Himalayal®

Tank Type Variable Inductance Resonance System

IEC60-1,

IEC1000,

IEC358(1990)

HTRS 16000/400

(400kV, 16000KVA)

Himalayal Corporation Limited

Operating Conditions:

Altitude ≤1000m

Ambient Temperature: -10℃～+50℃

Max. Daily Temp. Difference ≤25℃

Relative Humidity:≤90%（at 20℃）

Anti Earthquake: ≤ Class 8

Indoor use

Geoclimatic Horizontal Acceleration: 3.0m/s^2

Geoclimatic Vertical Acceleration: 1.5m/s^2

Waveform of power supply voltage is sine actually, and the waveform distortion rate is< 3%

Set a reliable earthing section, and its earthing resistance is < 0.5 ohm

Background PD level of our factory: 2pC

System Configuration:

Item	Mode	Name	Qty
1	HTRS 16000/400	Power Frequency Variable Inductance Resonant Reactor	1set
2	TYDZ 400/0.4/0~3.3	Voltage Regulator	1set
3	HVF 400/15000	Capacitance Voltage Divider/Coupling Capacitor	1 set
4	HCC 400/15000	Coupling Capacitor	1 set
5	HET 400/10, 20	Exciter transformer	1set
6	LNF 400/2*133.3	Power Noise Filter	1 set
7	HDR 400-40-0.5	Current Limit Inductance	1 set
8	PGL-1	Low Voltage Switch Cabinet	1 set
9	pV2-1	Digit Peak Voltmeter	1 set
10	ACS-2010	Digital Control and Measuring System	1set
11	Accessories	Control cable, measuring cable and corona rings	1 set

Main Parameter of the System Component

Variable Inductance Power Frequency Tank Type Resonant System

Item	Qty	Description
1.1	1	**Mode: HTRS 16000/400** Tank type Single phase Frequency: 50Hz

Indoor use
Rated Capacity: 16000kVA
Rated Voltage: 400kV
Rated Current: 40A
Rated capacitance: 16000kVA
Current adjusting range: 0-40A
Cooling methods: ONAN
Waveform deviation ≤1%
Noise:≤75dB
Inductance adjusting range:
Rated voltage 400KV: 31.84-338.1H
Rated capacitance adjusting range:
Rated voltage 400KV: 30-318.5nF
Over Current Ability: Continuous working for 300S under 110% rated current (44A), then thermal damage or distortion of the winding shall not be occurred.
Over Voltage Ability: Over voltage at 110% UH (440kV) for 60s., then it shall not happened any insulation damage for the testing transformer.
Quality factor: >50 non-load, >40 with load
PD Level :< 2pC at 100%UH of complete test system
Working time and temperature: one hour on and three hour off under rated load, everyday 6cycle.Winding temperature raise not surpass 65K, oil temperature raise less than 55K
Linearity: 10%-100% reactance, error≤±1%
Structure: iron coil structure, user can change the reactance through adjusting open coil gaps, two epoxy tube, the steel bracket is made of stainless material in case of the reducing of quality factor which caused by eddy loss; pedestal has considered the heat which is caused by high-intensity magnetic field; the resonant system designation has considered the expand with heat and contract with cold of the oil.

Contact Type Voltage Regulator

Item	Qty.	Description
1.2	1	Type:**TYDZ-400 / 0.4/0～3.3** Single phase Frequency: 50Hz Rated Capacity: 400kVA Voltage adjusting methods: electrical drive (DC motor adjusting) Rated Input Voltage: 0.4kV Rated Input Current: 1000A Rated Output Voltage:0～3.3kV Rated Output Current: 121.2A Aberration Ration of Waveform: ≤3% Starting Voltage ≤1.5% Impedance voltage: ≤7.5% (adjusting in the range of 50% ~ 100%, impedance is linear) Short-circuit ability: continuous discharge 8 cycles not causes any damage on the regulator winding. Cooling: ONAN Working time: one hour on and three hour off under rated load Note: include - magnetism oil surface indicator, servo motor driving device, position indicator with terminal contacts and protection contacts. The symmetrical compensation and reversed polarity voltage regulation circuit is adopted so that output voltage of the regulator keeps smooth and linearity, and regulating speed can be set and to be very stable. The interlock between voltage regulator, control table and secondary switch are available.

Capacitive Voltage Divider

Item	Qty.	Description
1.3	1	Mode: **HVF 400/15000** Frequency: 50Hz Rated voltage: 400kV Rated capacity: 15000pF (two units, serial connection), single unit capacitance: 30000pF Nominal Dividing Ratio: 2000:1 Dielectric Loss <0.2% Cooling: ONAN Measuring Accuracy: ≤±1% Allowed Operating Time: one hour on and three hour off under rated load Partial discharge level: ≤2pC, under 100% rate voltage Insulation level: withstand 1min under 110% rated voltage (440kV), no abnormal discharge phenomenon.

Coupling Capacitor

Item	Qty.	Description
1.4	1	Mode: **HCC 400/15000** Frequency: 50Hz Rated voltage: 400kV Rated capacity: 15000pF (two units, serial connection), single unit capacitance: 30000pF Nominal Dividing Ratio: 2000:1 Dielectric Loss <0.2% Cooling: ONAN Measuring Accuracy: ≤±1% Allowed Operating Time: one hour on and three hour off under rated load Partial discharge level: ≤2pC, under 100% rate voltage Insulation level: withstand 1min under 110% rated voltage (440kV), no abnormal discharge phenomenon.

Exciter Transformer

Item	Qty.	Description
1.5	1	**Mode: HET- 400/10,20** Rated capacitance: 400kVA Single phase Cooling methods: ONAN Rated voltage: LV voltage: 3kV HV voltage :10, 20kV LV current: 133.3A HV current: 40, 20A Rated frequency: 50Hz Impedance voltage: <5% Shielding methods: Set electrostatic shield layer between HV winding and LV winding Working time: one hour on and three hour off under rated load Exciter transformer protection: equip piezoresistor for each HV output, exciter transformer's input and output terminal connects with the ground via zinc oxide arrester, this methods can protect the operator and the equipment itself when test object breakdown.

Power Noise Filter

Item	Qty.	Description
1.6	1	Mode: **LNF-400/2*133.3** Rated Voltage: 3kV/3kV Rated Current: 133.3A Frequency: 50Hz Number Of Circuit: 2 Attenuation Character: 40KHz-100KHz>40dB; 100KHz-1MHz>60dB

Insulation Level: 10kV/1min
Allowed Operating Time: one hour on and three hour off under rated load

Current Limit Inductance

Item	Qty.	Description
1.7	1	Mode: **HDR400-40-0.5**
		Frequency: 50Hz
		Rated voltage: 400kV
		Rated current: 40A
		Rated inductance: 0.5H
		Partial discharge level: ≤2pC, under 100% rate voltage
		Working time: one hour on and three hour off under rated load
		Temperature raise: continuous working under 100%IH, surface temperature raise not higher than 100K

Primary Switchgear Cabinet

Item	Qty.	Description
1.8	1	Mode: **PGL-1**
		Single phase
		Rated frequency: 50Hz
		Rated voltage: 0.4kV
		Rated current: 1000A
		Operating voltage: AC220V (Switch-on and switch-off)
		Action times: 20000
		Indoor use
		Structure: adopt 1250A breaker

Digital Control and Measuring System

Item	Qty.	Description
1.9	1	Mode:**ACS-2010**
		Structure: PLC control
		Control circuit voltage : automatic / manual function
		Control circuit voltage: 220V/5V, equip automatic and manual control function, HV voltage output speed keep at 1kV±10%; time setting: 1S-99 hour, current can setting random, over-current action time ≤10ms; equip constant interlock function; when automatic control, control console has accuracy reference voltage, its instability less than 1%, the different between real voltage and reference voltage less than 1%, regulating accuracy reach 1%; most of the component, contactor, button, relays are imported.
		Function: equip with over-voltage and puncture voltage protection device, electric component are Omron, SIEMENS and other big company products.

Delivery and Final Test Items

Complete sets of equipment shall be carried out following the factory test and final acceptance:

The following items, unless noted, the factory test and final acceptance shall be done, and its standards in accordance with the relevant professional standards and the implementation of the agreement. the factory test and final acceptance results should be no substantive difference.

No.	Test Items	Test Method
1	Appearance inspection: no leakage of oil, smooth surface without injuries, without permanent deformation.	Visual measurement
2	Seal test: To exert pressure 0.02MPa, 24-hour pressures no drop, no leakage of oil, without permanent deformation	0.05MPa with a full-scale pressure gauge, pressure through the compressor to the pressure of 0.02MPa, the observation geometry and the oil situation.
3	Transformer ratio test	Voltage method
4	Winding connection group editing	Voltage method
5	The winding DC resistance measurement	Bridge Measurement
6	Determination of insulation identity: 1: Determination of insulation resistance >1000MΩ; 2: Absorption ratio (R60/R15) determination; 3: Determination of dielectric loss factor	Instrumentation: 1: ZC-2500 Measuring hand-shake; 2: High-voltage Dielectric Loss Bridge Measurement
7	Transformer oil test (1) Electric strength test Breakdown Voltage ≥ 60kV/2.5mm;(2)micro-water<10ppm; (3)Dielectric loss factor≤0.4%(90℃)	Transformer oil pressure Instrument and transformer oil of the physical and chemical analysis measurement
8	Applied withstand voltage test	Low voltage to measuring winding, high-voltage tail and earth withstand voltage 18kV/1min no abnormal discharge
9	Inductance withstand voltage test	Regulator Act in 18kV/60min, 19.8kV/1min no abnormal discharge
10	No-load current and no-load loss measurement	Voltage, current, loss measurement
11	Short-circuit impedance measurement	Voltage, current, loss measurement
12	Partial discharge measurements (before and after induction voltage, comparison test)	The use of partial discharge instrument is recorded pre-and post-discharge data, and then compare the data, No significant deviation of qualified products.
13	Discharge test: discharge three times under 80% of the rated voltage (short circuit to ground)	Using the stick to plate discharge three times. Assessment arising from the discharge of over-voltage to cascade system components without damage.
14	Waveform distortion measurement <1%	Oscilloscope Measurement
15	Temperature rise test	Short circuit method
16	Load test: The full load test under load capacitance	Full load according to client's requirement

2. System component will be tested together with system