

Distribution Transformer Test System

(for distribution transformer up to 36kV, 30MVA, for dry/oil transformer.)

- Container structure
- Or traditional type



Test Items:

The system can be done with HIMALAYAL **Power transformer test system:**

(Please find out the suitable test item for your lab.)

1. Routine Tests

- A. Insulation Resistance Testing and Absorption Ratio Measurement
- B. Winding DC Resistance Measurement
- C. Voltage Ratio Measurement and Connection Label Verification
- D. 10%~110% No-load loss and no-load current measurement;
- E. Load loss measurement and short-circuit impedance measurement (including maximum and minimum taps)
- F. On-load tap switch test
- G. Apply withstand voltage test; (IEC 60076-3)
- H. Induced voltage test (150...200 HZ) (IEC 60076-3)
- I. Induced voltage test- Induced voltage test with PD measurement (150...200 HZ) (IEC 60076-3)
- J. Measurement of capacitance & dissipation factor (Tan delta)
- K. P-Measurement of frequency response (Frequency response Analysis or FRA)

2. Type Test

- L. End terminal lightning impulse chopping wave test
- M. Neutral point lightning impulse test
- N. Temperature rise test (IEC 60076-2)

3. Special Test

- O. noise level measurement
- P. zero-sequence test
- Q. Test of built-in current transformer
- R. measurement of no-load current harmonics at rated voltage

Applied Standard:

- | | | |
|----------------|------------------|----------------------|
| ■ IEC 60076-1 | ■ GOST 1516.2, | ■ GB/T 1094.7 |
| ■ IEC 60076-2 | ■ GOST 21023-75 | ■ GB/T 1094.1 |
| ■ IEC 60076-3 | ■ GOST 1516.3, | ■ IEEE C57.12.90 |
| ■ IEC 60076-7 | ■ GOST 3484.2-88 | ■ IEEE Std C57.12.91 |
| ■ GOST R 52719 | ■ GB/T 1094.1 | ■ CSA C227.3 |
| ■ GOST 3484.1, | ■ GB/T 1094.2 | ■ CSA C2.1 |
| ■ GOST 3484.3, | ■ GB/T 1094.3 | ■ GSO IEC 60076-1 |



Sin Wave Frequency Converter



The frequency converter is one of very important components for power transformer testing. Can effectively take place of Motor Generator and carry out all routine test, type test for power transformer. Compare with the Motor Generator, there are multiple advantage for it, like below table:

Model	Input voltage	Output voltage	Freq range(Hz)	PD level
HFC 200kW	0.38kV±10%	0-800v	45-200Hz	<5pC
HFC 400kW	0.38kV±10%	0-800V	45-200Hz	<5pC
HFC 800kW	6kV ±10%	0-6300V	45-200Hz	<10pC
HFC 1000kW	6kV ±10%	0-6300V	45-300Hz	<10pC
HFC 2000kW	6kV ±10%	0-6300V	45-300Hz	<10pC
...

- *The feeding frequency can be 50Hz or 60Hz
- *The feeding voltage can be customized according to user power.
- *The output voltage range depends on the system, can be up to 12kV.
- *The high voltage filter and Low voltage filter are included in the frequency converter.
- *The frequency converter PD level is very low, and suitable for PD testing, User please prepare the faraday cage to make sure of the background PD level meet the requirement. If need offer for Faraday cage, please contact with Himalayal Sales.

Depends on the capacity, structure can be cabinet or Container:



Capacitor Bank Tower

Transformer testing capacitor banks are large high-voltage electrical installations used for shunt reactive power compensation. Essentially, they are tower-structured assemblies comprising numerous series- and parallel-connected high-voltage capacitor units. Their core function is to provide capacitive reactive current to compensate for the inductive reactive current drawn by the transformer under test, thereby significantly reducing the capacity requirements of the test power supply.

- During transformer no-load tests and induced withstand voltage tests, the transformer behaves like a large inductor, drawing substantial inductive reactive current from the power source.
- The capacitor bank, conversely, supplies capacitive reactive current.
- Dramatically reduces the required capacity of the test power supply
- Improves test conditions
- Energy saving and cost-effectiveness



Intermediate Transformer

Description

When the voltage is raised on the output side, the transformer is called the intermediate transformer. In this transformer, the number of turns in the secondary winding is always greater than the turns in the primary winding because a high voltage is developed on the secondary side of a transformer. Intermediate transformers are cohesive coils consisting of primary coils and secondary coils, and generate the voltage that corresponds to turn ratios with mutual induction effects. Intermediate transformers allow smaller sizes and more stable mutual induction effects than those of conventional products with the use of automatic winding technology. They can be mounted inside electronic devices that have become smaller and thinner in recent years and are suitable for applications that require high voltages.

Key Design Features

- High Overload Capability: Designed for short-time overload (e.g., for the test duration), typically with reinforced insulation and cooling systems.
- Low Impedance: Its short-circuit impedance is designed to be very low to minimize its own voltage drop and losses.
- Multiple Taps: Both the high-voltage and low-voltage sides usually have several tapping points to adapt to different voltage ratios and impedance matching requirements.
- Excellent Insulation Structure: Must withstand various overvoltages during testing and have extremely low partial discharge levels to avoid interfering with PD measurements on the TUT.
- Flexible Terminal Arrangement: Facilitates easy connection to various power sources and TUTs.



Capacitance & Tan Delta Test System

HCL2840 or HCL2840-F mode



The HCL2840 high-precision automatic capacitance & dissipation test set (12kV) is designed to measure dissipation or power factor in heavy electromagnetic interference environment, such as power plants or substations. Also it can be used in the laboratory to conduct high accurate tests. The HCL2840 function includes UST, GST and GSTg while HCL2840-F function contains CVT, UST, GST and GSTg.

The test set is all-in-one structure, including precise digital bridge, 12kV/200mA frequency conversion power unit, reference capacitor (Cn) and other electronic circuits. An external power supply can expand the test range. It is movable and easy to use thanks to being light and full automation. The high performance is realized by the digital process.

Features and Technical Specifications (I)			
Main Features	Accuracy		Capacitance Range
Interference Suppression	Cx	$\pm (\text{reading} \times 1\% + 1\text{pF})$	External HV 3pF~1.5uF (No Limitation on Voltage)
High accuracy	DF tg δ	$\pm (\text{reading} \times 1\% + 0.00040)$	Resolution 0.001pF, 4 digits, No limit
Safe protection	PF	$\pm (\text{reading} \times 1\% + 0.00040)$	Internal HV 3pF~60000pF/10kV, 60pF~1uF/0.5kV
Technical Specifications (II)			
Input current range	10 μ A~5A	Test time	30s or so (may vary according to different test modes)
External HV	UST: 5A max	tg δ range	C/L/R specimen is automatic recognized
	GST: 12kV/5A max, 38-72Hz	Internal HV	0.5~12kV / 200mA (max)
Display	128*64 dot matrix	Accuracy	$\pm (\text{reading} \times 1\% + 10\text{V})$
Printer	Thermal printer	Control mode	Rise or fall smoothly 45Hz, 50Hz, 55Hz, 60Hz, 65Hz
Computer port	RS-232	tg δ range	C/L/R specimen is automatic recognized
Operating temperature	-10 $^{\circ}$ C ~50 $^{\circ}$ C	Power supply	95~130V, 180V~260V, 50Hz/60Hz or 1 phase power
Storage temperature	-20 $^{\circ}$ C ~60 $^{\circ}$ C		supply or generator
Humidity	<90%	Frequency	65Hz single frequency, 45Hz/55Hz, 55Hz/65Hz,
Dimensions	46cm(L)*35cm(W)*34cm(H)		47.5Hz/52.5Hz dual frequency
Weight	Main unit: 28kg ,	Interference	Ratio of interference current to specimen current is 2:1 (200%)
	cable: 3.5kg		

Gas Insulated Standard Capacitor

HSC serial



Description

The gas-Insulated standard capacitor is an indispensable instrument in every modern HV laboratory and test field where it occupies a wide range of important functions.

The SF6 insulated standard capacitor is used as capacitance standard in measuring bridge circuits to measure the dielectric dissipation factor of all types including cables, capacitors, bushings, power transformers. Furthermore, it can be used as high voltage capacitor for voltage divider circuits of HV transformer test.

The SF6 insulated standard capacitor can be used indoor or outdoor. The HSC SF6 standard capacitors are used for:

- Exact measurements of the capacitance and tan delta
- Exact measurements of AC voltages (AC divider) in the industrial frequency range (with add. Internal electrode or add secondary part)

Technical Specifications

Technical Specifications (some models)							
Model	Rated voltage	Withstand volt	Capacitance	PD level	Tan δ_{C12}	Volt dev	SF6 gas pressure
	(kV)	(kV)	(pF)	(pC)	/	/	/
HSC10kV/50pF	10	11	50	≤ 2	1×10^{-5}	$< 3 \times 10^{-5}$	350 \pm 50KPa
HSC30kV/1000pF	30	33	1000	≤ 5	1×10^{-5}	$< 3 \times 10^{-5}$	350 \pm 50KPa
HSC50kV/1000pF	50	55	1000	≤ 5	1×10^{-5}	$< 3 \times 10^{-5}$	350 \pm 50KPa
HSC200kV/100pF	200	220	100	≤ 5	1×10^{-5}	$< 3 \times 10^{-5}$	350 \pm 50KPa
HSC300kV/70pF	300	330	70	≤ 5	1×10^{-5}	$< 3 \times 10^{-5}$	350 \pm 50KPa
HSC600kV/50pF	600	660	50	≤ 5	1×10^{-5}	$< 3 \times 10^{-5}$	350 \pm 50KPa
HSC1000kV/50pF	1000	1100	50	≤ 5	1×10^{-5}	$< 3 \times 10^{-5}$	350 \pm 50KPa
HSC1500kV/20pF	1500	1650	20-50	≤ 10	1×10^{-5}	$< 3 \times 10^{-5}$	350 \pm 50KPa

Working Conditions

The standard capacitor operates lower than 1000 meters. The temperature coefficient is less than 3×10^{-5} and pressure coefficient is $2.2 \times 10^{-3}/\text{kPa}$. The temperature ranges from -5°C to 45°C and relative humidity is equal to and less than 75%.

Three-Channel DC Resistance Tester (HCL200-40WA Integrated)

Performance Characteristics

1. This instrument features a high output current (up to 20A maximum) and a wide test range (up to 2k Ω maximum), making it suitable for temperature rise tests and DC resistance measurements on all transformers rated 110kV and below.
2. Comprehensive dual-power supply design. Capable of simultaneous testing on both the high-voltage and low-voltage sides, as well as separate testing for each.
3. The unit includes protection and alarm functions for incorrect AC 380V input connection, anti-arcing protection for wire breaks, and audible discharge alarms. Clear indicators reduce operational errors. A robust protection circuit ensures high reliability.
4. Equipped with a color touchscreen for intuitive operation, displaying clear and easily readable data.
5. Automatically prints and stores temperature rise data at set intervals during the temperature rise test, facilitating convenient record-keeping.
6. Features a perpetual calendar, storage for 100 sets of routine test data, and storage for results from two temperature rise tests. Data is retained after power-off. A USB port is provided for easy data export to a computer for generating temperature rise curves.
7. The instrument is equipped with an RS485 communication interface. When used with the provided PC control software, it enables remote control and measurement.
8. Includes dedicated temperature rise software for automatic data processing and generation of temperature rise curves.

Output Current:

High-Voltage CH1: 5A, 1A, 0.1A, 0.01A

Low-Voltage CH2: 20A, 10A, 5A, 2A

Measurement Range:

(High-Voltage CH1 - 5A): 0 Ω — 4 Ω

(High-Voltage CH1 - 1A): 20m Ω — 20 Ω

(High-Voltage CH1 - 0.1A): 200m Ω — 200 Ω

(High-Voltage CH1 - 0.01A): 2 Ω — 2000 Ω

(Low-Voltage CH2 - 20A): 0 Ω — 0.1 Ω

(Low-Voltage CH2 - 10A): 2m Ω — 0.4 Ω

(Low-Voltage CH2 - 5A): 4m Ω — 0.8 Ω

(Low-Voltage CH2 - 2A): 10m Ω — 2 Ω

Accuracy:

(High-Voltage CH1): 0.2% \pm 1 $\mu\Omega$

(Low-Voltage CH2): 0.2% \pm 0.2 $\mu\Omega$

Minimum Resolution: 0.1 $\mu\Omega$

4 channels PD Tester

HCL2024T (with impedance/calibrator)



PD measurement part

Number of channels	4 channels
Input impedance	50Ω
Analog filter (-6dB)	According to standards of IEC60270, GB/T7354-2018 Lower limit frequency f_L : 10kHz, 20kHz, 40kHz, 60kHz, 80kHz Upper limit frequency f_H : 100kHz, 200kHz, 300kHz, 400kHz, 500kHz
Detection sensitivity	$<1pC(CA=10nF/CK=1nF)$ $<0.1pC(CA=1nF/CK=1nF)$
Sampling accuracy	14bit
Sampling rate	80MHz
Gain Adjustment Range	60dB, 40dB, 20dB, 0dB, -20dB, -40dB Automatic or manual adjustable
Capacitance of tested objects	6pF~250μF
Linearity error	$<\pm 3\%$

Interlace

PD input	4 × BNC
Voltage input	4 aviation plug
Ethernet/LAN	1 × RJ-45

PC specifications

Operating system	Windows10 64-bit operating system
Processor	Intel CORE i5 or above
Memory	8G or above
Hard drive	128G or better
Network interface	10/100/1000Mbps

Voltage measurement part

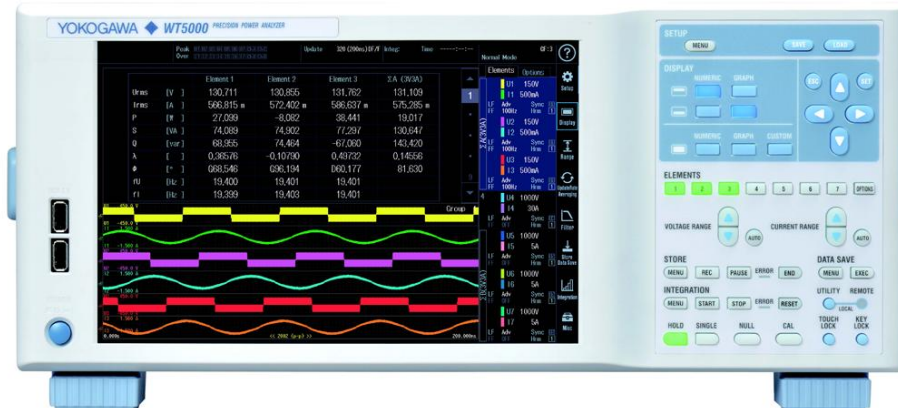
Number of channels	4 channels
Input voltage range	5~230VAC (RMS)
Linearity error	$<\pm 3\%$
Frequency range	10~450Hz
Synchronization method	Automatic switching of power synchronization or input voltage synchronization
Synchronization accuracy	$<1^\circ$

Physical and environmental specifications

Power source	176~264 VAC, 50/60Hz
Power fuse	250V T 5A
Operation temp.	-10°C~50°C
Storage temp.	-40°C ~60°C
Relative humidity	5%~95%, without condensation
Dimension	445mm×355mm×88mm (WxDxH)
Weight	11.7kg



Power Factor Analysis



Yokogawa 【 WT500-WT5003 (Japan)】

Measurement Channels: 3

The sampling rate is as high as 10MS/s with an 18-bit ADC.

Measurement Range:

Voltage: 1.5/3/6/10/15/30/60/100/150/300/600/1000V (1500VDC) (Crest Factor CF3);

Current: Direct Input

5mA, 10mA, 20mA, 50mA, 100mA, 200mA, 500mA, 1A, 2A, 5A (Crest Factor CF3);

Instantaneous Maximum Allowable Input ($\leq 1s$):

Voltage: Peak voltage of 2.5kV or RMS voltage of 1.5kV, whichever is smaller;

Current (Direct Input): Peak current of 150A or RMS current of 50A, whichever is smaller;

Continuous Maximum Allowable Input:

Voltage: Peak voltage of 1.6kV or RMS voltage of 1.5kV, whichever is smaller. If the frequency of the input voltage exceeds 100kHz, the input voltage shall be $\leq (1200 - f)V_{rms}$, where "f" is the frequency of the input voltage in kHz;

Current (Direct Input): Peak current of 90A or RMS current of 33A, whichever is smaller;

External Current Sensor Input: Peak voltage shall not exceed 5 times the range or 25V, whichever is smaller;

Continuous Maximum Voltage to Ground (DC~50/60Hz):

Voltage: Input Terminal (DC~50/60Hz) 1000V CAT II;

Current: Input Terminal (DC~50/60Hz) 1000V CAT II;

External Current Sensor Input Terminal (DC~50/60Hz) 1000V CAT II;

Measurement Range:

- 50ms update: $45 \text{ Hz} \leq f \leq 2 \text{ MHz}$
- 100ms update: $20 \text{ Hz} \leq f \leq 2 \text{ MHz}$
- 200ms update: $10 \text{ Hz} \leq f \leq 2 \text{ MHz}$
- 500ms update: $5 \text{ Hz} \leq f \leq 2 \text{ MHz}$
- 1s update: $2 \text{ Hz} \leq f \leq 2 \text{ MHz}$
- 2s update: $1 \text{ Hz} \leq f \leq 2 \text{ MHz}$
- 5s update: $0.5 \text{ Hz} \leq f \leq 2 \text{ MHz}$
- 10s update: $0.2 \text{ Hz} \leq f \leq 2 \text{ MHz}$
- 20s update: $0.1 \text{ Hz} \leq f \leq 2 \text{ MHz}$
- Accuracy: $\pm(0.06\% \text{ of reading} + 0.1 \text{ mHz})$

Conditions: Signal level: $\geq 30\%$ of range for Crest Factor CF3; $\geq 60\%$ of range for Crest Factor CF6/6A. Input level $> 50\%$ of range is required when frequency is $\leq 2\times$ the lower limit of the above ranges.

Frequency Filter:

- $0.1 \text{ Hz} \leq f < 100 \text{ Hz}$: 100 Hz
- $100 \text{ Hz} \leq f < 1 \text{ kHz}$: 1 kHz
- $1 \text{ kHz} \leq f < 100 \text{ kHz}$: 100 kHz

Harmonic Measurement:

- **Measurement Target:** All installed units.
- **Method:** PLL synchronization method.
- **Frequency Range:**
 - Fundamental frequency: 0.1 Hz ~ 300 kHz.
 - Analysis frequency: 0.1 Hz ~ 1.5 MHz.
 - PLL source: Voltage or current of selected input unit, or external clock.
- **Input Level:** Refer to unit specifications. Conditions for turning on the frequency filter are the same as for frequency measurement.
- **Frequency Filter ON Conditions:**
 - $0.1 \text{ Hz} < f < 100 \text{ Hz}$: 100 Hz
 - $100 \text{ Hz} < f < 1 \text{ kHz}$: 1 kHz
 - $1 \text{ kHz} < f < 10 \text{ kHz}$: 10 kHz
 - $10 \text{ kHz} < f < 100 \text{ kHz}$: 100 kHz

General Specifications:

- Warm-up time: Approx. 30 minutes.
- Operating environment:
 - Temperature: $5\sim 40^{\circ}\text{C}$
 - Humidity: 20%~80% RH (non-condensing)
- Operating altitude: 2000 m or below.
- Usage location: Indoor.
- Storage temperature:
 - Temperature: $-25\sim 60^{\circ}\text{C}$ (non-condensing)
 - Humidity: 20%~80% RH (non-condensing)
- Rated supply voltage: 100~120 VAC, 220~240 VAC.
- Allowable supply voltage fluctuation: 90~132 VAC, 198~264 VAC.
- Rated supply frequency: 50/60 Hz.
- Allowable supply frequency fluctuation: 48 Hz~63 Hz.
- Power consumption: Max. 560 VA.

Temperature Patrol Tester

HCL700-24 Temperature Data Logger (24-Channel)



- ◆ Uses an ARM microprocessor, which can simultaneously realize multi-channel (the instrument host supports up to 64 channels and more internally) signal acquisition, recording, display and alarm;
- ◆ Employs a 70MB large-capacity FLASH memory chip to store historical data, with no data loss even when power is off;
- ◆ Features high display accuracy, with a basic error of $\pm 0.2\%$ F-S;
- ◆ Equipped with a standard USB interface. It supports easy operation with a mouse and keyboard, and enables quick and convenient transfer of output historical data;

	Input type	Measuring range	Measurement Accuracy (AD Integration Time 16.7ms, 20ms)	Resolution	
Range	$\pm 10V$	-11.000V to +11.000V	$\pm 0.05\%$ of rdg ± 2 digit	1mV	
	$\pm 5V$	-5.500V to +5.500V	$\pm 0.05\%$ of rdg ± 2 digit	1mV	
	$\pm 1V$	-1.1000V to +1.1000V	$\pm 0.05\%$ of rdg ± 2 digit	0.1mV	
	$\pm 100mV$	-110.0mV to +110.0mV	$\pm 0.05\%$ of rdg ± 2 digit	0.01mV	
	1-5V	+0.800V to +5.200V	$\pm 0.05\%$ of rdg ± 2 digit	0.1mV	
	0-5V	0.000V to +5.500V	$\pm 0.05\%$ of rdg ± 2 digit	0.1mV	
	4-20mA	+0.38mA to +21.00mA	$\pm 0.05\%$ of rdg ± 2 digit	0.001mA	
	K	-50°C to +1372°C	$\pm 0.05\%$ of rdg ± 0.6 °C	0.05°C	
	J	-50°C to +700°C	$\pm 0.05\%$ of rdg ± 0.6 °C	0.05°C	
	E	0°C to +1600°C	$\pm 0.05\%$ of rdg ± 0.6 °C	0.05°C	
	T	-50°C to +400°C	$\pm 0.05\%$ of rdg ± 0.5 °C	0.05°C	
	N	0°C to +1300°C	$\pm 0.05\%$ of rdg ± 0.6 °C	0.05°C	
	W	+1500°C to +2315°C	$\pm 0.05\%$ of rdg ± 1.1 °C	0.1°C	
		0°C to +1500°C	$\pm 0.05\%$ of rdg ± 1 °C		
	R	+300°C to +1768°C	$\pm 0.05\%$ of rdg ± 0.8 °C	0.1°C	
		0°C to +300°C	$\pm 0.05\%$ of rdg ± 1.6 °C		
	S	+300°C to +1768°C	$\pm 0.05\%$ of rdg ± 0.9 °C	0.05°C	
		0°C to +300°C	$\pm 0.05\%$ of rdg ± 1.6 °C		
	B	+400°C to +600°C	$\pm 0.05\%$ of rdg ± 1.7 °C	0.05°C	
		+600°C to +1820°C	$\pm 0.05\%$ of rdg ± 1.0 °C		
		Pt100	-200°C to +400°C	$\pm 0.05\%$ of rdg ± 0.3 °C	0.02°C
		Cu50	-50°C to +150°C	$\pm 0.05\%$ of rdg ± 0.3 °C	0.02°C

AC Dielectric Test System



AC Dielectric Test Transformer design

For more details, please check AC dielectric test system's separate tech file.

Impulse voltage generator



For more details, please check Impulse voltage test system's separate tech file.

Faraday Cage

Faraday cage will be necessary for the Partial Discharge testing.



Technical data

1. Shielding Effectiveness

Magnetic field			Electric field	Plane wave	Microwave
50kHz	100kHz	200kHz	200KHz~30MHz	30MHz~1GHz	1GHz~10GHz
≥60dB	≥60dB	≥60dB	≥60dB	≥60dB	≥60dB

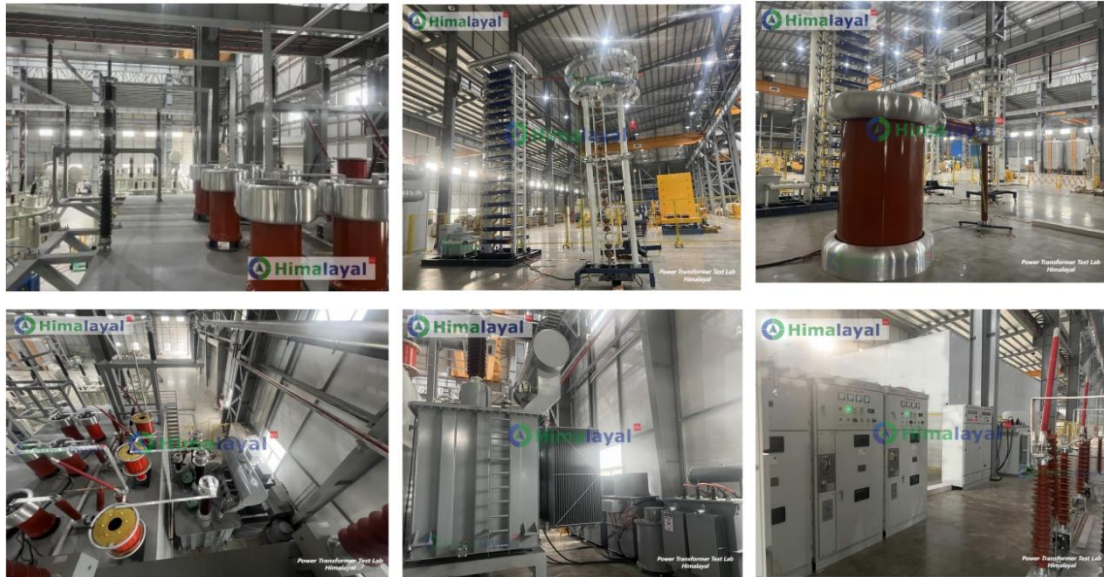
2. Acoustic Indicators

No.	Parameter	Semi-Anechoic Chamber			Remark
1	Cutoff Frequency	125Hz	250Hz	500Hz	
2	Sound Absorption Coefficient	0.32	0.76	1.0	Semi-Anechoic Chamber
3	Background Noise	≤40dB(A)			Ambient Noise≤75dB(A)

3.PD background noise level <2pC in the shielded room, in accordance with IEC 60270

4. Grounding Resistance: ≤ 0.5 Ω (to be completed by the Purchaser)

5. Dimension will according to transformer's rating and dimensions.



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