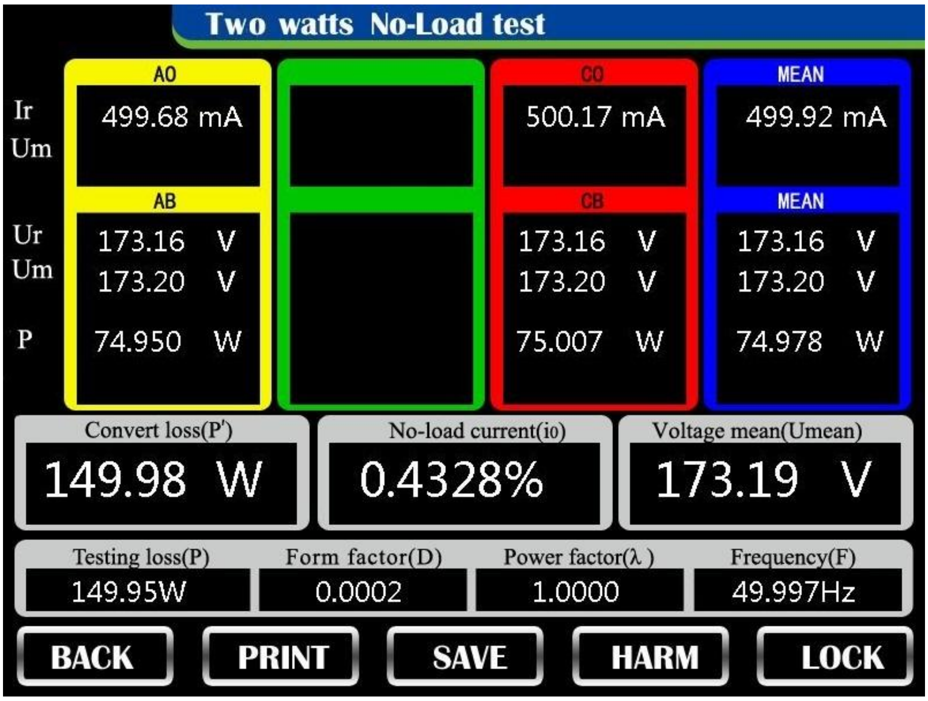


Fig. 19 Testing Interface of No Load Two Watt Meter

"BACK": The instrument returns back the upper level menu, and reset.

"LOCK": The screen data is locked, the data can't be refreshed. Now this key becomes red "RUN" key, print and storage keys are activated at same time (refer to Fig. 20). Click again and resume data real-time fresh status.

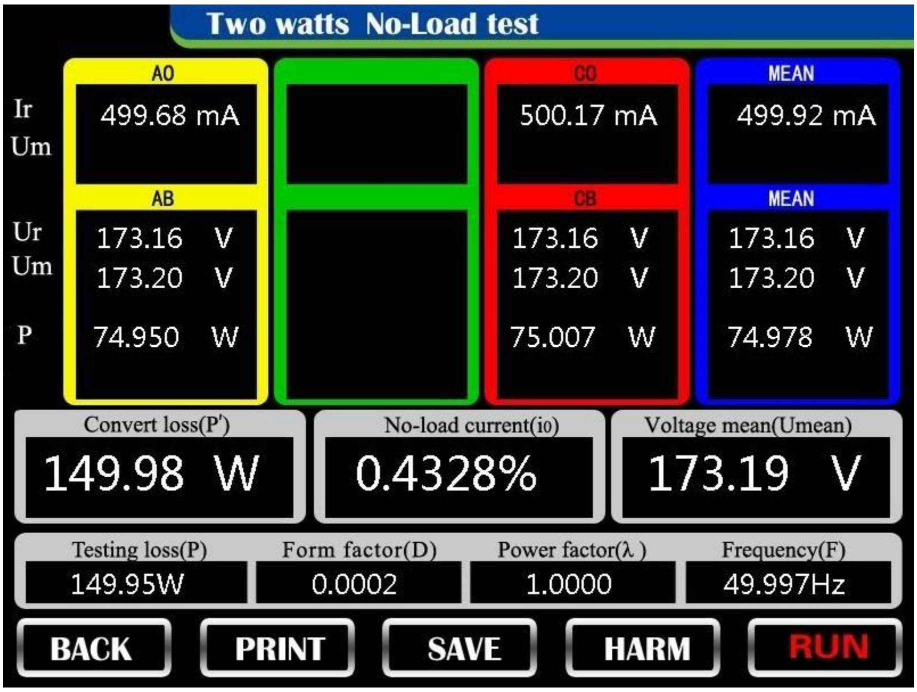


Fig. 20

Ur Effective value of voltage

Um Average value of voltage

Ir Effective value of current

P Actual measured power

φ power factor $\varphi = P/(Ur \times Ir)$

AO, CO express current of each phase

AB, CB express line voltage values

”Average value voltage” is average of average value line voltage. It is pressure imposing reference of no load test.

”Actual measured loss” is actual measured total loss $P = Pab + Pcb$

”Waveform factor“ means distortion of waveform of voltage $D = (Um - Ur) / Um$

“Power factor” expresses total power factor

“No load current” $io = (Ia + Ic) / 2In$ In is rated current

“Calibration loss” is power after wave form calibration $P' = P \times (1 + D)$

(4) Adjust voltage regulator. When “average voltage” reaches voltage value of setting test. The instrument automatically seizes and locks data. The buzzer sounds and remind for long time. Interface of the instrument enters into status in Fig. 20. Now carry out data print and storage operation. Press down “Run” key, release locking status and enter into real time testing status again.

(III) No load single watt testing:

1 Wiring method of no load single watt meter

(1) Direct measurement of single watt meter method

This wiring method is applied when voltage and current don’t exceed allowable input scope of the instrument.

Single phase voltage regulator test wiring refer to Fig. 21.

Three - phase voltage regulator test wiring refer to Fig. 22 and 23.

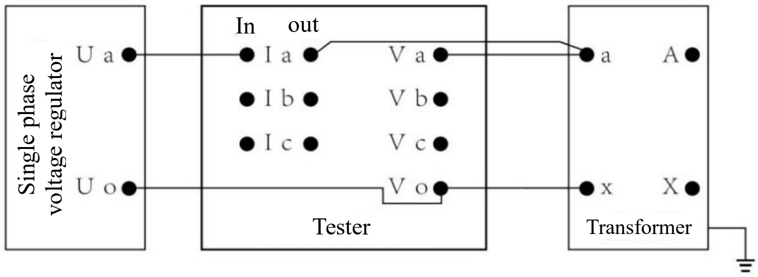


Fig. 21 Wiring Method for Direct Measurement of No Load Loss Single Watt Meter AO

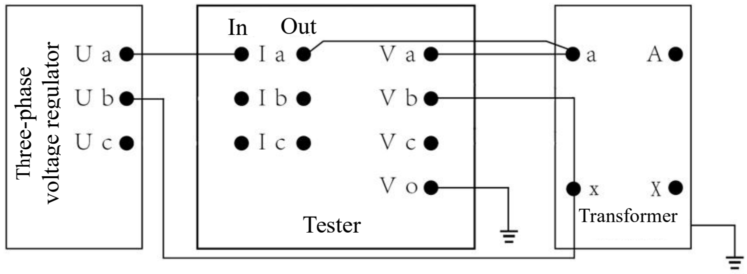


Fig. 22 Wiring Method for Direct Measurement of No Load Loss Single Watt Meter AB

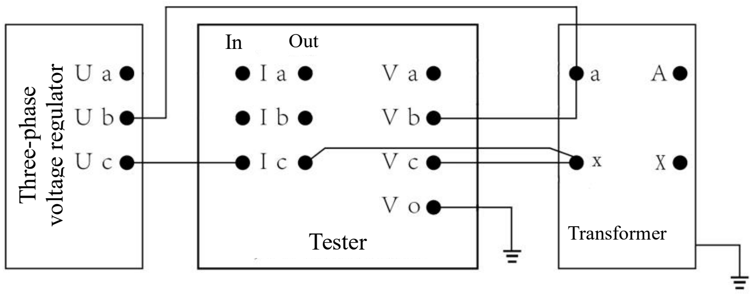


Fig. 23 Wiring Method for Direct Measurement of No Load Loss Single Watt Meter BC

(2) External connected voltage transformer and current transformer measurement with no load loss single watt meter method

When testing voltage and current exceed allowable input scope of the instrument, use this method to connect wire. Refer to Fig. 24 25 and 26

Only when testing voltage exceeds allowable input scope of the instrument, this method also must apply to connect wire. Protect high voltage against directly entering into the instrument and causing the instrument damaged.

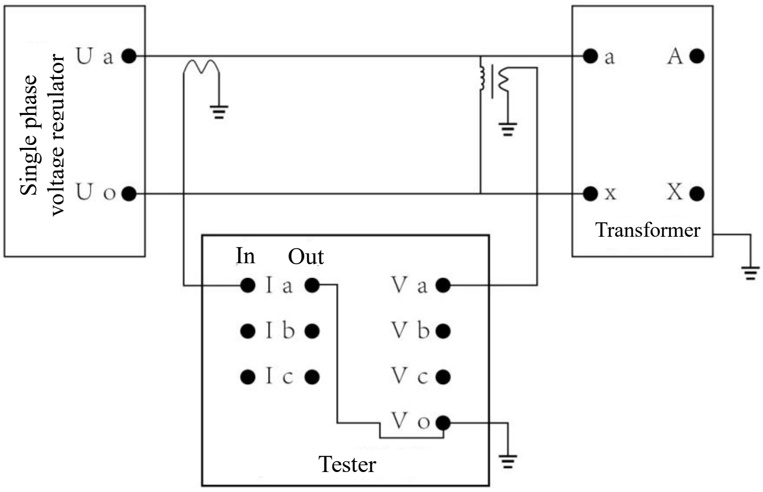


Fig. 24 Wiring Method for Measurement of External Voltage Transformer and Current Transformer with No Load Loss Single Watt Meter Method

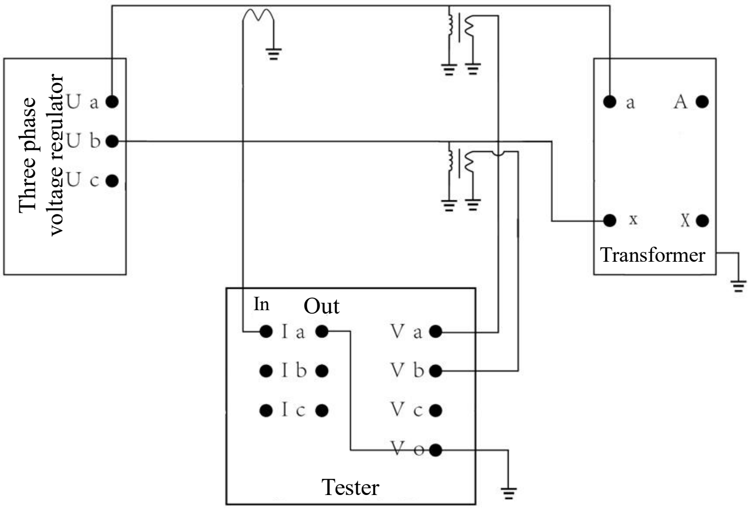


Fig. 25 Wiring Method for Measurement of External Voltage Transformer and Current Transformer with No Load Loss Single Watt Meter Method

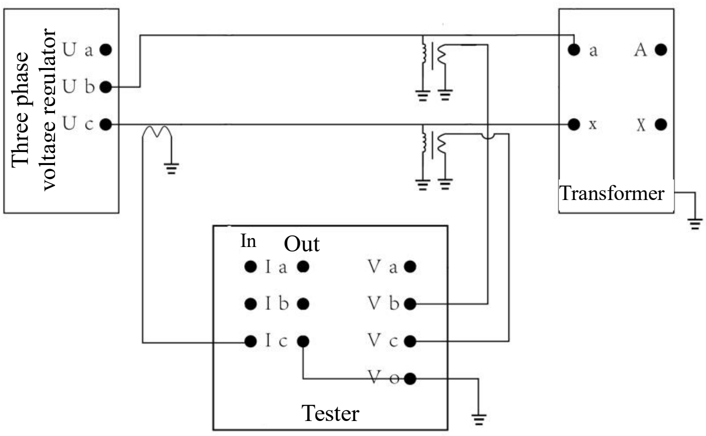
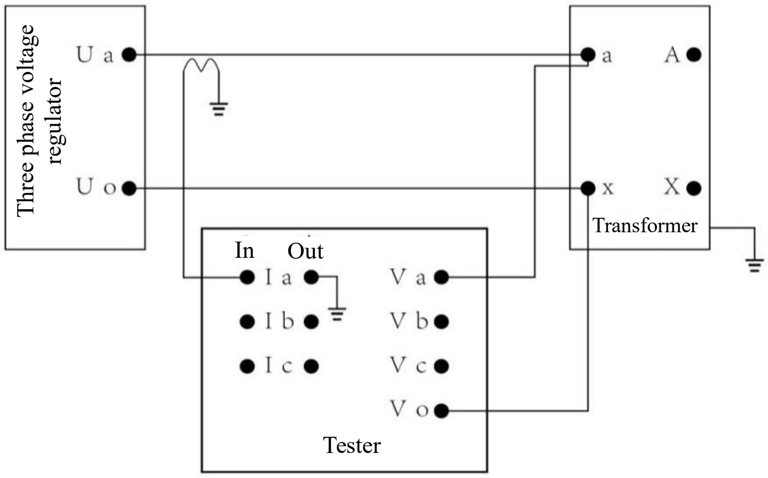
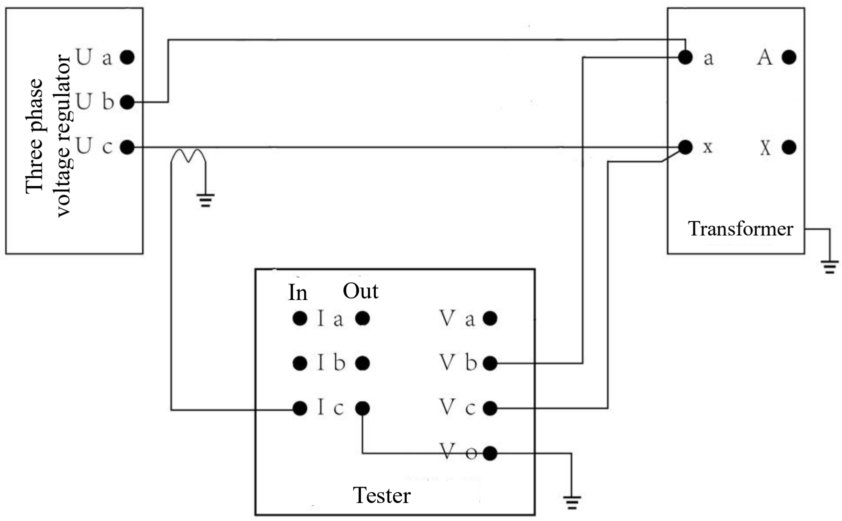


Fig. 26 Wiring Method for Measurement of External Voltage Transformer and Current Transformer with No Load Loss Single Watt Meter Method

(3) Measurement of external current transformer with no load loss single watt meter method

When voltage doesn't exceed allowable input scope of the instrument, this method is used when current exceeds allowable input scope of the instrument. Refer to Fig. 27.





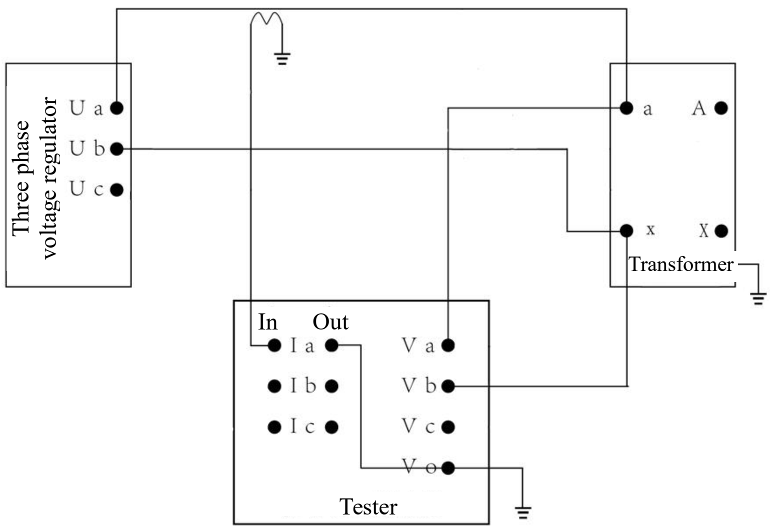


Fig. 27 Wiring Method for External Current Transformer Measurement Transformer with No Load Single Watt Meter

2 Testing menu operation method of no load single watt meter method

(1) Connect testing wire shown as above figure, inspect whether it is free of fault. Switch on the power supply and enter into main operation menu (refer to Fig. 28).

Fig. 28 Main Menu

(2) Press down "no load test" and enter into no load parameter setting interface. Refer to Fig. 29.

Click the modified parameter setting slightly, pop up the keyboard (refer to Fig. 30) , click the input digit or number directly, input is complete, press down "Enter" and return back Menu in Fig. 10.

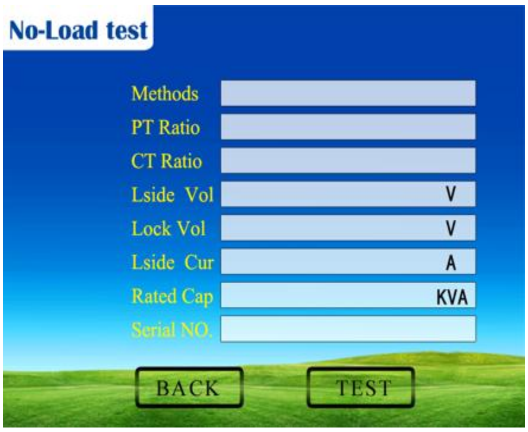


Fig. 29 No Load Parameter Setting

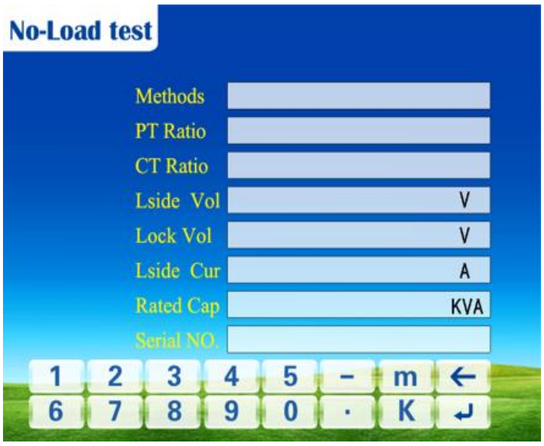


Fig. 30

Wiring options:Single-phase power supply test when the choice of AO wiring.When the three-phase power supply test, select AB or BC wiring

PT transformation ratio and CT transformation ratio are transformation ratios of external PT and CT. There is no external input "1".

Rated voltage is low voltage rated voltage of the transformer.

Testing voltage is setting voltage of locking data during this test.

Rated current is low voltage rated current of the transformer.

Rated capacity is rated capacity of the transformer.

(3) After parameter setting is complete, press down “Testing” and enter testing interface of no load two watt meter, refer to Fig. 31.

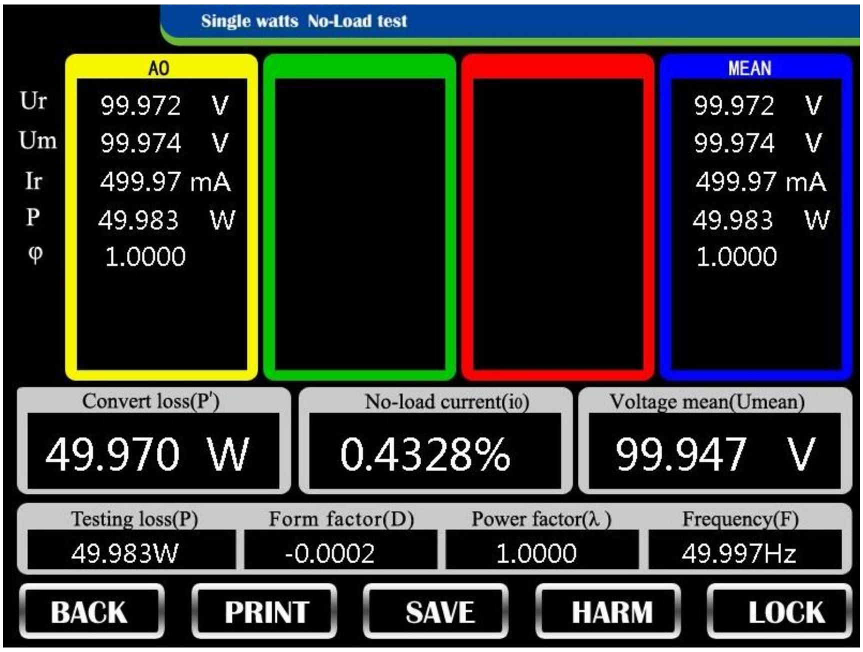


Fig. 31 Testing Interface of No Load Single Watt Meter

“BACK”: The instrument returns back the upper level menu, and reset.

“HARM”: The instrument enters into harmonic analysis interface.

“LOCK”: The screen data is locked, the data can’t be refreshed. Now this key becomes red “RUN” key, print and storage keys are activated at same time (refer to Fig. 32). Click again and resume data real-time fresh status.

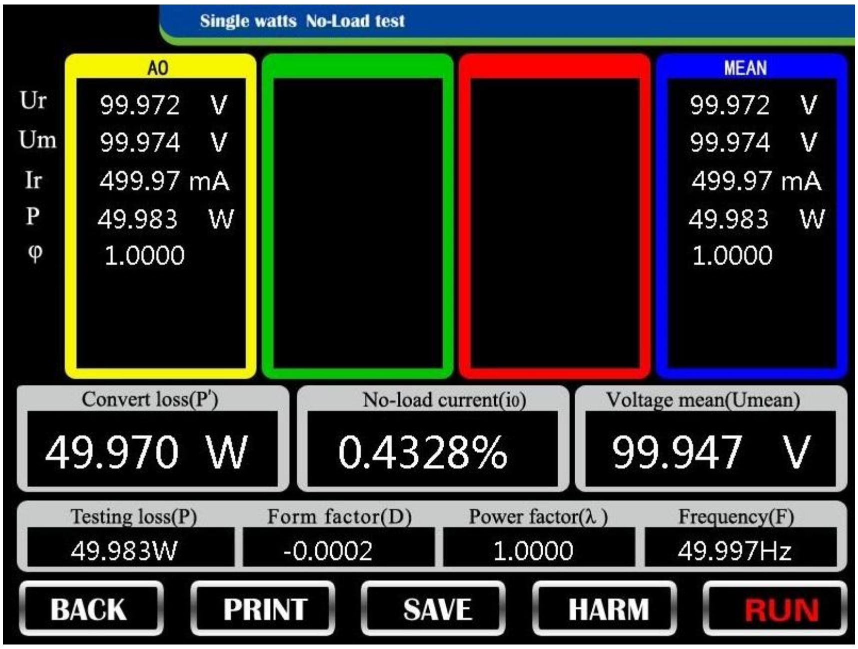


Fig. 32

Ur Effective value of voltage

Um Average value of voltage

Ir　Effective value of current

P　Actual measured power

φ power factor　φ=P/(Ur×Ir)

“Average value voltage” is pressure imposing reference of no load test.

”Actual measured loss“ is actual measured total loss

”Waveform factor“ means distortion of waveform of voltage　D=(Um-Ur) /Um

“No load current”　io=Ia+/In　　In is rated current

“Calibration loss” is power after wave form calibration　P’=P×(1+D)

(4) Adjust voltage regulator. When “average voltage” reaches voltage value of setting test. The instrument automatically seizes and locks data. The buzzer sounds and remind for long time. Interface of the instrument enters into status in Fig. 32. Now carry out data print and storage operation. Press down “Run” key, release locking status and enter into real time testing status again.

(IV) Harmonic analysis:

1　On no load testing interface, press down “Harmonic” and enter into harmonic analysis interface, refer to Fig. 33.

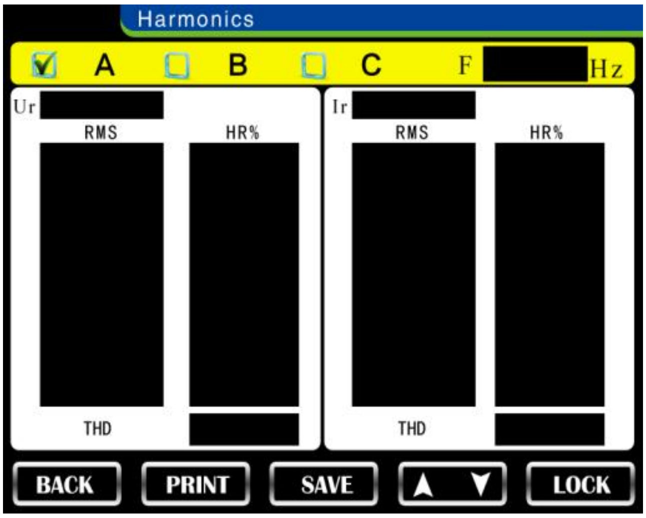


Fig. 33　A Phase Harmonic Analysis Interface

Press down “LOCK” key and data are lock, carry out data print and storage operation. Press down “▲▼” to change page. Press down the “BACK” key to return back no load testing interface.　Click “A ” “B ” and “C ” to check voltage and current harmonic of A phase, B phase and C phase respectively (refer to Fig. 34 and Fig. 35) .

Ur　Effective value of full wave voltage

Ir　Effective value of full wave current

U1　Effective value of fundamental wave voltage

I1　Effective value of fundamental wave current

U2-U30 is effective value of No n times harmonic voltage

I2-I30 is effective value of No n times harmonic current

“Contain rate” is ratio between effective value of harmonic wave and effective value of fundamental wave HR=(Un/U1) ×100

“Distortion rate” is ratio between total harmonic content and fundamental wave THD = (UH/U1) ×100

UH =√(U2+…Un) ²

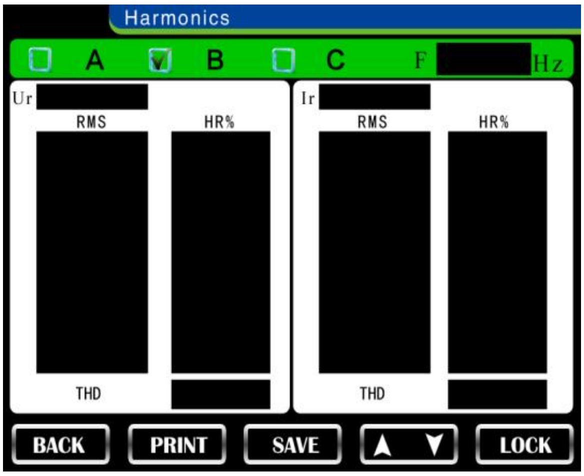


Fig. 34 B Phase Harmonic Analysis Interface

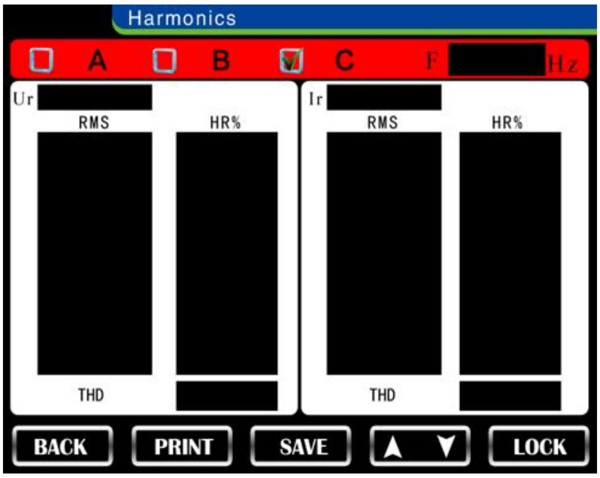


Fig. 35 C Phase Harmonic Analysis Interface

VII Load testing

Three phases at Non-testing end of the transformer are shorted circuit reliably during load test. Short circuit resistance and contact resistance are less, which can be neglect, the enclosure of the transformer is grounded reliably.

The grounding end of the instrument is grounded reliably.

(I) Load three watt testing:

1 Wiring method of Load three watt meter/three-phase four-line with a neutral point testing

(1) Direct measurement of three watt meter method

This wiring method is applied when voltage and current don’t exceed allowable input scope of the instrument.

Wiring method shown in Fig. 36 is applied when the three phase voltage regulator has neutral point output.

Wiring method shown in Fig. 37 is applied when the three phase voltage regulator has no neutral point output.

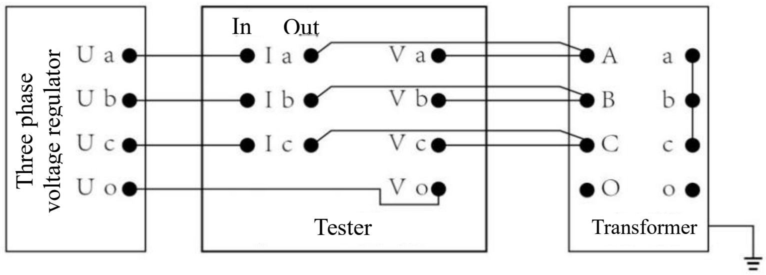


Fig. 36 Wiring Method for Direct Measurement of Load Loss Three Watt Meter (I)

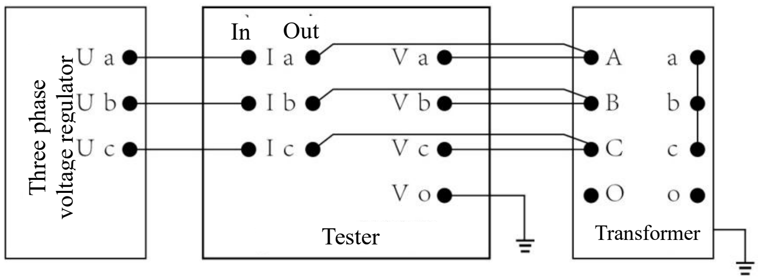


Fig. 37 Wiring Method for Direct Measurement of Load Loss Three Watt Meter (II)

(2) External connected voltage transformer and current transformer measurement with load loss three watt meter method

When testing voltage and current exceed allowable input scope of the instrument, use this method to connect wire.

Only when testing voltage exceeds allowable input scope of the instrument, this method also must apply to connect wire. Protect high voltage against directly entering into the instrument and causing the instrument damaged.

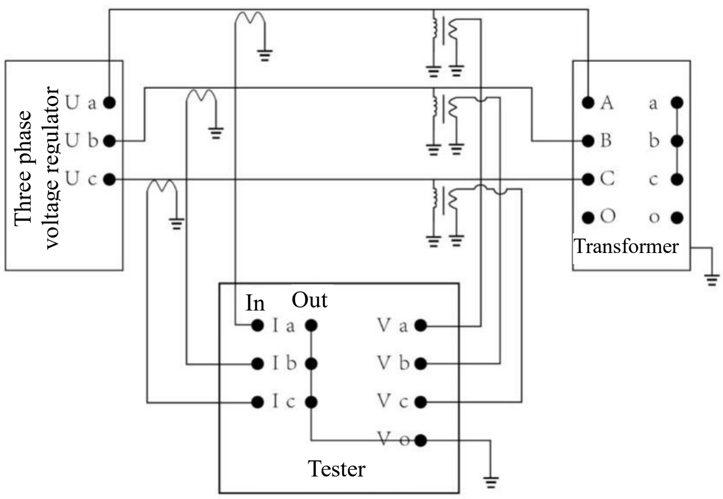


Fig. 38 Wiring Method for Measurement of External Voltage Transformer and Current Transformer with Load Loss Three Watt Meter Method

(3) Measurement of external current transformer with load loss three watt meter method

When voltage doesn’t exceed allowable input scope of the instrument, this method is used when current exceeds allowable input scope of the instrument.

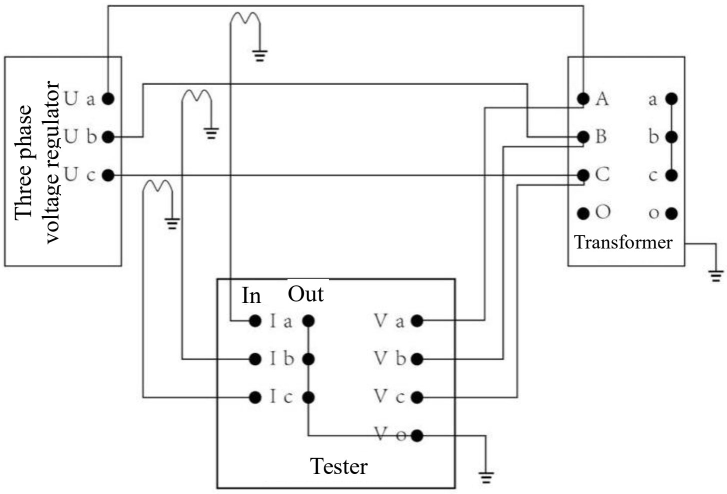


Fig. 39 Wiring Method for Measurement of External Current Transformer with Load Loss Three Watt Meter Method

2 Testing menu operation method of load three watt meter method

(1) Connect testing wire shown as above figure, inspect whether it is free of fault. Switch on the power supply and enter into main operation menu (refer to Fig. 40).

Fig. 40 Main Menu

(2) Press down "load test" and enter into load parameter setting interface. Refer to Fig. 41.

Click the modified parameter setting slightly, pop up the keyboard (refer to Fig. 42) , click the input digit or number directly, input is complete, press down "Enter" and return back Menu in Fig. 41.

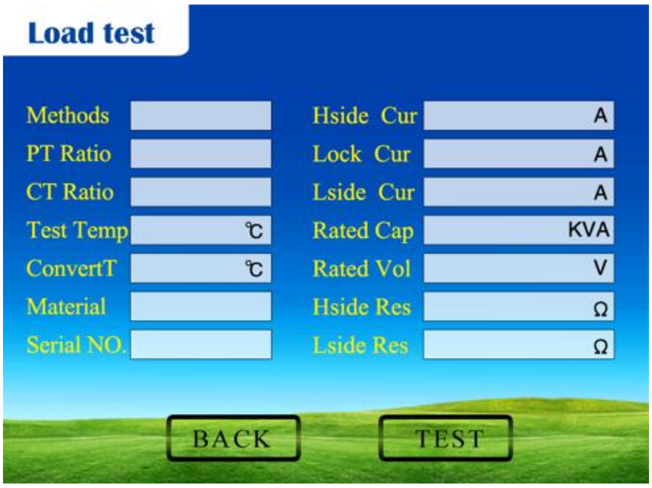


Fig. 41 Load Parameter Setting

Fig. 42

Wiring way select “Three watt”.

“PT transformation ratio and CT transformation ratio” are transformation ratios of external PT and CT. There is no external input “1”.

“Rated current” is high voltage rated current of the transformer.

“Testing current” is setting current when data are locked during this test.

“Low voltage current” is low voltage rated current of the transformer. It is used for data calibration.

“Rated capacity” is rated capacity of the transformer.

“Rated voltage” is high voltage rated voltage of the transformer.

“Resistance of high voltage line” is line resistance average value of the high voltage winding.

“Resistance of low voltage line” is line resistance average value of the low voltage winding.

“Test temperature” is temperature of the transformer during testing.

“Calibration temperature” is temperature that load loss shall be calibrated.

(3) After parameter setting is complete, press down “Testing” and enter testing interface of load three watt meter, refer to Fig. 43.

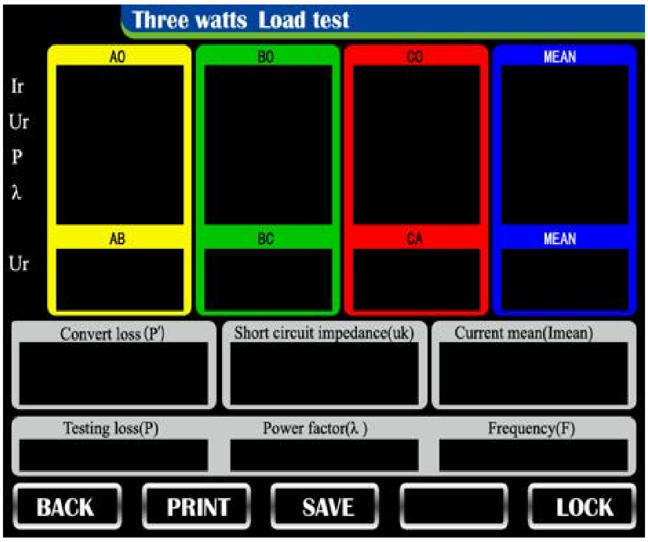


Fig. 43 Testing Interface of Load Three Watt Meter

"BACK": The instrument returns back the upper level menu, and reset.

"LOCK": The screen data is locked, the data can't be refreshed. Now this key becomes red "Run" key, print and storage keys are activated at same time (refer to Fig. 44). Click again and resume data real-time fresh status.

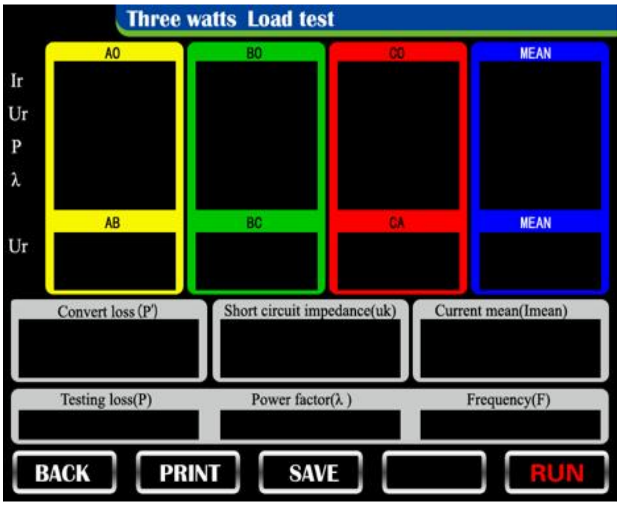


Fig. 44

Ur Effective value of voltage

Ir Effective value of current

P Actual measured power

φ power factor $\varphi=P/(Ur\times Ir)$

AO, BO, CO express value of each phase

AB, BC, CA express linear value

"Current average value" is average value of current, which is voltage imposing reference during load test.

"Actual measured loss" is actual measured total loss $P=Pa+Pb+Pc$(three watt meter) $P=Pab+Pcb$(two watt meter)

"Power factor" expresses total power factor

“Short circuit impedance” is short circuit impedance which is calibrated to calibration temperature.

$Zk = \sqrt{[Zkt^2+(Pkt/(10\times Sr))^2+(Kt^2-1)]}$

$Zkt = (Ukt\times Ir)/(Ur\times Ik)\times 100$

In which: Ukt: voltage at t°C when test current is Ik

Ur : Rated voltage

Ir: Rated current

Kt: $Kt=T+235/(235+t)$ Copper

$Kt=T+225/(225+t)$ Aluminium

T is calibration temperature, t is test temperature

“Calibration loss” is load loss which is calibrated to calibration temperature.

Select to input high and low voltage resistance:

1) $Pk = [Pkt+Pr\times(Kt-1)]/Kt$

In which Pkt: load loss at test temperature

Kt: temperature conversion coefficient

Pr: Amount of resistance loss of high and low voltage windings, $Pr=1.5Ir^2\times Rxn$ (Ir is rated current of winding, Rxn is line resistance)

2) When there is no high and low voltage resistance input:

$Pk=Pkt\times Kt$

(4) Adjust voltage regulator. When “average voltage” reaches voltage value of setting test. The instrument automatically seizes and locks data. The buzzer sounds and remind for long time. Interface of the instrument enters into status in figure 43. Now carry out data print and storage operation. Press down “Run” key, release locking status and enter into real time testing status again.

(II) Load two watt testing:

1 Wiring method of load two watt meter

(1) Direct measurement of two watt meter method

This wiring method is applied when voltage and current don’t exceed allowable input scope of the instrument.

Wiring method shown in Fig. 45 is applied when the three phase voltage regulator has neutral point output.

Wiring method shown in Fig. 46 is applied when the three phase voltage regulator has no neutral point output.

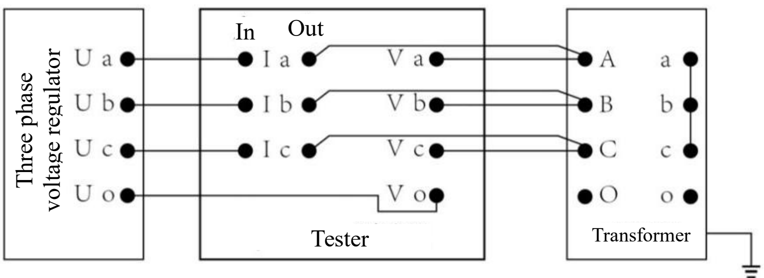


Fig. 45 Wiring Method for Direct Measurement of Load Loss Two Watt Meter (I)

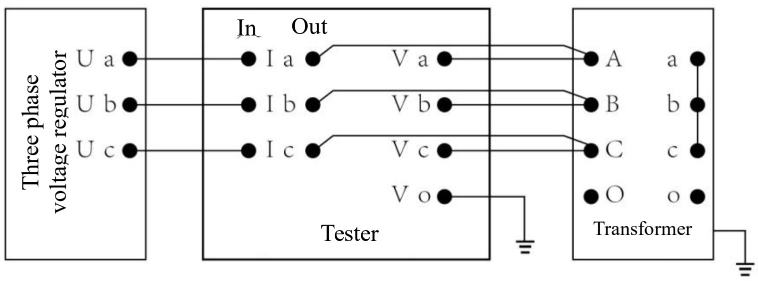


Fig. 46   Wiring Method for Direct Measurement of Load Loss Two Watt Meter (II)

(2) External connected voltage transformer and current transformer measurement with load loss two watt meter method

When testing voltage and current exceed allowable input scope of the instrument, use this method to connect wire.

Only when testing voltage exceeds allowable input scope of the instrument, this method also must apply to connect wire. Protect high voltage against directly entering into the instrument and causing the instrument damaged.

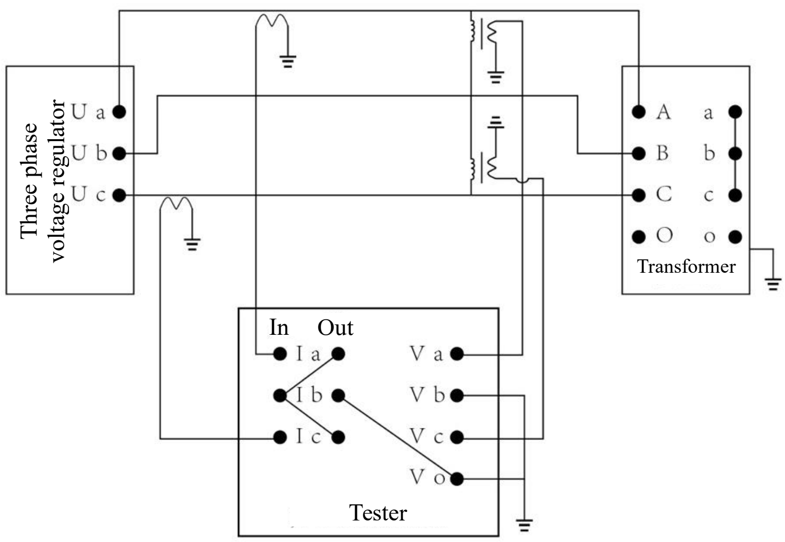


Fig. 47   Wiring Method for Measurement of External Voltage Transformer and Current Transformer with Load Loss Two Watt Meter Method

(3) External connected current transformer measurement with load loss two watt meter method

When voltage doesn't exceed allowable input scope of the instrument, this method is used when current exceeds allowable input scope of the instrument.

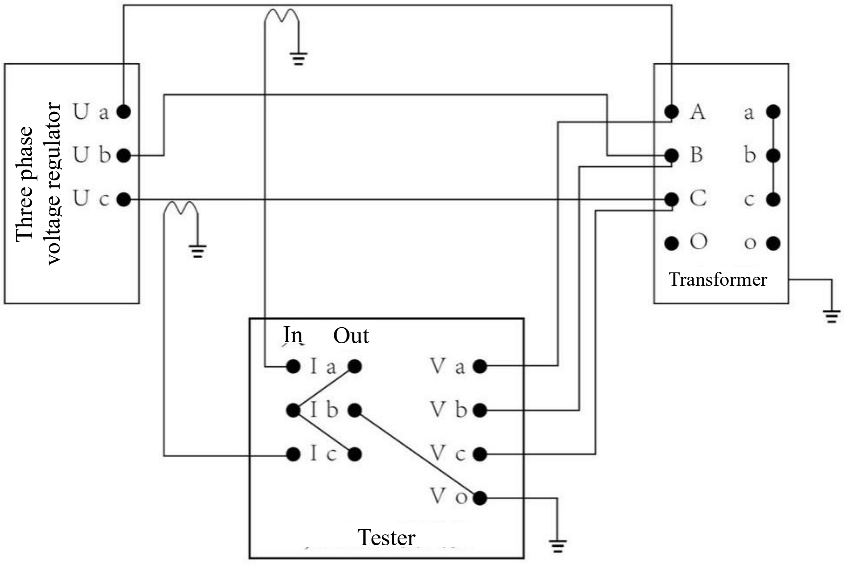


Fig. 48 Wiring Method for Measurement of External Current Transformer with Load Loss

Two Watt Meter Method

2 Testing menu operation method of load two watt meter method

(1) Connect testing wire shown as above figure, inspect whether it is free of fault. Switch on the power supply and enter into main operation menu (refer to Fig. 49).

Fig. 49 Main Menu

(2) Press down "load test" and enter into load parameter setting interface. Refer to Fig. 50.

Click the modified parameter setting slightly, pop up the keyboard (refer to Fig. 51) , click the input digit or number directly, input is complete, press down "Enter" and return back Menu in Fig. 50.

Fig. 50 Load Parameter Setting

Fig. 51

Wiring way select “Two watt”.

“PT transformation ratio and CT transformation ratio” are transformation ratios of external PT and CT. There is no external input “1”.

“Rated current” is high voltage rated current of the transformer.

“Testing current” is setting current when data are locked during this test.

“Low voltage current” is low voltage rated current of the transformer. It is used for data calibration.

“Rated capacity” is rated capacity of the transformer.

“Rated voltage” is high voltage rated voltage of the transformer.

“Resistance of high voltage line” is line resistance average value of the high voltage winding.

“Resistance of low voltage line” is line resistance average value of the low voltage winding.

“Test temperature” is temperature of the transformer during testing.

“Calibration temperature” is temperature that load loss shall be calibrated.

(3) After parameter setting is complete, press down “Testing” and enter testing interface of load three watt meter, refer to Fig. 52.

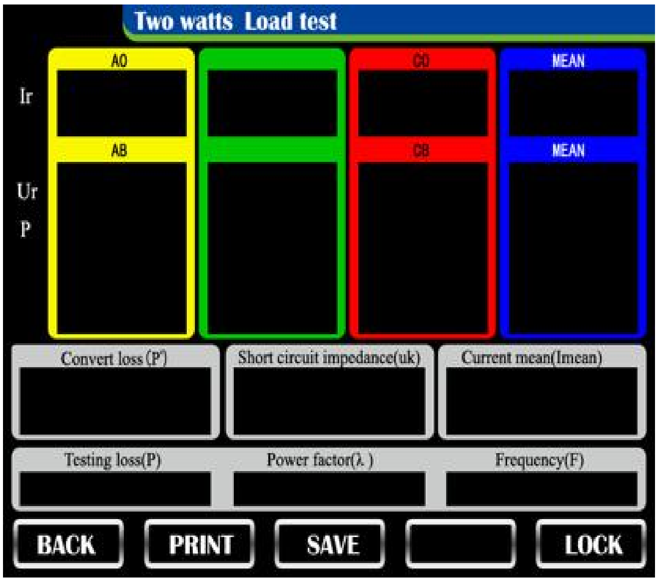


Fig. 52 Testing Interface of Load Two Watt Meter

“BACK”: The instrument returns back the upper level menu, and reset.

“LOCK”: The screen data is locked, the data can’t be refreshed. Now this key becomes red “Run” key, print and storage keys are activated at same time (refer to Fig. 53). Click again and resume data real-time fresh status.

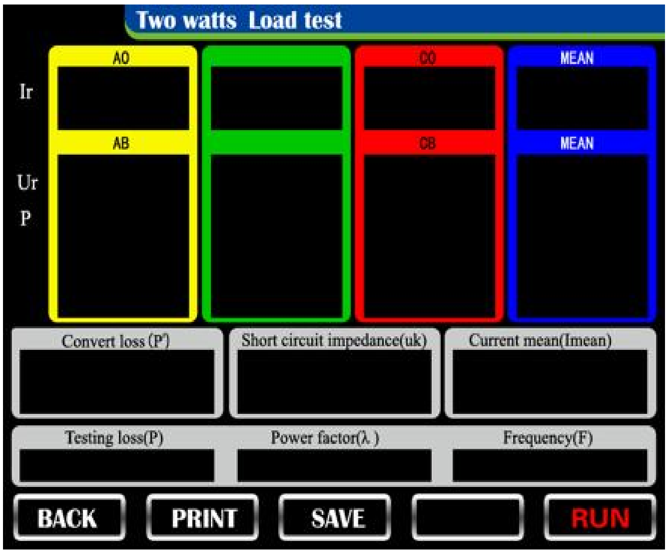


Fig. 53

Ur Effective value of voltage

Ir Effective value of current

P Actual measured power

φ power factor φ=P/(Ur×Ir)

AO, CO express value of each phase

AB, CB express linear value

"Current average value" is average value of current, which is voltage imposing reference during load test.

"Actual measured loss" is actual measured total loss P=Pab+Pcb

"Power factor" expresses total power factor

"Short circuit impedance" is short circuit impedance which is calibrated to calibration temperature.

$Zk = \sqrt{[Zkt^2+(Pkt/(10\times Sr))^2+(Kt^2-1)]}$

$Zkt = (Ukt\times Ir)/(Ur\times Ik)\times 100$

In which: Ukt: voltage at t℃ when test current is Ik

Ur : Rated voltage

Ir: Rated current

Kt: Kt=T+235/(235+t) Copper

Kt=T+225/(225+t) Aluminium

T is calibration temperature, t is test temperature

"Calibration loss" is load loss which is calibrated to calibration temperature.

4) Select to input high and low voltage resistance:

$Pk = [Pkt+Pr\times(Kt-1)]/Kt$

In which Pkt: load loss at test temperature

Kt: temperature conversion coefficient

Pr: Amount of resistance loss of high and low voltage windings, Pr=1.5Ir²¡ÁRxn(Ir is rated current of winding, Rxn is line resistance)

4) When there is no high and low voltage resistance input:

$Pk=Pkt\times Kt$

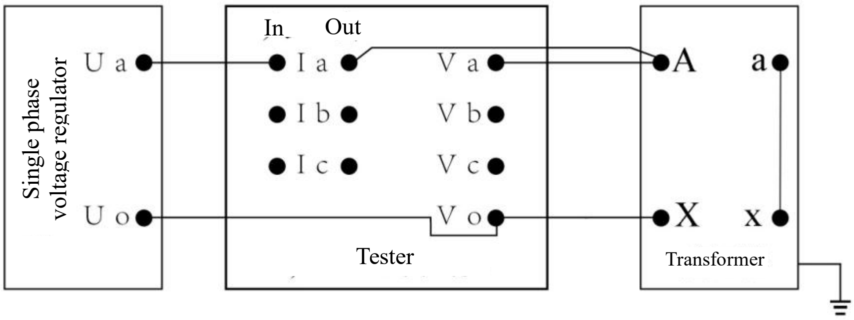
(4) Adjust voltage regulator. When "average voltage" reaches voltage value of setting test. The instrument automatically seizes and locks data. The buzzer sounds and remind for long time. Interface of the instrument enters into status in Fig. 13. Now carry out data print and storage operation. Press down "Run" key, release locking status and enter into real time testing status again.

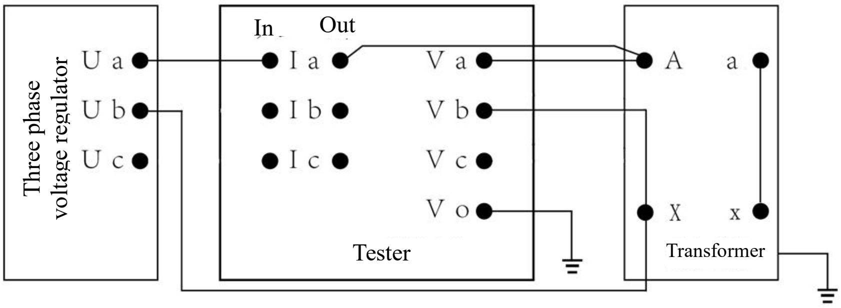
(III) Load single watt testing:

1 Wiring method of load single watt meter

(1) Direct measurement of single watt meter method

This wiring method is applied when voltage and current don't exceed allowable input scope of the instrument. Refer to Fig. 54.





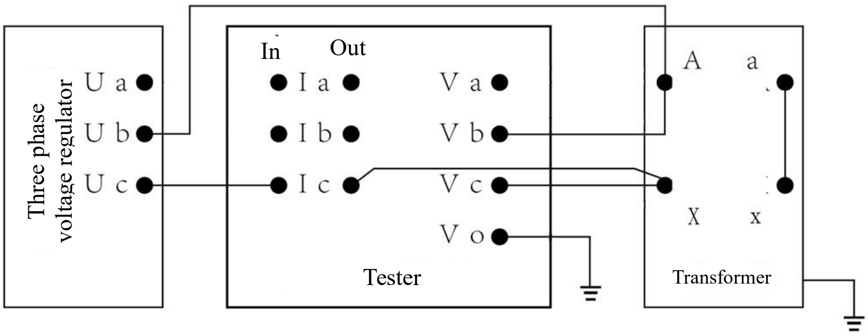


Fig. 54 Wiring Method for Direct Measurement of Load Loss Single Watt Meter

(2) External connected voltage transformer and current transformer measurement with load loss single watt meter method

When testing voltage and current exceed allowable input scope of the instrument, use this method to connect wire. Refer to Fig. 55.

Only when testing voltage exceeds allowable input scope of the instrument, this method also must apply to connect wire. Protect high voltage against directly entering into the instrument and causing the instrument damaged.

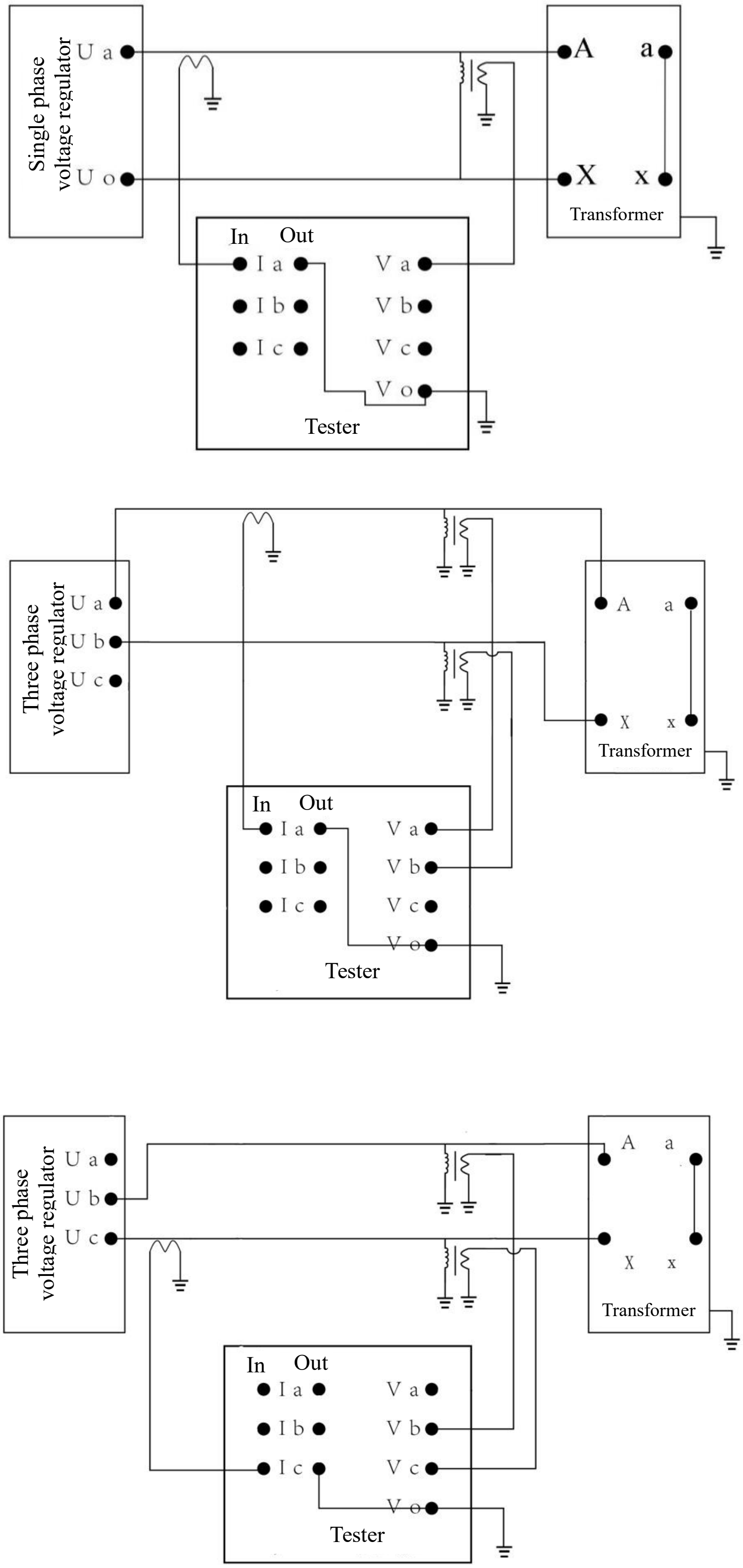


Fig. 55 Wiring Method for Measurement of External Voltage Transformer and Current Transformer with Load Loss Single Watt Meter Method

(3) Measurement of external current transformer with load loss single watt meter method

When voltage doesn't exceed allowable input scope of the instrument, this method is used when current exceeds allowable input scope of the instrument. Refer to Fig. 56.

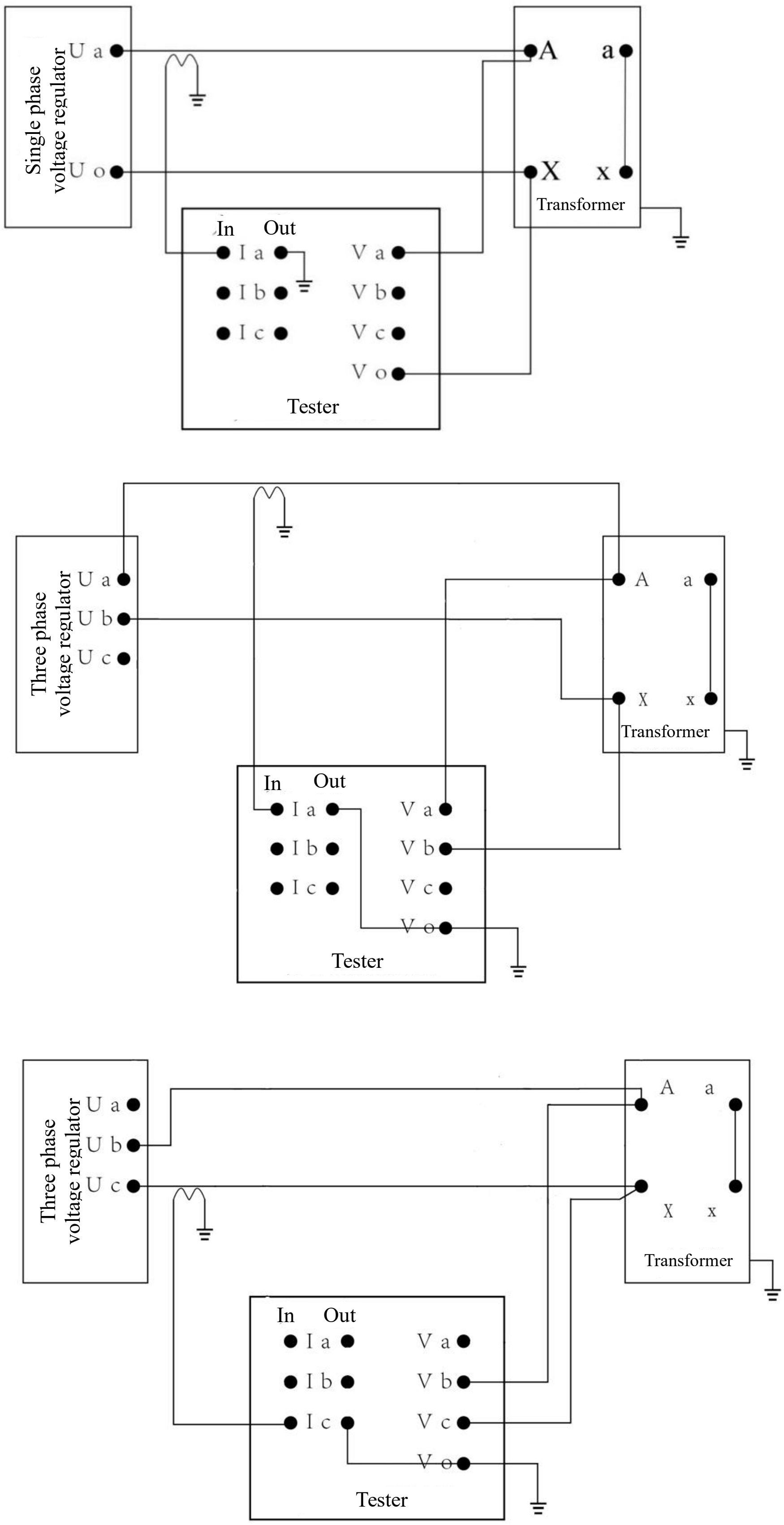


Fig. 56 Wiring Method for External Current Transformer Measurement Transformer with Load Single Watt Meter

2 Testing menu operation method of load single watt meter method

(1) Connect testing wire shown as above figure, inspect whether it is free of fault. Switch on the power supply and enter into main operation menu (refer to Fig. 57).

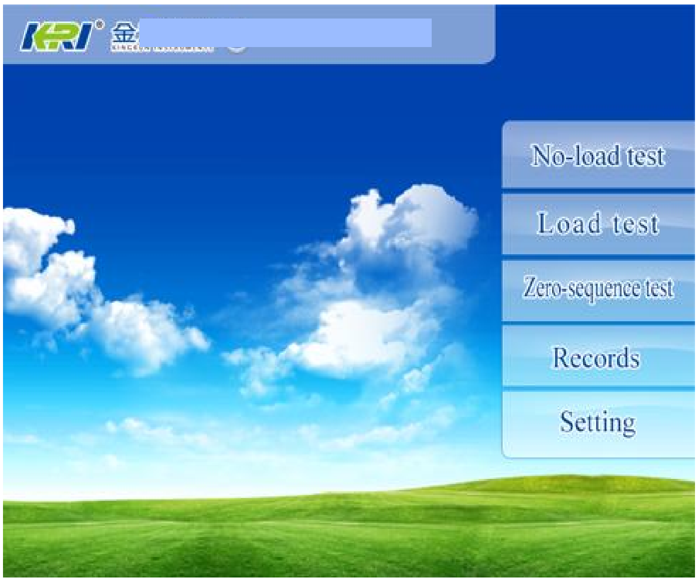


Fig. 57 Main Menu

(2) Press down "load test" and enter into load parameter setting interface. Refer to Fig. 58.

Click the modified parameter setting slightly, pop up the keyboard (refer to Fig. 59) , click the input digit or number directly, input is complete, press down "Enter" and return back Menu in Fig. 58.

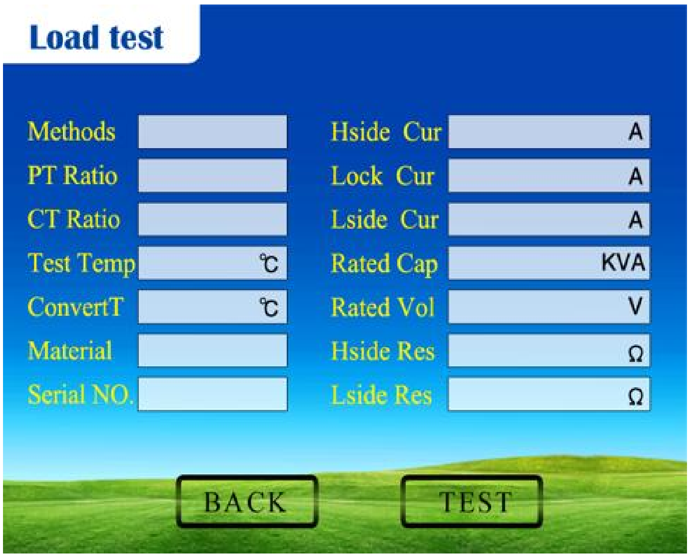


Fig. 58 Load Parameter Setting

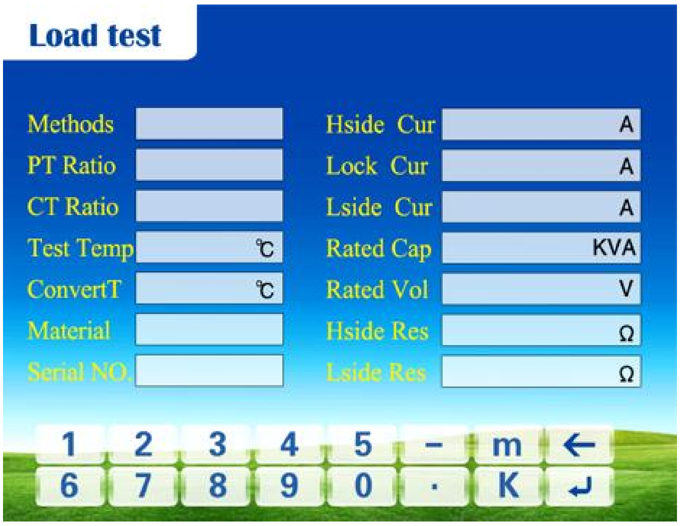


Fig. 59

Wiring way select “Single watt”.

“PT transformation ratio and CT transformation ratio” are transformation ratios of external PT and CT. There is no external input “1”.

“Rated current” is high voltage rated current of the transformer.

“Testing current” is setting current when data are locked during this test.

“Low voltage current” is low voltage rated current of the transformer. It is used for data calibration.

“Rated capacity” is rated capacity of the transformer.

“Rated voltage” is high voltage rated voltage of the transformer.

“Resistance of high voltage line” is line resistance average value of the high voltage winding.

“Resistance of low voltage line” is line resistance average value of the low voltage winding.

“Test temperature” is temperature of the transformer during testing.

“Calibration temperature” is temperature that load loss shall be calibrated.

(3) After parameter setting is complete, press down “Testing” and enter testing interface of load single watt meter, refer to Fig. 60.

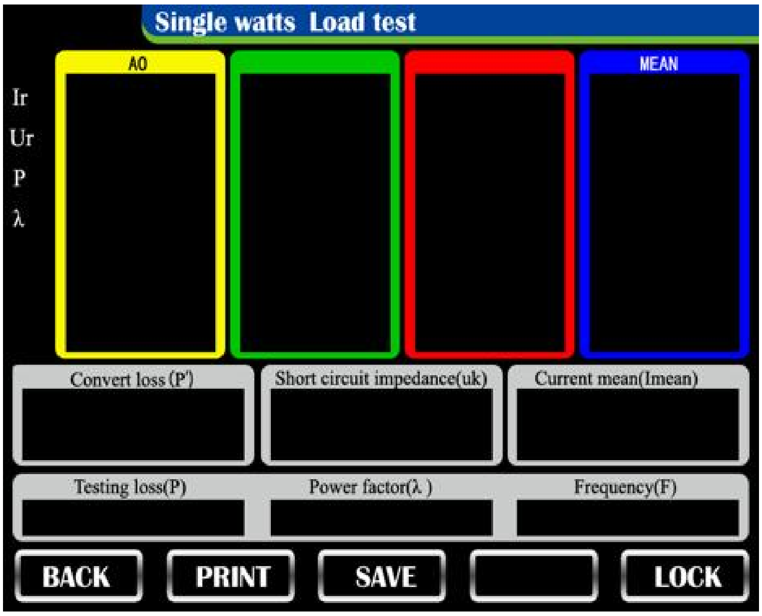


Fig. 60 Testing Interface of Load Single Watt Meter

"BACK": The instrument returns back the upper level menu, and reset.

"LOCK": The screen data is locked, the data can't be refreshed. Now this key becomes red "Run" key, print and storage keys are activated at same time (refer to Fig. 61). Click again and resume data real-time fresh status.

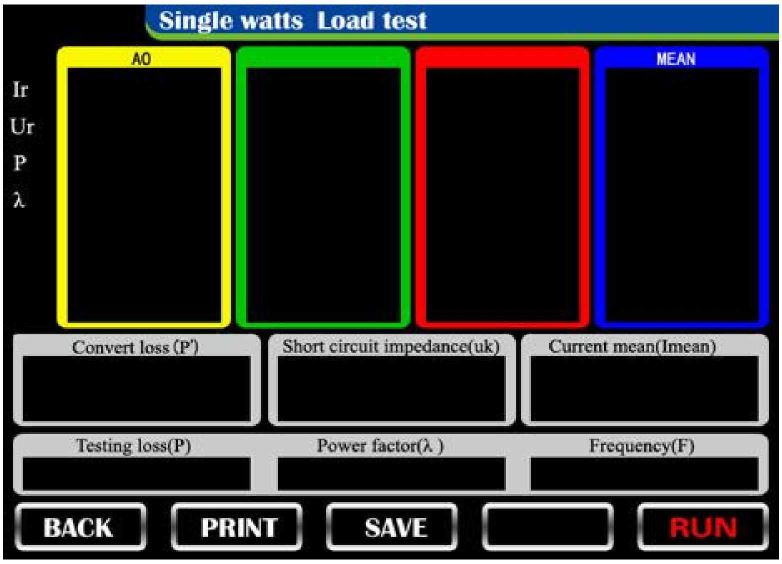


Fig. 61

Ur Effective value of voltage

Ir Effective value of current

P Actual measured power

φ power factor φ=P/(Ur×Ir)

"Current average value" is actual measured value of current, which is voltage imposing reference during load test.

"Actual measured loss" is actual measured total loss

"Power factor" expresses total power factor

"Short circuit impedance" is short circuit impedance which is calibrated to calibration temperature.

$Zk = \sqrt{[Zkt^2+(Pkt/(10\times Sr))^2+(Kt^2-1)]}$

$Zkt = (Ukt\times Ir)/(Ur\times Ik)\times 100$

In which: Ukt: voltage at t°C when test current is Ik

Ur : Rated voltage

Ir: Rated current

Kt: $Kt=T+235/(235+t)$ Copper

$Kt=T+225/(225+t)$ Aluminium

T is calibration temperature, t is test temperature

“Calibration loss” is load loss which is calibrated to calibration temperature.

1) Select to input high and low voltage resistance:

$Pk = [Pkt+Pr\times(Kt-1)]/Kt$

In which Pkt: load loss at test temperature

Kt: temperature conversion coefficient

Pr: Amount of resistance loss of high and low voltage windings, $Pr=Ir^2\times Rxn$(Ir is rated current of winding, Rxn is resistance of winding)

2) When there is no high and low voltage resistance input:

$Pk=Pkt\times Kt$

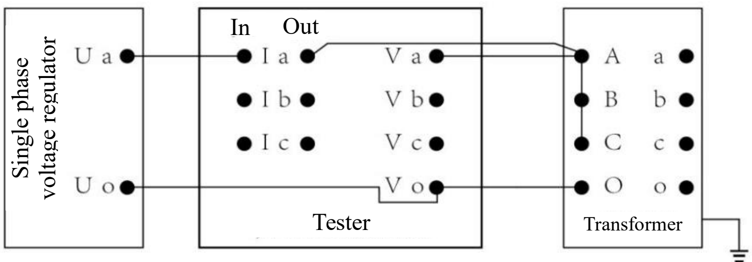
(4) Adjust voltage regulator. When “average voltage” reaches voltage value of setting test. The instrument automatically seizes and locks data. The buzzer sounds and remind for long time. Interface of the instrument enters into status in Fig. 13. Now carry out data print and storage operation. Press down “Run” key, release locking status and enter into real time testing status again.

VIII zero-sequence impedance

1 Wiring method for testing of zero sequence impedance

(1) Direct measurement of zero sequence impedance testing

This wiring method is applied when voltage and current don’t exceed allowable input scope of the instrument. Refer to Fig. 62.



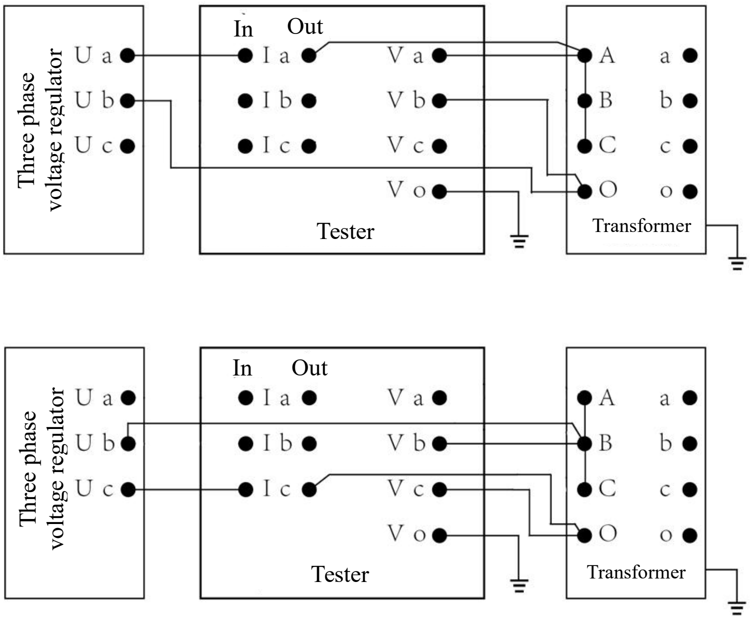
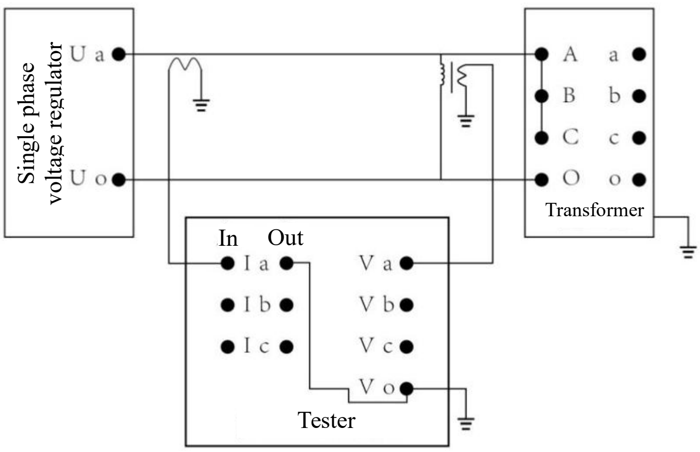


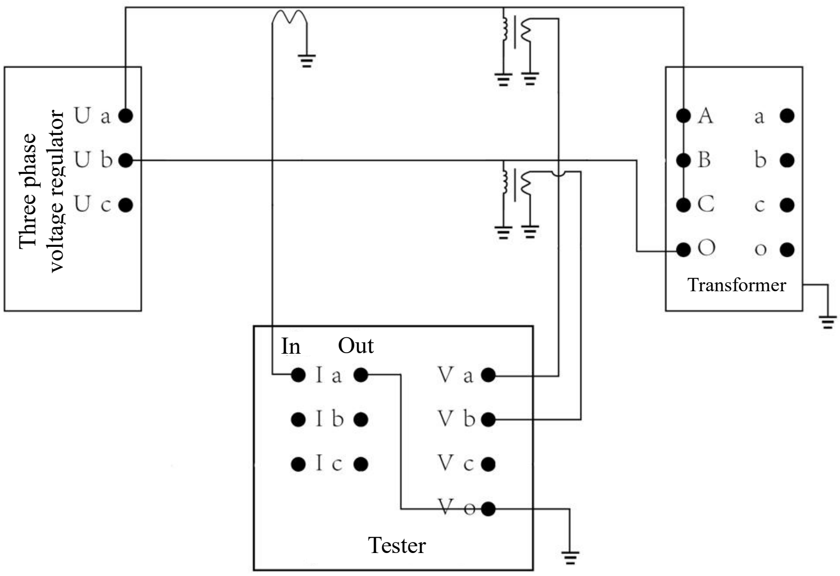
Fig. 62 Wiring Method for Direct Measurement of Zero Sequence Impedance Testing

(2) External voltage transformer and current transformer measurement of zero sequence impedance testing

When testing voltage and current exceed allowable input scope of the instrument, use this method to connect wire. Refer to Fig. 63.

Only when testing voltage exceeds allowable input scope of the instrument, this method also must apply to connect wire. Protect high voltage against directly entering into the instrument and causing the instrument damaged.





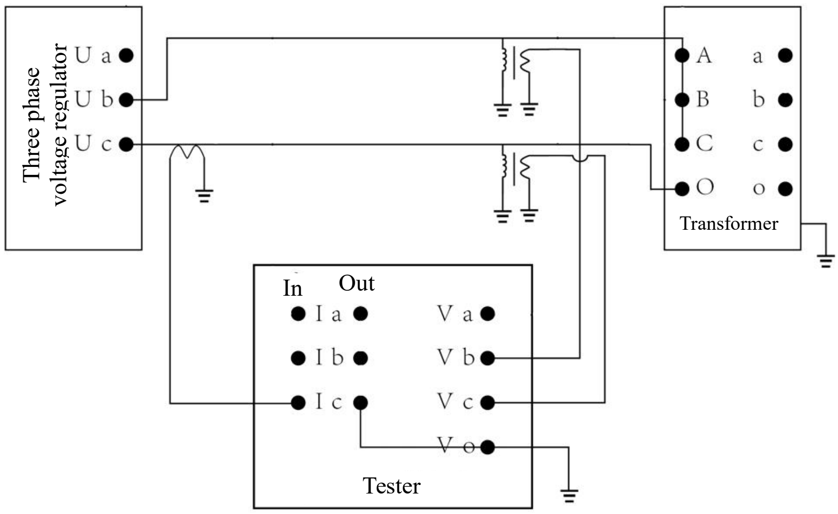
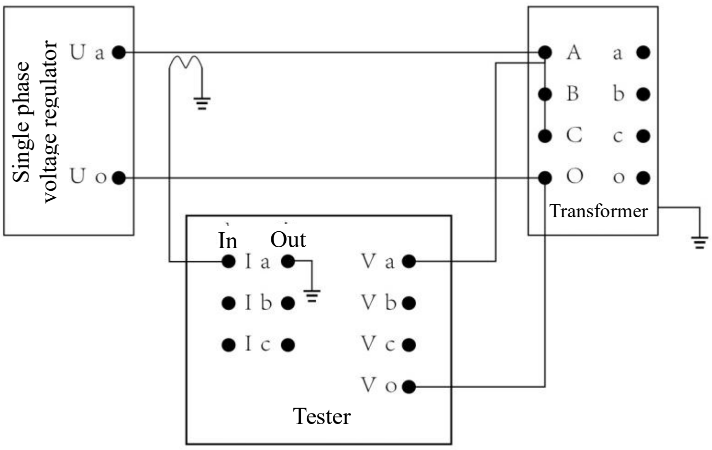


Fig. 63 Wiring Method for External Voltage Transformer and Current Transformer Measurement of Zero Sequence Impedance Testing

(3) External current transformer measurement of zero impedance testing

When voltage doesn't exceed allowable input scope of the instrument, this method is used when current exceeds allowable input scope of the instrument. Refer to Fig. 64.



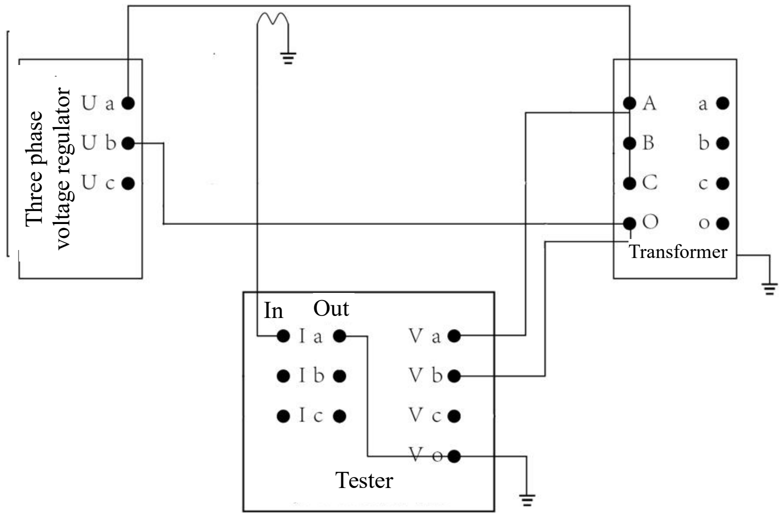


Fig. 64 Wiring Method of External Current Transformer Measurement Transformer for Zero Sequence Impedance Testing

2 Operation method for testing of zero sequence impedance

(1) Connect testing wire shown as above figure, inspect whether it is free of fault. Switch on the power supply and enter into main operation menu (refer to Fig. 65).

Fig. 65 Main Menu

(2) Press down “zero sequence impedance” and enter into zero sequence setting interface. Refer to Fig. 66.

Click the modified parameter setting slightly, pop up the keyboard , click the input digit or number directly, input is complete, press down “Enter” and return back Menu in Fig. 66.

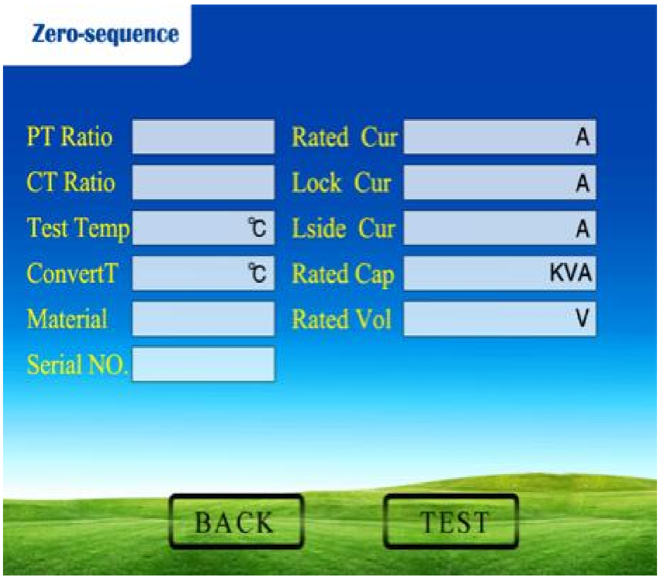


Fig. 66 Zero Sequence Impedance Parameter Setting

“PT transformation ratio and CT transformation ratio” are transformation ratios of external PT and CT. There is no external input “1”.

“Testing current” is setting current when data are locked during this test.

(3) After parameter setting is complete, press down “Testing” and enter testing interface of load single watt meter, refer to Fig. 67.

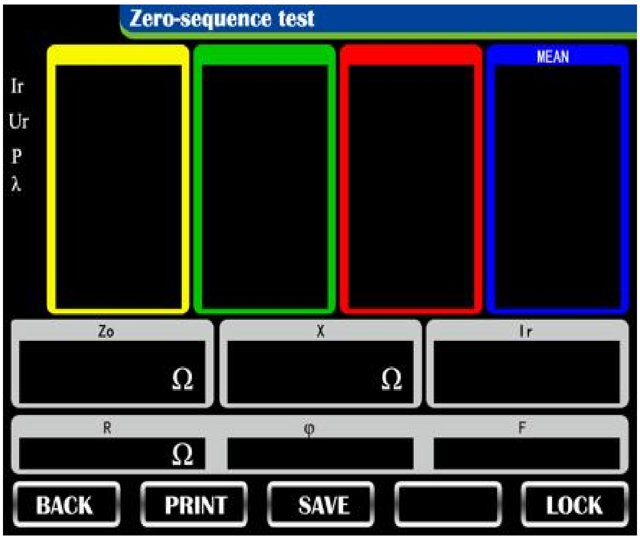


Fig. 67 Zero Sequence Impedance Testing Interface

“BACK”: The instrument returns back the upper level menu, and reset.

“LOCK”: The screen data is locked, the data can’t be refreshed. Now this key becomes red “Run” key, print and storage keys are activated at same time (refer to Fig. 68). Click again and resume data real-time fresh status.

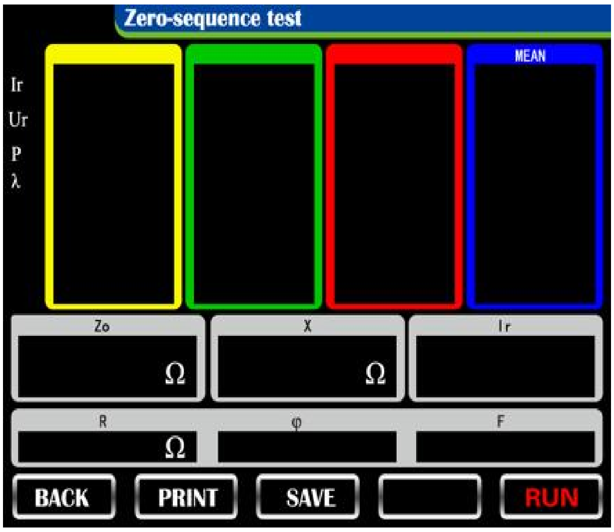


Fig. 68

Ir: Effective value of current

Ur: Effective value of voltage

P: Actual measured loss

φ power factor φ=P/(Ur×Ir)

Zo: Impedance

X: Reactance

R: Resistance

Φ: Power factory angle

(4) Adjust voltage regulator. When “average voltage” reaches voltage value of setting test. The instrument automatically seizes and locks data. The buzzer sounds and remind for long time. Interface of the instrument enters into status in Fig. 13. Now carry out data print and storage operation. Press down “Run” key, release locking status and enter into real time testing status again.

IX History record:

Press down “history record” button on main menu, enter into zero sequence impedance parameter setting, refer to Fig. 69.

Fig. 69 History Record Menu

Include loss testing record and harmonic testing record. Click corresponding storage record bar, display stored testing record information. Refer to Fig. 70. Carry out print and data export operation of stored data through the button on this interface.

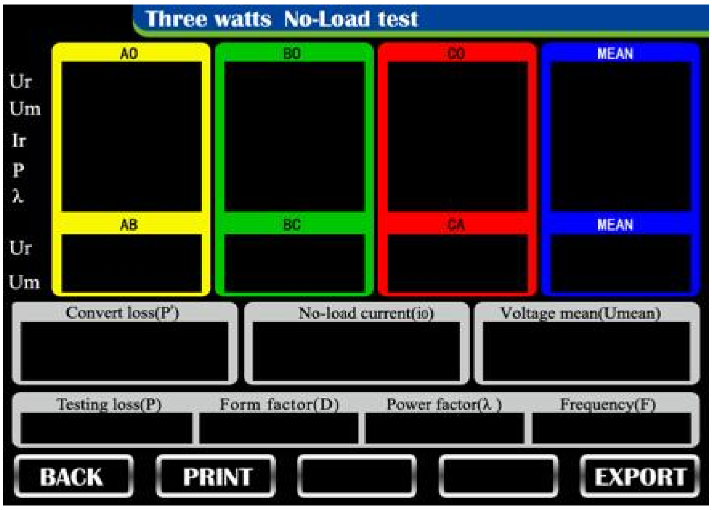


Fig. 70

X Data export of U disc

1 Enter into "History record" menu. Refer to Fig. 75. After U disc is inserted, display menu in figure 71. It means connection of U disc is successful. Carry out data export operation. If menu in figure 72 is displayed, U disc isn't connected successfully. Please operate again.

Fig. 71

Fig. 72

2 Click corresponding stored data, enter into interface of "Fig. 71", click the push button "export" and start store the saved data into the connected U disc. Automatically create folder, name is "SJ******", last six number are year, month and day of data storage. Document name is "SJ******.txt", last six number are hour, minute and second for storage. Followings are storage format of data in U disc.

No load three watt test No-load Loss

	AO	BO	CO	MEAN
Ur	10.407mV	8.7242mV	13.219mV	10.783mV
Um	9.7327mV	8.1523mV	12.688mV	10.191mV
Ir	0.0260mA	0.0243mA	0.0569mA	0.0357mA
P	0.0000mW	-0.0000mW	0.0000mW	0.0000mW
λ	0.0369	-0.0471	0.0132	0.0010
	AB	BC	CA	MEAN
Ur	2.7434mV	4.7062mV	4.1365mV	3.8620mV
Um	2.1218mV	4.5926mV	3.8443mV	3.5195mV
P'=0.0000mW	i0=0.0035 %	Umean= 3.5169mV		

P=0.0000mW	d=-0.0973	λ=0.0080	F=0.0000Hz	

XI Data print

1 No load print format

Load loss test No- Load Loss

2014-02-24 10:08:10

No. 1 （Number）

Un： 400V （Rated voltage）

In： 115.5A （Rated current）

Sn： 80KVA （Rated capacity）

PT： 1 （Transformation ratio of PT）

CT： 1 （Transformation ratio of CT）

P = 0.0000mW （Actual measured loss）

P’ = 0.0000mW （Calibration loss）

I = 0.0265mA （Current average value）

i0 = 0.0026% （No load current）

U = 11.373ｍV （Average effective value）

V = 11.073ｍV （Average value）

λ = 0.0498 （Power factor）

F = 0.0000Hz （Frequency）

2 Load print format

Load loss test Load Loss

2014-02-24 10:08:10

No. 1 （Number）

Un： 10kV （Rated voltage）

In： 4.62A （Rated current）

Sn： 80KVA （Rated capacity）

PT: 1 （Transformation ratio of PT）

CT: 1 （Transformation ratio of CT）

Test T: 15℃ （Test temperature）

Cal T : 75℃ （Calibration temperature）

P = 0.0000mW （Actual measured loss）

P’ = 188.65mW （Calibration loss）

U = 3.3146 mV （Average value of voltage）

uk = 5.7788% （Short circuit impedance）

I = 0.0265mA （Current average value）

λ = 0.0498 （Power factor）

F = 0.0000Hz （Frequency）

XII System setting

In main menu, refer to Fig. 73, press down “system setting” key, enter into “system setting” menu, refer to Fig. 74.

Fig. 73

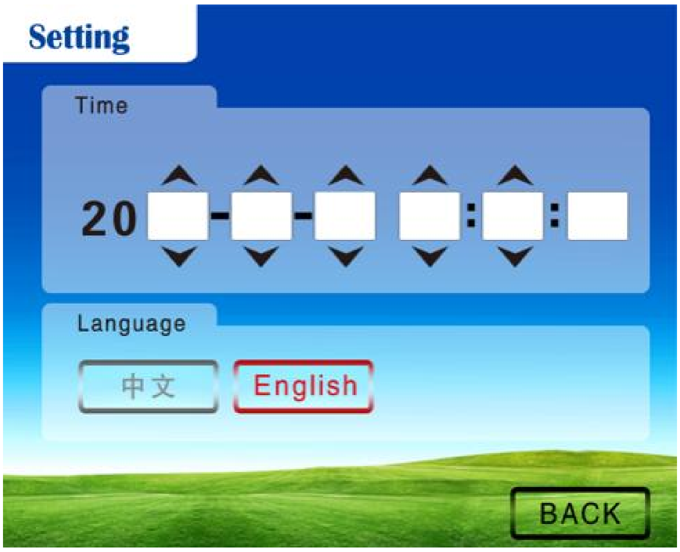


Fig. 74 System Setting Menu

1 Time setting: press down “▲”“▼” for corresponding year, month, day, hour and minute for modification in time setting. After modification is complete, press down “BACK” key to return back main menu.

2 Language setting: Press down “Chinese” or “English” and enter into corresponding language mode. After modification is complete, press down “return” key to return back main menu.

XIII Precautions

1 It shall be grounded reliably during application of the instrument.

2 Shut down only after voltage of the voltage regulator returns back zero.

3 Carry out wiring and operation according to method in this manual.

4 Voltage or current must be within allowable input scope.

5 Three-phase transformer loss test when the transformer neutral point should not be connected to the zero line. When the three-phase voltage is unbalanced, the zero line will produce a very large current.

XIV Current range setting

Press the "gear setting" button, you can choose to set the current range test range. "Automatic" by the instrument automatically determine the current stalls, without human intervention. "1A" range maximum test current of 1A, "10A" range maximum test current of 10A, "100A" range maximum test current of 100A.
Note: When selecting the current range, the maximum test current must not exceed the nominal value of the selected range. Otherwise the instrument may be damaged.(No load test, the maximum test current should not exceed 50% of the nominal value, otherwise the test data may be biased.)

XV Completeness of instruments

Main machine	1 unit
Testing wire	1 set
Power supply wire	1 line
Operation manual	1 book
Certificate/ Guarantee card	1 piece
Packing list	1 piece
Fuse	2 units (2A)

XVI After sale service

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