

## HTBZ-H Automatic Motor Comprehensive Test Bench Solution



Manufacturer: Wuhan UHV Power Technology Co.,Ltd.

Contact person: mike xu 13808601259

Design time: 2023.6.14

## 1. Standards and requirement

No.

1.1	IEC 60034-1:2004	Rotating electrical machines--Rating and performance
1.2	IEC 60034-2-1:2007	Rotating electrical machines-Part 2-1: Standard methods for determining losses and efficiency from tests(excluding machines for traction vehicles )
1.3	IEC 60073:2002	Basic and Safety Principles for Man-Machine Interface, Marking and Identification - Coding Principles for Indication Devices and Actuators
1.4	IEC 60204-1:2005	Safety of machinery- Electrical equipment of machines- Part 1: General requirements, IDT
1.5	GB/T 14394-1993	Computer Software Reliability and Maintainability Management
1.6	GB/T 125054-2011	Design Specification for Low Voltage Power Distribution
1.7	GB/T 125055-2011	Code for design of power distribution for general electrical equipment
1.8	GB/T 125063-2008	Code for design of electrical measuring instruments for power installations
1.9	GB/T 6738-86	Safety requirements for electrical measurement indicating and recording instruments and their accessories

## 2. Design principles

- 2.1 Take reliability, safety, economy, practicality, operability, maintainability and progressiveness into consideration.
- 2.2 The measurement and control system of the testing equipment adopts industrial control computer+PLC control+digital display measuring instrument.
- 2.3 The surface of all benches, electric control cabinets and boxes of the test system shall be sprayed with plastic, and all marks shall be clear and not easy to fall off.
- 2.4 All equipment and installation materials in the testing equipment are brand new, and the parts, instruments and all drawings of the equipment, paper data are all in accordance with the international unit (SI) standard.

### **3. Working condition**

#### **3.1 Environmental requirements for testing equipment**

3.1.1 The rated working temperature of the central control room is +20 °C, the allowable range is 0 °C~40 °C, and the relative humidity  $\leq 85\%$  at 20 °C.

3.1.2 The central control room shall be far away from electromagnetic interference and mechanical vibration to avoid the erosion of corrosive gases.

3.1.3 The ambient temperature of the cabinet area and equipment area is - 5 °C~+40 °C, and the relative humidity  $\leq 50\%$  at +40 °C,  $\leq 95\%$  at +25 °C.

3.1.4 There shall be no excessive dust, acid, salt, corrosion and explosive gas in the air.

3.1.5 The installation altitude shall not exceed 1000m.

#### **3.2 Power grid quality requirements**

3.2.1 The change range of AC voltage is equal to  $\pm 10\%$  of the input rated voltage for a short time (within 0.5s ) AC voltage fluctuation range is - 15%~+10% of input rated voltage

3.2.2 The peak value of non-repetitive transient voltage shall be  $ULSM \leq 2.5$  times the peak value of working voltage ULWM

3.2.3 The repetitive transient voltage peak shall be  $ULRM \leq 1.5$  times the working voltage peak ULWM

3.2.4 The deviation of power frequency shall not exceed  $\pm 2\%$  of rated frequency, and the relative harmonic component shall not exceed 10%

3.2.5 Grounding resistance: grounding resistance  $\leq 1 \Omega$ , and the grounding grid has no frequency conversion interference

### **3. Technical description**

#### **4.1 Scope of application**

This testing device adopts a 1-channel output wiring method, and only one motor can be tested at a time, meeting the factory testing requirements of the following motors (the specific capacity depends on the power supply capacity, please refer to the schematic diagram explanation):

##### **1.AC motor:**

**400/690V - 1000kW ( can meet the full rotation speed and full voltage when capacity  $\leq 2500kW$ )**

**6000 V: 500~2000kW ( can meet the full rotation speed and full voltage when capacity  $\leq 2500kW$ )**

**10000V: 800~7000kW ( can meet the full rotation speed with 30% of max. voltage when capacity  $\geq 2500kW$ )**

##### **2. DC motor:**

50~800V or smaller till 800kW

#### 4.2 Design basis

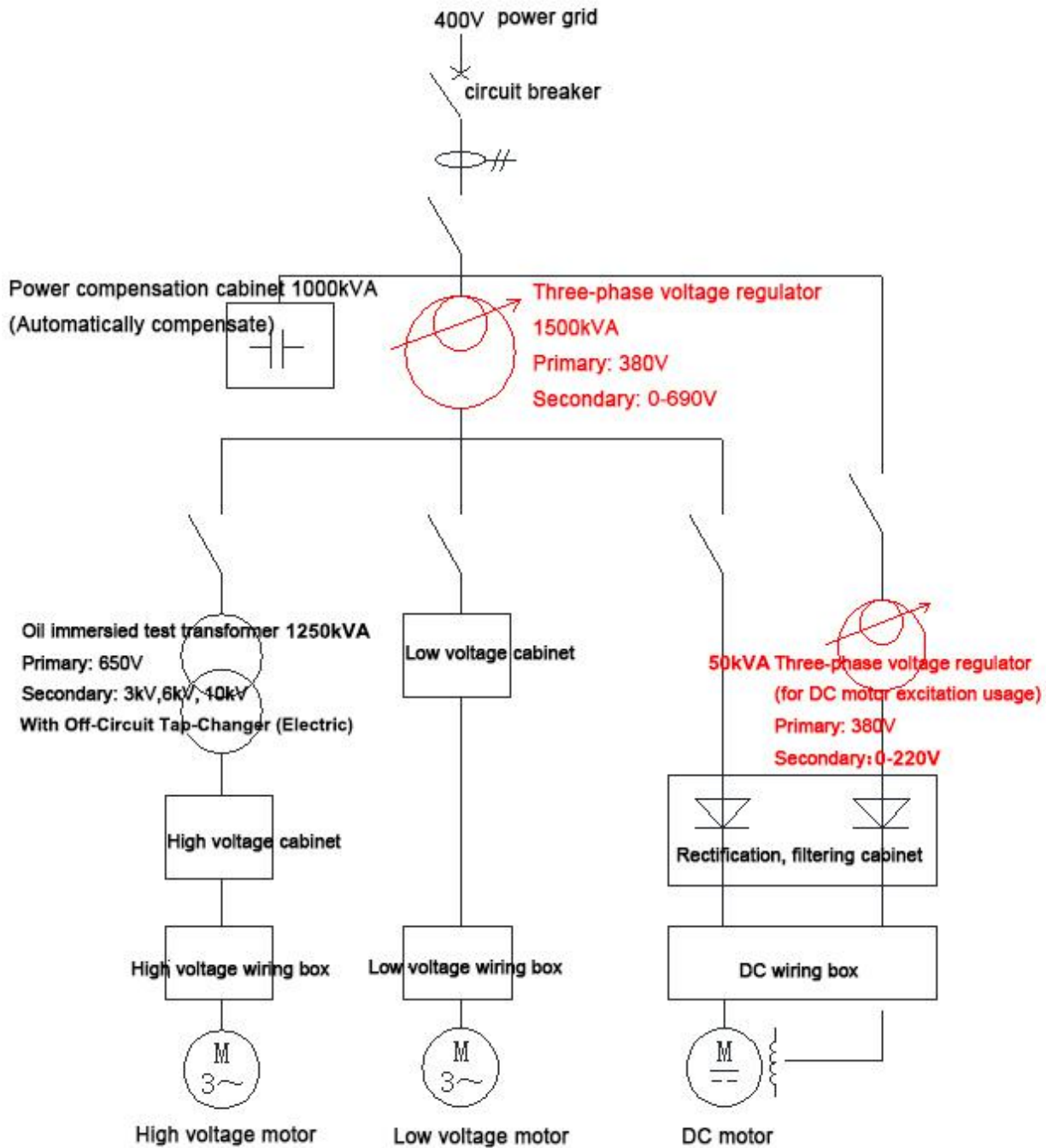
The testing of the testing device meets the following standards:

- IEC 60034-1:2017, Rotating electric machines-Part 1: Rating and performance, IDT
- IEC 60034-2-1:2007, Rotating electrical machines-Part 2-1: Standard methods for determining losses and efficiency from tests(excluding machines for traction vehicles )
- IEC 60034-1: Rotating electrical machines-Part 1: Rating and performance
- IEC60034-2:1972 Rotating Electrical Machines Part 2: Methods for Determining Losses and Efficiency of Rotating Electrical Machinery from Tests (Excluding Machines for Traction Vehicles) Machines
- IEC60034-4:1985 Test method for measuring parameters of synchronous motors

#### 4.3 Technique parameters (The instrument measures parameters and accuracy, and the actual testing ability is determined by the power supply)

Test item		Measurement range	Accuracy	Performance Description
AC electric test	Current	HV: 1A~300A	0.5	
		LV: 1A~1000A		
	Voltage	HV: 100~12000Vac	0.5	
		LV: 100~700Vac		
Frequency	50Hz			
DC electric test	Current	1A~500A	0.5	
	Voltage	50~800V DC	0.5	

## 5. System principle and test items



## 5.1 System principle description

This system uses a voltage regulator to provide testing power for the test motor. Considering that the power grid capacity of Party A (Buyer) is relatively small but the test motor is relatively large and the power factor of the test motor is very low, the system compensates for the reactive power of the motor by adding a reactive power compensation cabinet to reduce the impact on the power grid.

The resistance required for asynchronous starting of synchronous motors shall be provided by Party A (Buyer). The resistance required for starting the rotor series resistance of a wound rotor motor shall be provided by Party A (Buyer).

The output current capacity of the system is shown in the following table: (Only representing the selection of equipment components, actual reference is based on the voltage regulator and transformer power supply of Party A (Buyer). Currently, 1500kVA voltage regulator and 1250 kVA transformer are used as references)

Voltage output gear	Rated output current	Short time output current capability (1min/10min)	Remark
400/690V	888A	1332A	1. The actual active power of the motor without load plus the losses of the transformer and voltage regulator cannot be higher than the power supply capacity of the power grid (or generator).  2. The nominal output capacity of the equipment is the capacity with a power compensation cabinet, which needs to be determined based on the no-load power factor of the motor, the actual capacity of the power compensation cabinet, and other parameters.
3kV	192A	288A	
6kV	96A	144A	
10kV	57A	86A	
DC Max. 800V	400A	500A	The actual output capacity cannot exceed the

			power grid system capacity: 2.5MW 400V
--	--	--	--

## 5.2 AC motor testing items:

- **Partial discharge test: Using instruments for individual testing**

--- Max. output : AC: U= 45kV, I=2.2A    DC : U= 60kV, I=2A

- **No load test (Before testing high-power wound rotor motors and synchronous motors, the rotor winding or excitation winding should be sealed with a short resistor, and then tested according to the asynchronous motor testing method)**

- **Power frequency AC and DC withstand voltage test**

--- AC max. output : U= 45kV, I=2.2A    DC max. output : U= 60kV, I=2A

- **Motor rotation speed test**

- **Temperature rise test**

- **Lock rotor test:**

1. Using a rotor blocking rod to block the output shaft of the motor and test the actual output current, but there is a high requirement for the power grid and high-power motors require voltage reduction.

--- Max. output : at 3kV gear , I=240A.    at 6kV gear , I=120A. at 11kV gear , I=72A.

## 5.3 DC motor testing items:

- **No load test**

- **Lock rotor test:** Use a blocking rod to block the motor output shaft and test the actual output current. For Locked rotor mechanical tooling, Party B shall provide the Lock rotor rod part, while the Lock rotor rod head shall be provide by Party A themselves (this part need to customize according to different motor ).

- **Power frequency AC and DC withstand voltage test**

- **Motor rotation speed test**

- **Temperature rise test**

- **No-load speed test:** The system adopts Party A's AC voltage regulator as the voltage regulating device, and the back-end outputs DC power through rectification and filtering components, thereby providing armature and excitation power for the DC motor.

## 6. User testing software

The user testing software provides encryption functionality and data sharing based on permission levels. The results of inter turn, withstand voltage, and resistance tests can be manually input into the test report.

## **6.1 Software interface**

### 6.1.1 English interface

6.1.2 The test software interface is exclusive, and the tester cannot access other application software interfaces

6.1.3 Friendly interface, simple and convenient operation, clear and concise steps

6.1.4 Relevant prompt areas (operation guidance, error prompt, etc.)

6.1.5 Relevant curve display area

6.1.6 Real-time information display area including current operator name, time, model and number of tested motor

## **6.2 Software functions**

### **6.2.1 Standard parameter settings and input functions (corresponding authority is required)**

Motors with the same model, different voltage, or different number of poles are treated as different models in the parameter database and stored separately. This interface provides functions such as creating, deleting, editing, and searching parameters.

### **6.2.2 The testing process and working conditions control function**

supports automatic test under user-defined working conditions (if No abnormality occurs during the test, and a complete test is completed automatically without manual intervention)

### **6.2.3 System setting and hardware proportion setting function (must have corresponding authority)**

### **6.2.4 Operation prompt function**

(it can display the operation in progress in real time during automatic test, and it can display the operation in manual test, be able to prompt the next operation instructions; Error prompt in case of misoperation)

### **6.2.5 Automatic control function**

Can control the test process Automatically

### **6.2.6 Number management function**

You can save the corresponding motor number according to the model type and choose to automatically add it.

### **6.2.7 The test process recording function (recording the completed items)**

**6.2.8 Can display the size of each test quantity in real time and automatically generating some curves.**

**6.2.9 Can converse the test results and judging whether the test result is qualified automatically.**

### **6.2.10 Saving function of test results**

Establish a product qualification database and choose whether the test data is qualified or not by computer or manual judgment. The test software automatically saves the test data (the test data can be manually corrected), the historical



test record can be queried and also can choose whether to save the data of unqualified motors.

#### **6.2.11 Native database function**

It has database interface and can connect to server database

#### **6.2.12 Test result retrieval function**

There is a corresponding data management interface that allows for data retrieval through methods such as time and model. It also allows for statistical analysis of test data by year, month, and day, and allows for calculation of pass rates based on test items.

#### **6.2.13 Test report printing function**

6.2.13.1 The certificate of conformity and/or factory inspection report can be printed according to the requirements of Party A, and statistical reports can be automatically issued.

6.2.13.2 Data backup function.

6.2.13.3 Search function by number.

6.2.13.4 Test data can be exported as a file and can be easily copied through a USB port.

### **7 Software copyright description**

The test software is a product independently developed by our company. Our company sells it to users only on behalf of users who have the right to use it, and the final copyright belongs to our company. Our company promises that the test software developed can fully meet the use needs agreed with the user. Our company will not provide the installation version of the operating system platform, test software development platform, office software, network database (if involved), etc. related to the test software.

### **8. Inspection and acceptance**

1. This clause is used to inspect and accept the testing equipment provided by Party B(Seller) during the execution of the contract, ensuring that the equipment provided by Party B(Seller) meets the technical requirements of this agreement.

2. Within one week after debugging, Party A(Buyer) shall organize on-site testing and acceptance to inspect whether the testing device meets the requirements of the agreement. After acceptance, Party A(Buyer) shall provide written acceptance documents.

### **9. Technical Information**

1. The party B(Seller) shall provide the electrical schematic diagram and manual of the testing device.

2. Provide testing software for the testing device and ensure that the software meets the valid version of the current standard. Party B(Seller) promises to provide preferential assistance for future software upgrade services. Party B(Seller) shall provide the factory certification of the main purchased device components.

## 10. Technical Services and Collaboration

1. Warranty: Warranty is 1 year, during the period, B(Seller) will provide the free charge repairment and reasonable charge replacement (customer take the shipment cost ) & lifelong after sale-service (reasonable charge) when using time exceed 1 year.
2. According to the negotiation, after the arrival of the testing device, Party A (Buyer) shall be responsible for unloading, receiving, and preliminary acceptance.
3. Party A (Buyer) shall specify the contact person for the implementation of the system project, in order to facilitate timely communication during the project implementation process.
4. The Party A (Buyer) shall provide the tested motor for the performance and functional inspection of the equipment. If it cannot be provided temporarily no performance and functional inspection shall be conducted during pre-acceptance;

Tested motor:

5. The party B (Seller) is responsible for equipment debugging, and the party B (Seller) provides necessary work space and assistance; The testing power supply and motor testing wire shall be provided by Party A (Buyer) and installed under the guidance of Party B (Seller).
6. Party B (Seller) is responsible for training Party A (Buyer)'s staff to familiarize them with the performance, operation, daily maintenance, and simple repairs of the testing device.

## 11. Other

Other matters not covered shall be resolved through friendly consultation between both parties.

The output terminal of the voltage regulator is equipped with current and voltage monitoring and protection circuits.

## 12. Product Price

No.	Product name	Model	Manufacturer	Unit	Amount (USD)	Remark
1	Automatic Motor Comprehensive Test Bench	HTBZ-H	UHV	1		Intelligent information measurement and control system

2	Installation and debugging	For 2 people 8 days		1		Optional
2	Flight tickets for 2 people (no food and accommodation)	Come and back		1		
3	Package charge			1		
Total:(Amount in words):						
5. Production time: 60 days, Warranty is 1 year, during the period, we provide the free charge repairment and reasonable charge replacement (customer take the shipment cost ) & lifelong after sale-service (reasonable charge) when using time exceed 1 year.						
Note: Include the factory calibration, installation cost and training cost, while not include shipment cost						

### 13.Scope of supply

No.	Name	Model	QTY	Price	Mark
<b>Part I: Main console</b>					
1	Automatic Motor Test Bench Main Control Cabinet	HTBZ-H	1		Triplet Piano style
	Industry Computer		1	/	
	Display Screen			19" full color	
	Software operation system		1		Windows
	Power analyzer				
	I/O Control Power analyzer		1		I/O Expansion card
	Function card		1		Serial port Expansion card
<b>Part II: Motor characteristic test</b>					
1	Power compensation cabinet	400V 1000kVA with automatic compensation controller, which can automatically compensate	1		

No.	Name	Model	QTY	Price	Mark
		according to power factor			
2	Three-phase voltage regulator	1500kVA 380V/0-690V	1		
2	Three-phase voltage regulator	50kVA 380V/0-220V	1		
3	Junction box	LV Junction box, DC Junction box, HV Junction box	2		
4	DC power meter	DC power meter+ diverter	1		
5	Temperature test equipment	16 temp. Measure channels (including PT100 thermal resistance test line) -20~200°C	1		
<b>Part III: Configuration required for Low-voltage motor test</b>					
1	Low voltage cabinet	Low voltage conversion and low voltage AC measurement cabinet	1		
		DC rectification, filtering, and DC measurement cabinet	1		
<b>Part IV: Configuration required for High-voltage motor test</b>					
1	High voltage cabinet	High voltage measurement cabinet	1		
2	High voltage standard current transformer	HTHL-800A	3		
3	High voltage standard voltage transformer	HTHJ-22kV	3		
4	High voltage transformer	1250kVA Primary: 650V Secondary: 3 kV, 6 kV, 10kV, with non-excitation tap changer (electric)	1		
<b>Part V: Power frequency AC and DC withstand voltage test</b>					

No.	Name	Model	QTY	Price	Mark
1	(PD free) Oil Type AC DC Test Transformer	YDJW-100kVA	1		
2	Precision Voltage Divider	HTFY-60kV	1		
3	Metal Protection Impedance	60kV	1		
<b>Part VI: Partial discharge withstand voltage test</b>					
1	Partial discharge analyzer	JFD-2000A	1		
	Square wave generator		1		
	Signal amplifier		1		
2	PD free coupling capacitors	HTDR-100kV	3		
3	Single phase low-pass filter	HTLB-120kVA	1		
<b>Part VII: Motor Rotation Speed Test</b>					
1	Rotation Speed Tester	/	1		
<b>Part VIII: Independent equipment and semi-finished product testing section</b>					
1	DC resistance fast tester	HT-R-10A	1		
2	Lock rotor equipment	/	1		
3	Insulation dielectric loss tester	HT-JS-II	1		<b>Excluded</b>
<b>Part IX: Other components</b>					
1	Cast iron platform	4*2.5*0.2m (Customize)	1		<b>Excluded</b>
2	On site cable		1		<b>Excluded</b>

#### 14. List of technical data submitted

No.	Item name	Electronic Version	Paper version	QTY	Remark

1.	Test bench wiring diagram/schematic diagram	√	√	1set	Ship together with system
2.	Wiring diagram/schematic diagram of power part of test system	√	√	1set	Delivery after completion
3.	Operation and operation instructions of test system	√	√	1set	Ship together with system
4.	Certificate	√	√	1set	Ship together with system
5.	Calibration Certificates for measurement equipment (Calibration method statement)	√	√	1set	Ship together with system

Note: "√" in the table means to provide the corresponding category of data, and "∕" means not to provide the corresponding category of data.

**Automatic Transformer Test Bench reference picture:**











