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Operation Manual

HM-YDQ 10kVA/100kV PD Free HV Test Set



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I. Brief introduction

The SF₆-gas PD test transformer is a necessary test equipment for power equipment detection and preventive test. With the development of power industry in China, the voltage level of test transformer is required to be higher and higher. However, the traditional oil-immersed test transformers are unable to meet the requirements of field work in terms of volume, weight and performance.

With the progress of basic scientific research , the application of new materials and new processes has pushed the new medium SF₆ gas to the application field of electric equipment.

Sf₆ gas is widely used as a new insulating medium because of its excellent insulation performance, arc extinguishing performance and non-combustibility.

After years of efforts, our company has successfully developed SF₆ gas PD test transformer. Compared with the traditional oil-immersed light test transformer, this series of products can reduce the weight by 20%-60% (depending on the voltage and capacity level) and have no oil pollution. The voltage class of the single test transformer can reach 300KV. Because of the new production process, the technical performance of the product has been greatly improved, especially suitable for the field work and frequently moving working conditions.

II. Structure

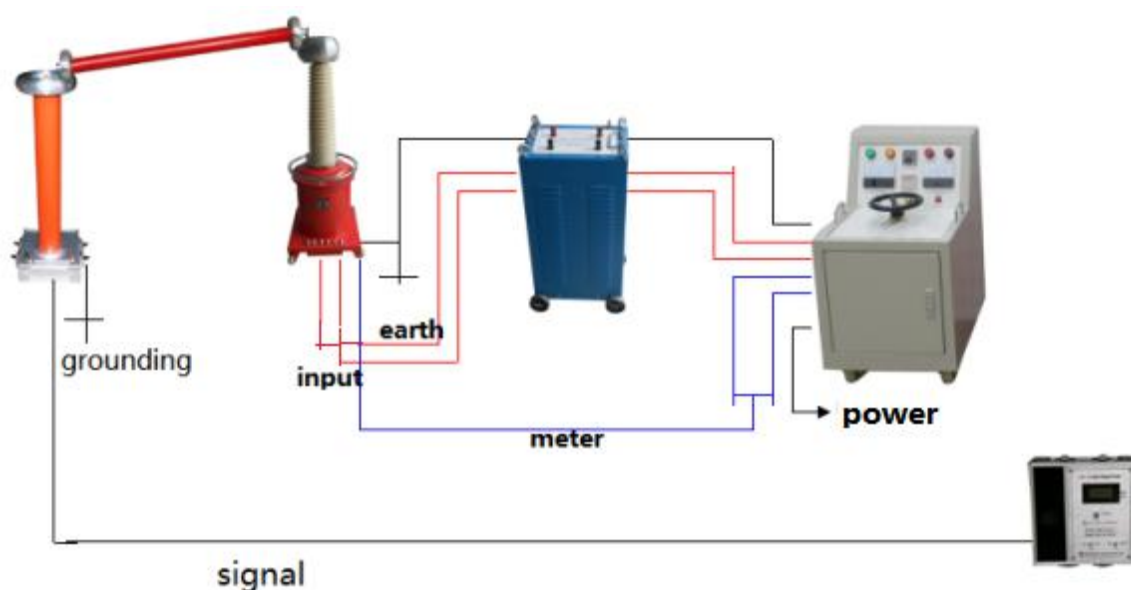
The design concept, material selection and technological process of the HM-YDQ series products are all new. Therefore, not only small size, light weight, beautiful appearance, and the technical index also reached << JB3570-98 >> standard requirements. HM-YDQ series products adopt a new making technology, the dielectric insulation materials are completely different from other products , so that the products achieve the effect of non partial discharge effect .



III. Working Principle

Feed power into the console (control box). The console is with function of overcurrent trip automatically and zero linkage to prevent sudden pressurization. The voltage is regulated by an auto-voltage regulator, and input into PD isolation transformer . And then output to primary winding of HM-YDQ PD transformer . According to the principle of electromagnetic induction,the voltage amplitude of the same multiple can be obtained through the ratio of secondary (high voltage) winding to primary winding.

IV. HM-YDQ Wiring diagram



V. Operation Steps

1. Following above wiring diagram to connect cables, check whether the pressure gauge indicates normal internal gas pressure($\geq 0.3\text{MPa}$)
2. Current limiting resistance configuration: power frequency withstand voltage of $0.3 \sim 1$ ohm per volt, it's necessary for all testing .
3. Remove the lead wire between HV test set and Tested object , remove dirty on HV test set, and better to make test in shield room .
4. After finish preparatory work, ensure device are in safe condition, boosting without



connecting tested object .

5. Connect with tested object .
6. Switch on , the Power indicator and Zero indicator are on .
7. Press Start button, the Run indicator is on .
8. Rotating the hand wheel clockwise , evenly and slowly . Watch the readings on voltmeter, stop to rotate once reach rated voltage .
9. Pay close attention to ammeter indication and withstand voltage time
10. Once reach withstand voltage time, the hand wheel should be quickly and evenly rotated in a timely and reverse manner until the voltage regulator returns to zero.
11. Finish testing .

VI. Attentions

1. The arrangement of test equipment should have enough safe distance around the person. Avoid placing equipment and high voltage leads in personnel aisles.
2. Fence shall be installed and "stop, high pressure danger" sign shall be hung on the test site.
3. The high voltage lead shall have a support or traction insulation during the test. There should be security guards to prevent people from approaching and passing underneath of high voltage lead .
4. In withstand voltage test, check whether the equipment capacity is sufficient, and avoid resonance.
5. The working ground wire (high voltage tail, stabilizer terminal grounding wire) and the protective ground wire (operating part housing) shall be connected separately and have good grounding performance.
6. If there is an irregular swing of the power supply (such as electric welding) in the test, it will inevitably affect the stability of the high-voltage output. At this time, the test should be stopped to find out the reason and eliminate it.
7. The climatic (temperature, humidity) requirements in test work shall be in accordance with the requirements of the test procedures and shall be recorded.



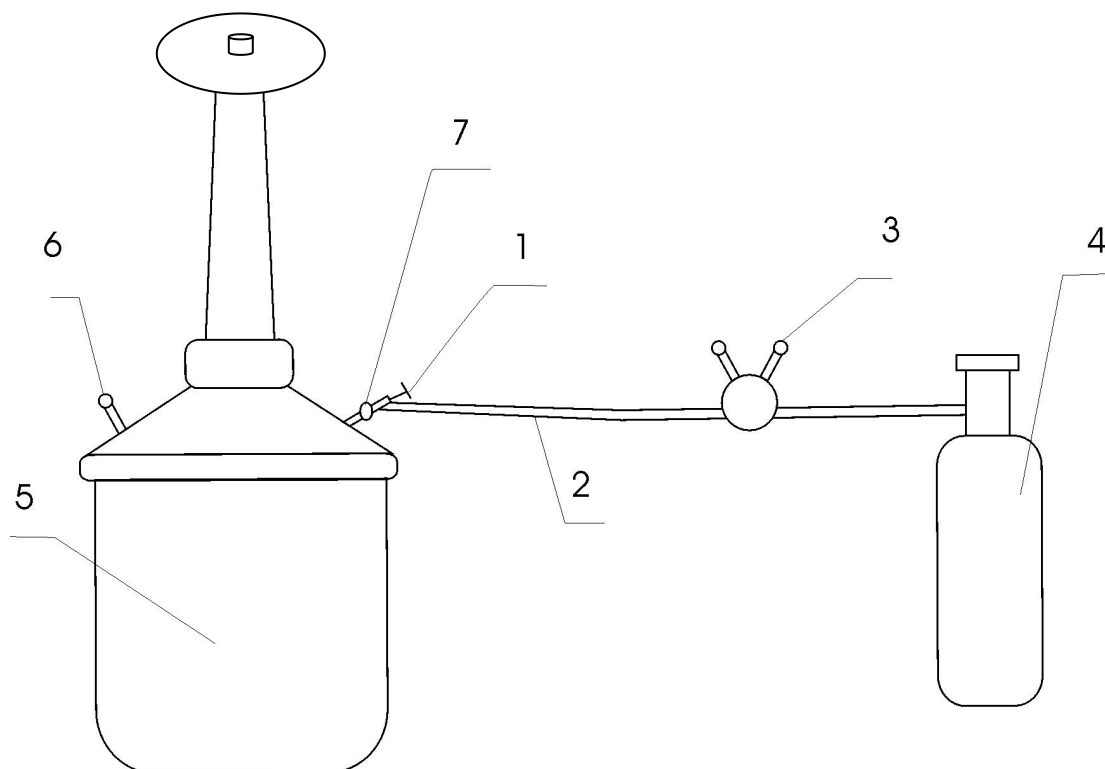
8. The high pressure testing shall be carried out in strict accordance with the safety working procedures issued by the Department of Energy.

The test staff must read the instruction manual carefully before the test and be familiar with the wiring connecting .

Before the electrified test, the test staff shall strictly review the wiring between the console (box), the test transformer and the tested object, and shall not conduct the electrified test until there is no error.

VII. Maintenance

1. The test transformer shall be kept clean on a regular basis. The nylon bushing shall be wiped clean before each test. and covered with plastic cloth after finish each test.
2. Do not twist the bolts except the wiring strut, to prevent leakage caused by seal damage.
3. Minor leakage is a normal phenomenon, with an estimated air pressure drop of 0.05mpa every 4 years or 0.4-0.5mpa at the factory. Air pressure increases or decreases slightly with the change of ambient humidity. When the air pressure drops to 0.3Mpa, the air should be filled in time.
4. When filling the gas, please use the special gas nozzle and small tank of sulfur hexafluoride gas provided by our company, and the air pressure must not be more than 0.55mpa. In general, 0.4-0.5mpa will do.
5. Inflatable way:



1. inflation valve 2. Oxygen pipeline 3. Oxygen meter 4. S_F6 steel cylinder
5. Transformer 6. Pressure meter 7. Gas charging port

- ① Connect the pipe according to the diagram.
- ② Open the valve on SF₆ gas cylinder, to ensure the pressure on the oxygen meter is about 20kg/cm.
- ③ Screw tip on oxygen meter, and let the air pressure rise slowly . Gas overflow at this time, force air out of pipe .
- ④ Unscrew the inflating valve immediately (clockwise), and hear the air flow into the transformer.
- ⑤ Adjust the screw tip on Oxygen gauge, ensure the outlet pressure of the oxygen meter at 5.5Kg/cm.
- ⑥ Monitor the pressure gauge of transformer, once pressure reach 4.0—5Kg/cm (0.4—0.5Mpa) , shut the inflating valve immediately (anticlockwise). Over-pressure is forbidden , to avoid danger .
- ⑦ Close valve of SF₆ cylinder.
- ⑧ Close valve on Oxygen gauge, inflating job is over.
- ⑨ Remove pipe and gas valve, let it stand for 5 minutes after inflating , begin to work work after gas mixing well .

**VIII. Working condition**

1. The working condition should meet requirements as below for test transformer .

A . Environment temperature: -20°C to $+40^{\circ}\text{C}$

B . Relative humidity, should not more than 85 % at 25°C

C . The installation site shall be free from gas, steam, chemical dust, dirt and other explosive media which seriously affect the insulation of the transformer.

D .When the test transformer is in use, its input voltage should be gradually increased and enough protection resistance should be installed at the output end. It is strictly prohibited to break the equipment under high voltage.

2. Transformer Running time

Continuous running time should not exceed half an hour , the interval time should be 5-10 time time of working time before make testing .

IX. Technical Specification

1.No-load currents in various voltage classes of transformer 4 ~ 9 % , impedance voltage 4 ~ 10 %

2.Console

Model no.	与 HM-YDQ KVA	Regulator Capacity KVA	Runnnng time (min)
HM-TC-2	1.5	1	≤ 5
HM-TC -3	3	2	≤ 5
HM-TC -5	5	3	≤ 5
HM-TC -10	10	7	≤ 5
HM-TC -20	20	14	≤ 5
HM-TC -30	30	20	≤ 5
HM-TC -50	50	30	≤ 5

Remark: It can also can be customized

**X. HM-YDQ Test Transformer**

Input voltage (V)	200	200	400	400	400	400	400
Output voltage (KV)	50	100	150	200	250	300	400
Partila discharge PC	≤ 5	≤ 5	≤ 5	≤ 5	≤ 10	≤ 10	≤ 10
Impedance voltage %	≤ 8	≤ 8	≤ 8	≤ 8	≤ 10	≤ 10	≤ 10
no-load current %	≤ 6	≤ 6	≤ 6	≤ 6	≤ 5	≤ 5	≤ 5
wave distortion %	$\angle 3$	$\angle 3$	$\angle 3$	$\angle 3$	$\angle 3$	$\angle 3$	$\angle 3$

HM-YDQ-□KVA/□KV is non-partial discharge test transformer, it comply with standard GB/T9641-1991 and DL/T848.3~2004, under 80% voltage, partial discharge level ≤ 5 PC, under 100% rated voltage $\angle 10$ PC.

PD free HV test set included :

- ① Non-partial discharge test transformer
- ② Isolated transformer
- ③ Console
- ④ Coupled capacitive voltage divider
- ⑤ PD detector (optional)
- ⑥ Protective resistance



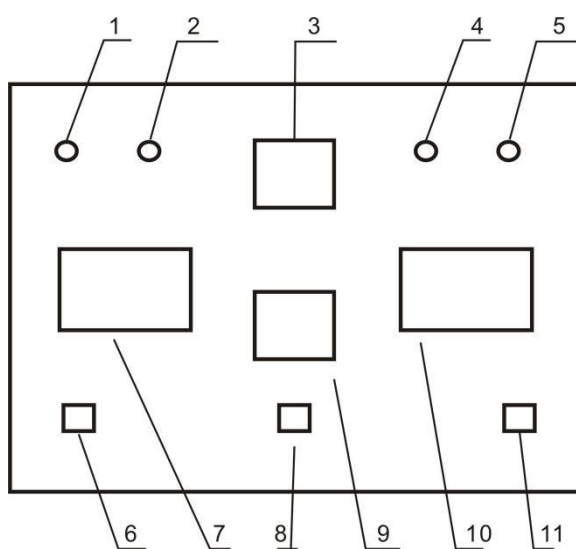
XC/TC Series of control box (console)

I. Overview

This series of control box (console) is based on high-voltage test transformer's use of unique to design and produce, and its functions are:

- A. switch on sound and light alarms;
- B. time sound and light alarms;
- C. electronic low-voltage current protection (box);
- D. high voltage direct-reading;
- E. voltage withstand test of time free to set up (digital);
- F. mobile structures (desktop)

II. Structure (Panel layout) :



Panel layout of console

- | | | |
|--------------------------|------------------------|-------------------------------|
| 1 - power signal lamp | 2- zero signal lamp | 3 - current protection relay |
| 4 - power indicator lamp | 5- alarm signals | 6 - low voltage current meter |
| 7 - timing relay | 8 - high voltage meter | 9-start button |
| 10 - times button | 11-stop button | |



III. Technical Parameters and Selection of Supporting

The control box (Taiwan) and the capacity of voltage regulator with the regulator and the nominal capacity, if the transformer and test (short-time working within 30min) supporting the work of the People's Republic of electricity in accordance with industry standards "DL474. 4-92 "provisions: $P_0 = 0.75P$ matching. P_0 -test type of transformer capacity; P -regulator capacity. Such as professional factory for electrical products for volume testing, surge capacity should be equal to test transformer capacity, that is: $P_0 = P$.

Control box (Taiwan) technical parameters such as Table 1

Specification	capacity (kVA)	Power			Output		Dimension (mm)	Reference weight (kg)
		phas es	volt (V)	frequency (Hz)	voltage (V)	current (A)		
HM-TC	10	1	220	50	240	45.5	410*540*680	28
HM-TC	15	1	220 380	50	240 430	68 39	410*540*680	35
HM-TC	20	2	380	50	430	52.6	410*540*680	40
HM-TC	30	2	380	50	430	78.9	470*630*1100	65
HM-TC	50	2	380	50	430	131.5	1020*650*1600	

IV. Step guide

Before the operation was based on different sample capacity, voltage level, a good first calculate the maximum operating current, and adjust the current protection device. The pilot should refer to the manual wiring of Figure 1 or the relevant test transformer connection diagram, should be a good grounding grounding terminal (hereinafter, as the voltage test as an example).

5-1, connected power supply (box-type for socket-type power supply, desktop power supply for the terminal), and voltage regulator to handle spin zero, the zero switch closed, the zero indicator (yellow) light, (also known as zero voltage regulator output status indication);

5-2, press the start button (green), contactor pull-in, by the power regulator, while the work



of light (red) light, and sound an alarm (siren left with zero voltage regulator, the police in order to stop the sound and light);

5-3, a clockwise rotation evenly slow regulator handle, and pay close attention to instrument readings, when high voltage to rise to the required value, should stop rotating hand-bing, and timely press the timer button (yellow), at this time, Digital display time relay time shun time (time units for the "s", seconds), when the arrival time set, control box (Taiwan) to issue sound and light alarm, time, voltage regulator handle rotating in the opposite direction until the transfer back to zero voltage, the time to lift button;

5-4, in the boost or voltage withstand test process, as a result of short circuit, flashover, breakdown, such as over-current, the current trip of relay protection, automatic voltage regulator power that test materials are not up to standard, at this time regulator should be back to zero, cutting off power supply, inspect the test products.

V. The use and maintenance

6.1 When unpack to inspect ,we should check whether the controlling circuit wiring is loose, the brush of voltage regulator is in a good contact;

6.2 Long-term when not in use, the use of pre-application form megohm 500V insulation resistance measurement, the value of not less than 0.5MΩ;

6.3 Supply voltage should be in line with me (Taiwan) on the nameplate input voltage value;

6.4 The Box (console) has over-current protection, the factory has been adjusted to 80% of rated current. For small loads, the test materials should be based on the rated capacity of the current re-setting;

6.5 After use, should be close box (console) covered the door to keep me (console) internal cleaning.

VI. The conditions of use

Environmental temperature :0-40 °C;

Altitude: <1000m; Relative humidity: <85%;

Workplace should be no gas, steam, chemical dust which seriously affect the insulation and other explosive.

Schematic diagram for Console

