

HTBZ-H 30MVA 69KV Automatic Transformer Test Bench Solution



Manufacturer: Wuhan UHV Power Technology Co.,Ltd.

Contact person: mike xu 13808601259

Design time: 2022.10.25

I. Summary

1.1 the technical proposal specifies the design, manufacture, inspection, test, technical data, acceptance, supply and transportation, on-site commissioning, after-sales service and other work of the transformer comprehensive test bench.

1.2 the products provided by Wuhan UHV Power Technology Co.,Ltd. are high quality products meeting the requirements of the customer.

1.3 the products provided by the supplier are stable in performance and reliable in test data, which are widely used in the production and test enterprises of transformers and power reactors, and are highly praised by users.

II. Standards and requirement

2.1 the technical conditions of the transformer comprehensive test bench provided by Huatian Electric power are comply with national and power transformer industry standards and specifications. If there are differences between the standards, the higher standard shall be adopted.

GB 1094.1—2013	Power transformers Part 1: General
GB 1094.2—2013	Power transformers Part 2: Temperature rise
GB 1094.3—2003	Power transformers - Part 3: Insulation levels, insulation tests and external insulation air gaps
GB/T 1094.4-2005	Power transformers - Part 4: guidelines for lightning impulse and switching impulse tests for power transformers and reactors
GB/T 1094.7-2008	Power transformers - Part 7: load guide for oil immersed power transformers
GB 1094.11—2007	Power transformers Part 11: dry type transformers
GB 1094.12-2013	Power transformers - Part 12: load guide for dry type power transformers
GB/T 1094.101-2008	Power transformers - Part 10.1: Application guide for sound level determination
GB/T 10228-2008	Technical parameters and requirements of dry type power transformer
JB/T 501-2006	Test guide for power transformer
GB 311	Insulation coordination of high voltage transmission and transformation equipment

GB/T16927.1—1997 High voltage test techniques Part 1 General test requirements
 GB/T16927.2—1997 High voltage test technology Part 2 Measurement System

GB 1208-2006 Current transformer
 JB/T 5472-1991 Instrument current transformer
 JJG 780-1992 Verification regulation of AC digital power meter
 JJG 34-1999 Verification regulation of AC digital voltmeter
 JJG 38.5-1999 Verification regulation of AC digital ammeter
 JJG 313-2010 Verification regulation of measuring current transformer
 JJG 314-2010 Verification regulation of measuring current transformer

2.2 Appearance inspection

Conduct visual inspection and measurement for the style, external dimension and process structure dimension of the platform, layout, wiring, installation process and surface coating of the equipment in the screen, and written records shall be made.

2.3 Testing requirement

The following tests shall be carried out in accordance with relevant IEC 60076-1 ~ 5 <power transformers> and IEC 60726 <dry type power transformers>. The test items are shown in the following table:

No.	Test Item	Factory test	On field test
1	Transformer no-load loss and No load current percentage test	✓	✓
2	Transformer Load loss and short circuit impedance test	✓	✓
3	Transformer power-frequency withstand voltage test	✓	✓
4	Transformer doubling frequency induction withstand voltage test	✓	✓
5	Transformer winding DC resistance test	✓	✓
6	Transformer transformation ratio / group test	✓	✓
7	Transformer Temperature rise test	✓	✓

III. System configuration

The equipment purchased by Party A and manufactured by Party B must meet the following requirements:

■ 69kV ordinary power transformer and special power transformer with 30MVA or smaller capacity (Full current, Resistance $\leq 10\%$)

■ 38.5kV ordinary distribution transformer and special power transformer with 31.5MVA or smaller capacity (Full current, Resistance $\leq 10\%$)

■ 10.5kV ordinary distribution transformer and special power transformer with 4MVA or smaller capacity (Full current, Resistance $\leq 6\%$)

The test object of the equipment purchased by Party A and manufactured by Party B must meet the following voltage level requirements:

The tested transformer's voltage level shall be:

■ High voltage side 69kV~10.5kV etc.

■ Low voltage side: 0.1kV ~ 10.5kV.

3.1 Product price

NO.	Name	Model	Manufactuer	Unit	QTY	Total (USD)
1	Automatic Transformer Test Bench	HTBZ-H	UHV	set	1	\$
Shipment and installation cost not included						
Delivery date: usually 25~35 days after everything is confirmed.						

3.2 Scope of supply

No.	Name	Model	QTY	Price	Mark
Part I: main console					
1	Automatic Transformer Test Bench Main control cabinet	HTBZ-H	1		Piano style
	Low Voltage Test Auxiliary Test Bench	HTBZ-H	1		PLC & Primary control
	Industry Computer with Software operation system	/	1		System software
	Industrial computer and printer	Integrated			
Part II: Transformer characteristic & doubling frequency test					
2	Transformer power analyzer meter	/	1		Imported / 0.1 accuracy
	Three phase Electric voltage regulator	250kVA	1		10-650V
Part III: Transformer doubling frequency induction withstand voltage test					
3	Intermediate frequency generator set	HTBP-150kVA	1		150Hz
Part IV: Transformer power-frequency withstand voltage test					
4.1	AC Test Transformer (Oil immersed)	YDJ-150kVA	1		double-tap
4.2	Precision Voltage Divider	HWFY-150kV	1		Full copper/ 150kV
4.3	Peak Voltage Meter	HTFZ-200	1		0-200V
4.5	Iron Protection Resistor	150kV	1		
Part V: Transformer Temperature rise test					
7	Dual channel temperature rise DC resistance tester	HTZRC-20W	1		For Temp. rise test
8	Full automatic temperature detector	HTW-16	1		16 Chanel
	Temperature sensor	HTPT-100	18		
Part VI: Transformer transformation ratio / group test					
9	Transformer Turns Ratio Group Tester	HTBC-V	1		lithium battery

No.	Name	Model	QTY	Price	Mark
Part VII: 69kV High Voltage Test					
1	Automatic High Voltage auxiliary control Bench	HTBZ-H	1		High voltage transformer switching
2	Capacitance compensation device	3450kVA	1		Manual Switching
3	Intermediate Step-up transformer	400kVA 0.6/4kV/11kV /22kV	1		
4	Precision current transformer	HL-200A	3		0.05 accuracy
	Precision voltage transformer	HJ-4kV	3		0.05 accuracy

3.3 Accessories

No.	Name	Model	Unit	QTY	Price	Mark
1	Field Commissioning Cable	BVR	m			test cable
2	High voltage test cable	/	m	45m		Silicone flexible cable
3	High current test clamp	300A	pc	3	free	free
4	Digital thermohygrometer		pc	1	free	free
Total:						

IV. Product performance

The Automatic Transformer Test Bench has the following functions (test items):

- ◆ Transformer no load characteristic test (no load loss, no-load current percentage of rated current);
- ◆ Transformer Load characteristic test (load loss, percentage of impedance voltage; automatic temperature conversion and load loss test under 30% or above full current);
- ◆ Transformer temperature test

V. System parameters (technical conditions)

5.1 Automatic Transformer test bench appearance: specification size: body color: body picture (for reference only)

1. Automatic Transformer Test Bench reference picture









5.2 the transformer power analyzer can meet the single-phase and three-phase measurement, and its performance index requirements are as follows:

- The voltage measurement range: 0v-1000v, the current measurement range is 0.1A-20A, and the accuracy is 0.1 level;
- Power $U * I$, accuracy class 0.3
- The power factor: 0.1-1.0, accuracy : 0.1 level
- The frequency : 40-70Hz, accuracy : 0.1 level;
- Three phase total power P;
- No load current I. %;
- No load loss P. ;
- Load loss PK;
- Impedance voltage UK;
- Three phase power values PA (PAB), Pb, PC (PBC);
- Three phase average line voltage Un;



- Three phase average line Current In.
- Include 31 times Harmonic measurement

5.3 Three Phase Voltage Regulator :

Input voltage: 3 phase 380V,

output voltage: 10-650V,

Max. load current: 222A.

The voltage regulator has the characteristics of contactless voltage regulation and is easy to use,

It can operate reliably for a long time. It is widely used in industrial and mining enterprises

Agriculture and scientific research units are used as general equipment for regulating voltage.

When the input voltage is constant, it can, The output voltage is adjusted steplessly and smoothly. Voltage regulator and TWK control It can be used together to realize automatic voltage regulation and stabilization. At rated frequency, The 50 Hz designed voltage regulator allows half load operation at 150 Hz frequency.



5.4 The medium frequency generator set:

- Rated capacity:: 160kVA;
- Output voltage range: 30V~800V
- Output current: 115A
- Output frequency: 150Hz \pm 2%.
- Input voltage: 380V



5.5 AC Test Transformer (Oil immersed)

- 1. Rated capacity: 150KVA;
- 2. Output voltage: 150kV;
- 3. Output current: 1A;
- 4. Input voltage: 0 ~ 600V;
- 5. Input current: 0 ~ 250A;
- Rated working frequency: 50Hz .



5.6 Dual channel temperature rise DC resistance tester:

Summary:

The DC resistance of the transformer is a required test item for the factory test, installation, handover test of semi-finished products and finished products in transformer manufacturing, as well as the preventive test of the electric power department. It can effectively find the manufacturing defects such as material selection, welding, loose connection parts, missing strands, broken wires and hidden dangers after operation. In order to meet the need of fast test of transformer DC resistance, the company developed HTZRC-20W DC resistance fast tester by using its own technical advantages. The instrument has a new power technology and features small size, light weight, large output current, dual channel measurement, real-time sampling, etc. The whole machine is controlled by a single chip microcomputer, which automatically completes self inspection, data processing, display, printing and other functions, and has automatic discharge and discharge indication functions. The instrument has high test accuracy and simple operation, and can realize fast measurement of transformer DC resistance.

Functional features:

- The instrument has large output current, wide measurement range, small volume, light weight and simple operation;
- Dual channel measurement, simultaneously measuring two resistance values;
- Temperature rise test, printing data every 30 seconds, easy to operate;
- Complete protection circuit with strong reliability;
- With audible discharge alarm function, the discharge indication is clear, reducing misoperation.

- With RS232 communication interface

Technical parameter:

- Max. Output current: 20A
- Measuring range: $100 \mu \Omega \sim 20k \Omega$
- Resolution: $0.1 \mu \Omega$
- Measurement accuracy $\pm (0.2\% \text{ reading} + 2 \text{ words})$



5.7 Full automatic temperature detector

It is applicable to the detection and alarm of 5-80 point process quantity. It can input sensor and transmitter signals such as thermal resistance, thermocouple, DC current and DC voltage.

The basic error is less than $0.2\% F \cdot S$, and the display range is -1999~9999

Each channel independently sets the input signal type, range and alarm value. Each channel independently sets the digital filtering time constant to effectively improve The anti-interference capability. Each channel independently sets zero point and full scale correction, effectively reducing transmission Sensor error, improve system measurement accuracy,Unused channels can be closed at will, Level 2 parameters. Level 2 parameters are controlled by password to prevent misoperation. With parameter copying function, the workload of parameter setting is greatly reduced



Unique and practical alarm function, which can be matched with XSLCU multipoint control unit to achieve alarm output of each channel, Manual, timing and alarm start printing, Fast and efficient communication interface, greatly reducing communication time, Including communication interface and software

5.8 Transformer Turns Ratio Group Tester

- Range: 0.9~5000
- Accuracy: 1~500, \pm (reading \times 0.1%+2 words)
500~3000, \pm (Reading \times 0.2%+2 words)
More than 3000, \pm (reading \times 0.3%+2 words)
- Resolution: 0.9 ~ 9.9999 (0.0001)
100 ~ 999.99 (0.01)
10~99.999 (0.001)
1000~4999.9 (0.1)
- Working power supply: input 100-240VAC, 50/60Hz
- Operating temperature: - 10 °C ~ 50 °C
- Relative humidity: < 90%, no condensation



5.9 69kV High Voltage Test

1. High voltage standard current transformer :

- Rated working voltage: 22kV
- Withstand voltage: 28kV
- Capacity: 1VA
- Measurement range: 0.1A ~ 600A;
- Accuracy: 0.05;
- Transformation ratio : 600, 400, 200, 100, 50, 20, 10, 5, 2.5/1A, with 8 gears in total



2. High voltage standard voltage transformer :

- Rated working voltage: 22kV
- Withstand voltage: 28kV
- Capacity: 1VA
- Measurement range: 0.3kv ~ 22KV;
- Accuracy: 0.05;

Its transformation ratio is 22kV, 11kV, 6kV, 3kV / 100V , with 4 gears in total

3. The intermediate step-up transformer:

- Rated capacity: 400KVA
- Rated input voltage : 0.6kV
- Rated input current: 385A
- Rated output voltage 1st gear: 4kV Rated current: 57.7A
- Rated output voltage 2nd gear: 11kV Rated current: 21A
- Rated output voltage: 3rd gear: 22kV Rated current: 10.5A

(The output terminal adopts manual tap changer to switch gears, and the output wiring method adopts Y connection)

- Withstand voltage level 45kV, time 60s
- Meet the requirements of 24-hour temperature rise test.

4. High voltage capacitance compensation tower :

4.1 The Supplier must implement the current national standards and industrial standards, and the main current standards to be followed are as follows:

GB/T6924.1-2001: < Shunt Capacitors for AC Power Systems with Standard Voltages above 10kV>

GB8287.1-1983: <Technical Characteristics of High Voltage Post Insulators>

GB8287.2-1989: <Dimensions and Characteristics of High Voltage Post Insulators>

GB50227-1995 : <Code for Design of Shunt Capacitor Devices>

JB/T7111-1993: <High Voltage Shunt Capacitor Device>

ZBK48003-1987: <Code for Electrical Test of Shunt Capacitors>

4.2 Working condition

- Outdoor use
- Altitude < 1000m
- Ambient temperature: - 25~+40 °C
- The specific creepage distance of capacitor external insulation shall not be less than 2.5cm/kV;
- Seismic requirements: the capacitor shall be able to withstand the action of seismic intensity of 8 degrees without damage

4.3 Technique requirement

Requirement: The cabinet entry requirement is that the computer controls the electric switch.

- Product model: BFM/ √ 3-200, BFM11/ √ 3-100, BFM11/ √ 3-50-1W BFM11/ √ 3-25-1W shunt capacitor
- Rated capacity: 3450kvar, and the capacity deviation shall not exceed 0~+5% of its rated value;
- Rated voltage: 7/ √ 3 kV
- Rated frequency: 50Hz
- Under the rated power frequency voltage, the dielectric loss angle tangent value measured at the ambient temperature of 20 °C shall be less than 2/10000;
- Insulation level: LI75/35;

VI. Design working principle

6.1 design code for comprehensive test system of transformer laboratory:

6.1.1 the system operation is simple, safe and reliable

- The whole test system takes into account the safety of test personnel and the reliability of equipment operation.
- various overvoltage and current protection functions are complete.
- The space layout is reasonable, and the wiring is clear and tidy.

6.1.2 system efficiency

Make full use of the microcomputer data processing technology to input the measurement results directly into the microcomputer for calculation. It saves the trouble of manual formula calculation. The external wiring shall be arranged uniformly, and manual wiring shall be avoided as far as possible. When changing the wiring, the automatic switch shall be completed only by using the

control button on the test bench.

6.1.3 humanized operation of the system

It makes full use of the function of mechanical and electrical interlocking and skillfully combines with computer software programs to effectively prevent the occurrence of misoperation. That is to say, if you do not follow the safety procedures, the system will refuse to start, thus effectively protecting the safety of people and equipment.

6.1.4 reliable operation of the system

The system is provided with manual and automatic operation modes. When the automatic operation mode is abnormal, the manual operation mode is used without affecting the normal test task.

6.1.5 the system has high measurement accuracy

The measuring instruments and meters of the system are higher than the requirements of national standards.

6.2 main components of the project (see itemized test table for detailed configuration)

- transformer comprehensive characteristic test system.
- AC and inductive voltage withstand test system.
- common instruments and meters in the laboratory

6.3 brief description of main test system

6.3.1 transformer characteristic test:

A. Manual function

- use the buttons on the front panel to control the test procedure.
- record the test data manually and save it in the database.
- data communication can be completed through PC software and loss meter on PC during the test.
- the test items can be selected by buttons, and only one test task can be run at the same time.
- all test functions and test processes are selected and controlled by the buttons on the front panel of the test bench.

B. Automatic function

- the test process can be controlled by the PC software on the PC with the mouse and keyboard.
- test data can be automatically recorded and saved in the database.
- during automatic operation, the keys on the front panel can be invalid.
- the test items can be selected through the buttons in the dialog box. Only one test task can be run at the same time.
- during no-load and load tests, the ambient temperature shall be recorded automatically.
- in the temperature rise test, the automatic control function of constant power and constant current is supported, and the temperature test data (or optional interval) is automatically recorded every 15 seconds.
- test results such as insulation resistance and oil withstand voltage can be manually entered into the document to improve the test report.
- all test results shall be corrected according to the requirements of GB1094, IEC 60076 or ANSI C57 series latest standards.
- after the test is completed, the database is automatically archived and the test report can be printed immediately.
- during the temperature rise test, the test data can be automatically calculated accurately.
- waveform correction, rated voltage correction and frequency correction (50Hz, 60Hz) can be automatically performed on the data of no-load test.
- automatic temperature correction (75 °C, 100 °C, 120 °C, 145 °C), rated current correction and frequency correction can be performed on the test data of load test.
- during no-load test, the voltage at the high-voltage side can be monitored, recorded and analyzed.
- during the load test, the low-voltage side current can be monitored, recorded and analyzed.

6.3.2 performance characteristics meet the following requirements:

- The direct circuit and the indirect circuit are automatically switched.
- The high-voltage current and voltage transformer adopt the secondary switching principle.
- CT \ PT range automatic switching
- the transformer comprehensive test bench comprehensively controls, measures and monitors the whole circuit.

■The measured data is processed automatically by the microcomputer and can be stored and printed as required.

■The microcomputer full-automatic control measurement system test bench and the manual operation electric control voltage regulation digital display are used as standby systems for each other.

■zero position protection, overcurrent protection and overvoltage protection.

■high voltage leakage current display and protection shall be safely grounded with 1:1 transformer.

The test transformer adopts a new type of oil immersed test transformer, with stronger insulation performance and greatly reduced volume capacity. Auxiliary facilities of test station

■safety alarm system.

■ system error alarm system.

■ stainless steel isolation guardrail. (self made by Party A)

■ audible and visual hazard warning system

VII. Transformer comprehensive test system design requirements :

- The distributed design scheme is adopted, that is, DC resistance test, transformation ratio test, no-load characteristic and load characteristic of transformer, as well as high and low-voltage power frequency voltage withstand test and induced voltage withstand test of transformer are in one platform, and each functional part is independent of each other and can be freely combined. Automatic test is realized.
- The advantages of the distributed scheme are that it is not only convenient for the test personnel to operate, but also easy to install and debug. The reliability of the platform can be improved

The system can automatically complete the test through computer program control. The test process is described as follows:

- The computer sends instructions to the console.
- After receiving the command, the console opens and closes the corresponding contactor to enable the test line.
- The computer sends instructions to the frequency converter to adjust the boost frequency, and then starts the induction non local discharge programmable frequency converter power supply to start the boost.

- The computer monitors the boosting process through the voltage and current signals fed back by the empty load tester.
- Stop boosting when the single test voltage reaches the set value.
- Record the test data, and then reduce the voltage.
- When the voltage drops to the zero point of the programmable variable frequency power supply without partial discharge, the system closes all contactors and the test is completed.

7.3 Transformer Power frequency withstand voltage test

The test of the system is a button type operation. The electric contact programmable variable frequency power supply without partial discharge is operated through the console to boost the voltage, and the voltage is sent to the tested object after passing through the power frequency test transformer. The test voltage is connected to the digital voltmeter on the console through the instrument end of the power frequency test transformer, and the test current is connected to the digital ammeter on the console through CT.

Composition of power frequency test system

1. Integrated test bench for collecting monitoring data of test unit and instrument.
2. Low voltage control cabinet
3. Oil immersed step-up transformer.

Power frequency test system layout

1. Distributed design scheme is adopted for power frequency test system
2. Distributed design scheme
 - The power frequency test system is independent of the transformer characteristics and temperature rise test system on the platform.
 - The power frequency test system is not only convenient for the test personnel to operate, but also convenient for installation and debugging. Therefore, the distributed scheme can improve the reliability of the platform.

Design requirements for power frequency test operating system

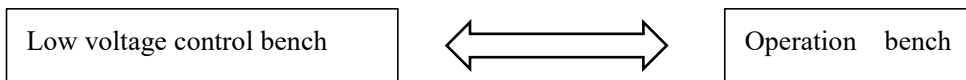
- Line voltage monitoring function is added, that is, digital indicator is added to three-phase input voltage.
- It can give an audible and visual alarm and prompt the tester.

- The over-current relay is added to improve the reliability of the system.
- Convenient operation process indication and operation control button.
- The display and operation classification design are adopted, and the viewing angle is good.
- The voltage regulating console adopts the automatic depressurization mode.
- When the withstand voltage time reaches the alarm prompt.
- Read out the AC leakage current value and install 1:1 current transformer for grounding to prevent the danger caused by poor grounding

Layout requirements of low-voltage control cabinet

- Composition and description of low-voltage control cabinet
- The low-voltage control cabinet is mainly composed of control contactor, low-voltage voltage transformer, low-voltage current transformer, time relay, etc.
- Built in main power supply overcurrent protection, and a 250A/5A current transformer with accuracy of 0.5.

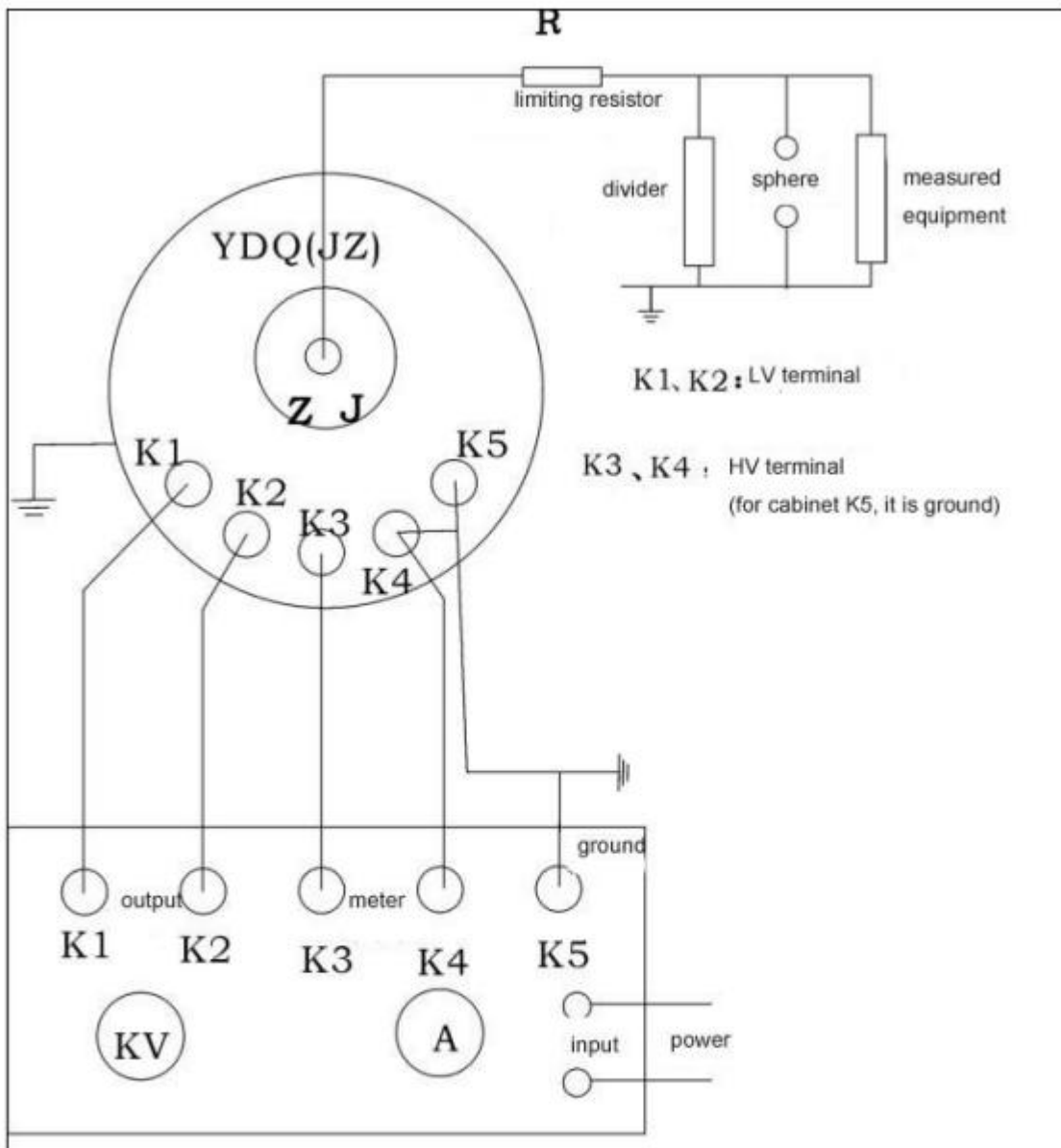
Low voltage control cabinet structure diagram



System schematic diagram (for reference)

Primary schematic diagram of the system (for reference)

AC withstand voltage test wiring diagram



Remark: (1). Control cabinet, limiting resistor, divider, sphere are optional for customers (not included in the standard product).

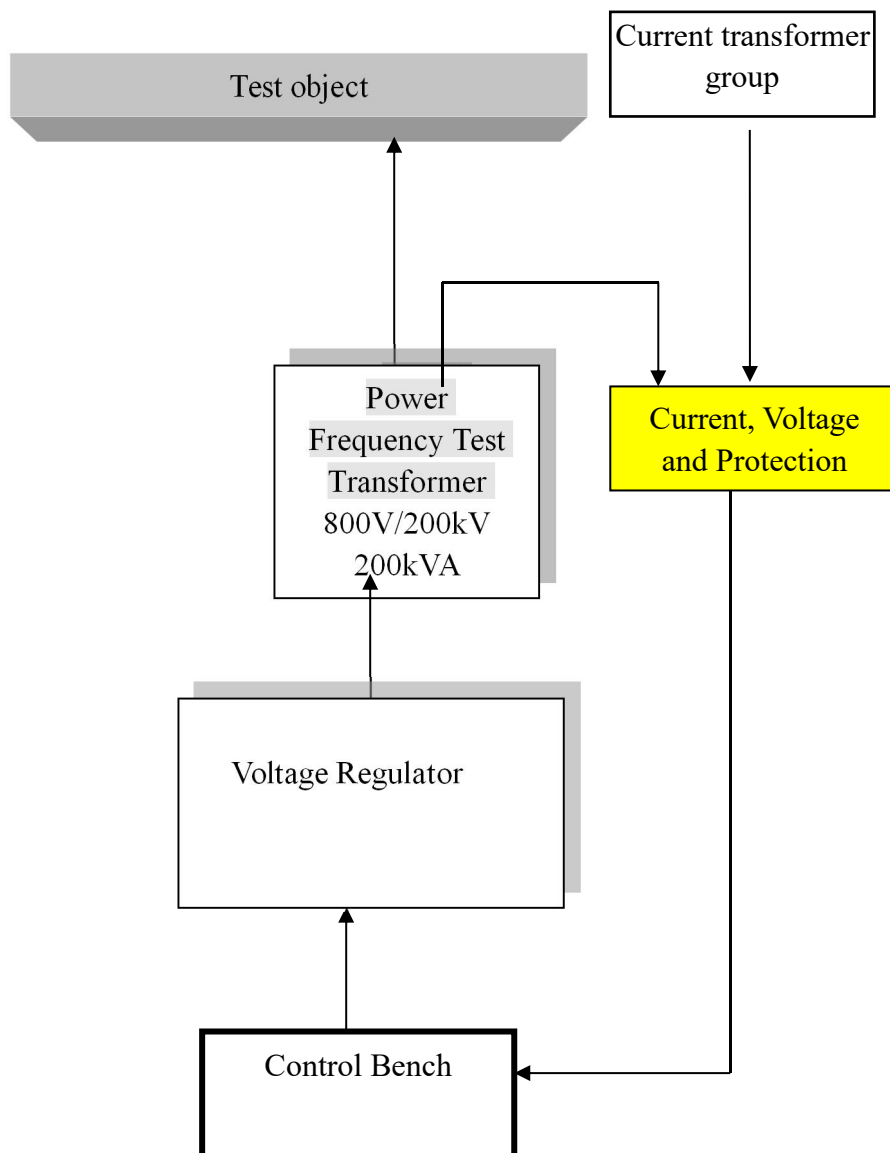
(2). The products must be well grounded (testing transformer/ control cabinet) to ensure safety of people and instruments.

Power frequency test system technique requirement:

- The waveform of the test voltage shall be approximate to the lower chord, and the waveform distortion shall not exceed 5%
- Load capacity: The test equipment shall have an overload capacity of 1.1 times. When the test transformer is selected, the oil insulated test transformer shall be selected.
- Voltage regulating speed: Boost speed is 2% - 3% per second

- System protection: High voltage output overvoltage protection. High voltage output overcurrent protection.
- The over-voltage protection is set by adjusting the electric control to protect the ball gap.
- It has zero start protection.
- Upper and lower limit protection.
- The measurement process is automatically ended when the withstand voltage time expires.
- The external current transformer shall be grounded safely.
- Current limiting protection resistance

The frame diagram of the test system is as follows:



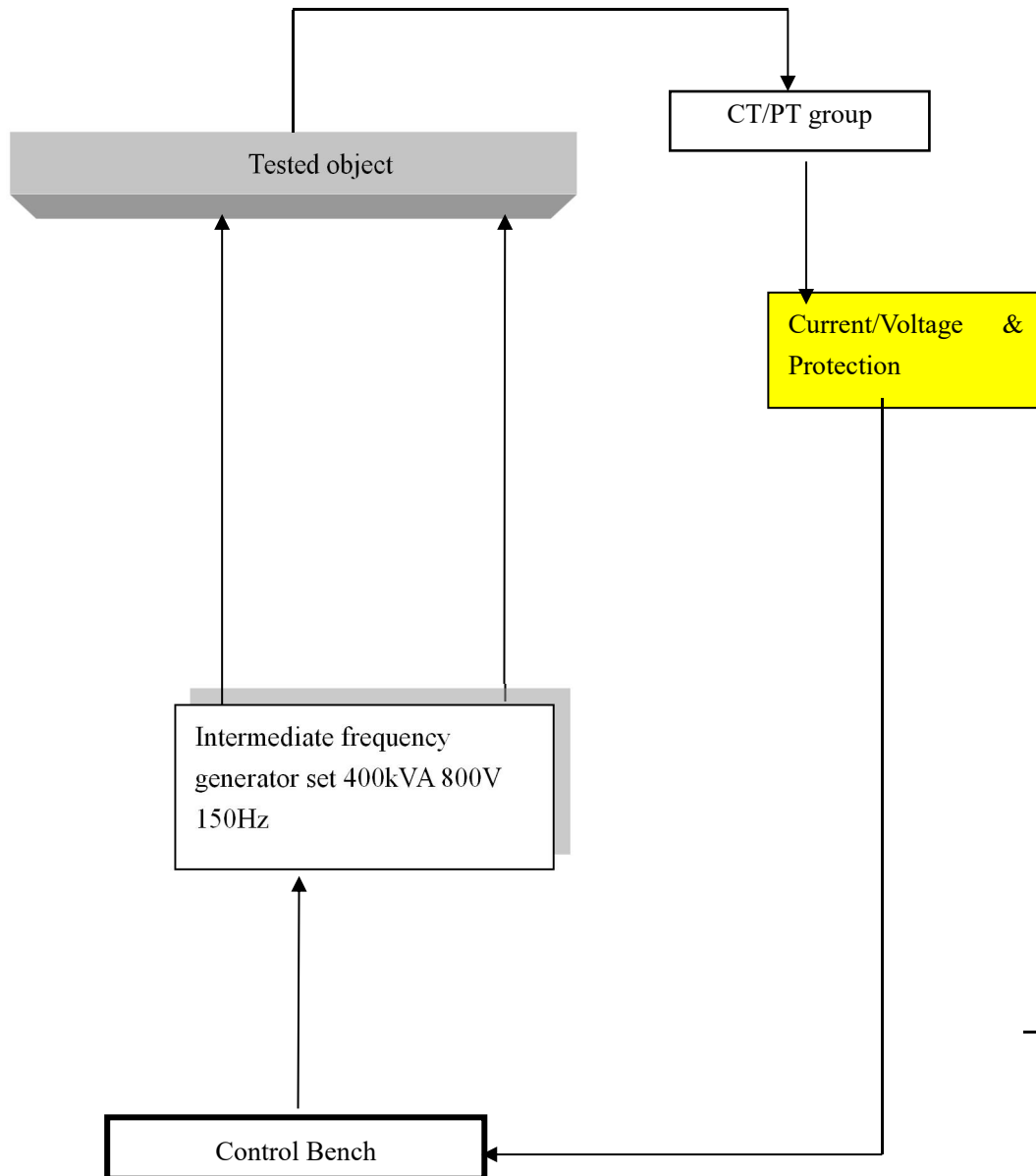
The system can automatically complete the test through computer program control. The test process is described as follows:

- a. The computer sends instructions to the console.
- b. After receiving the command, the console opens and closes the corresponding contactor to enable the test circuit.
- c. The computer monitors the boosting process through the voltage and current signals fed back by the empty load tester.
- d. Stop boosting when the single test voltage reaches the set value.
- e. Record the test data and then depressurize.
- f. When the voltage drops to the zero point of the programmable variable frequency power supply without partial discharge, the system closes all contactors and the test is completed.

7.4 Transformer Induced voltage withstand test

The test of the system is a button type operation, and the intermediate frequency generator is operated through the console to boost the voltage

The frame diagram of the test system is as follows:



The following distributed design scheme is adopted for the main console of the transformer integrated test bench:

The distributed design can ensure that other units can still work normally in the case of damage of one unit or several units. Because the platform is a testing equipment on the production line, it is used very frequently,

Therefore, various methods should be adopted to improve the reliability of the platform.

A low power factor power analyzer test unit is built in the upper part of the test bench. The lower part is built with current (voltage) transformer, output relay, various work indicator lights, buttons, various contactors, etc. The voltage regulator and oil immersed test transformer need to be external due to their large volume or high voltage.

the following distributed design scheme is adopted for the main console of power transformer integrated test bench:

Distributed design can ensure that other units can still work normally in case of damage of one unit or several units. Since the platform is a testing equipment on the production line, it is used frequently, so various methods should be adopted to improve the reliability of the platform.

The test unit of power factor and power analyzer is built in the upper part of the test bench. The lower part is built with current (voltage) transformer, output relay, various work indicator lights, buttons, various contactors, etc. The voltage regulator and oil immersed test transformer need to be external due to their large volume or high voltage.

VIII. Technical data

When we supply the equipment, the data provided are as follows:

- Manual 2pc
- Certificate 1pc
- electrical schematic diagram 1pc

IX. Delivery date

- Delivery date:
- Delivery address:
- Transportation mode:

X. Quality assurance and after-sales service

10.1 Quality assurance

The design, manufacture and commissioning of the products provided by the supplier shall be carried out in strict accordance with the ISO9001 quality assurance system standard.

10.2 Warranty period

The warranty period of the products supplied by the supplier is 12 months from the date of acceptance of the products, or 15 months from the date of arrival of the last piece of equipment, whichever comes first. The supplier shall provide the demander with free services within the warranty period; After the warranty period, the supplier will only charge the cost for the maintenance of the equipment.

All products are provided with lifelong maintenance service.

10.3 After sales service

After the equipment arrives, within 24 hours after receiving the notice from the demander, the supplier shall send representatives to the site to guide the installation, commissioning and trial operation, and be responsible for solving the manufacturing quality and performance problems found in the installation, commissioning and trial operation of the contract equipment. For equipment spare parts damage not caused by the supplier, the supplier shall give priority to providing spare parts and repairing. The supplier is responsible for long-term provision of vulnerable parts of equipment or list of suppliers of vulnerable parts.

We will send special personnel to the site for installation and commissioning until delivery, and provide on-site technical training for the demander.

During on-site commissioning, the Demander shall provide the following test environment: three-phase 380V \pm 10%, frequency 50Hz \pm 0.1, power supply and installation site with capacity not less than 100kVA; The power supply and test wires required for on-site installation and commissioning shall be provided by the demander.