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Abstract

The document describes the technical specifications and conditions of a power transformer manufactured by Transformadores e Serviços de Energia das Américas S/A, which is ready for sale, never used, and currently stored by the manufacturer. The power transformer is an advanced unit designed for industrial and power distribution applications, with a nominal capacity of 199/264/330 MVA and a primary voltage of 345 kV. This three-phase, oil-cooled transformer (ONAN/ONAF/ONAF) ensures high reliability and optimal performance. The transformer is specified for operation at altitudes less than 1000 meters and a design ambient temperature of 30°C.

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1. Introduction

Step-up transformer available for sale, this document describes the various characteristics and its current status. The subject of the opportunity is as follows:

General Data	
Manufacturer	JSHP Transformer
Serial No.	HP1100033005
Quantity	1
Available from	February 2025
Country	China

Technical Data	
Condition	New
Year of construction	2024
Rated Voltage	132 / 30 kVp
Rated Power	37.5/50 MVA
Rated frequency	50 Hz

Table 1: General data

2. Description of Supply

2.1 MV/HV Step-Up Power Transformer 199/264/330 MVA kV 345/34.5kV

The Power Transformer is a robust and advanced unit specifically designed for industrial and power distribution applications. This transformer is engineered to provide high reliability and efficiency, making it ideal for demanding operational environments.

The transformer has a rated power of 37.5/50 MVA, a primary voltage of (132 ± 10 x 1.5%), a secondary voltage of 30 kV. It features a cooling class of ONAN/ONAF and operates at a frequency of 50 Hz.

In terms of construction and dimensions, the total transformer weight (including oil) is 74,300 kg, with a shipping weight of 48,900 kg. The dimensions of the transformer are 7.28 x 5.31 x 6.72 meters (LxWxH).

This transformer has undergone extensive and rigorous testing to ensure it meets all relevant international standards, guaranteeing optimal performance and longevity. It is a reliable and efficient solution for industrial and power distribution applications.

Parameter	Value
Model	SFZ10-50000/132
Serial	HP1100033005
Manufacturer	JSHP Transformer
Application	Industrial and Power Distribution
Transformer Specifications	
Rated Power	37.5 / 50 MVA
Primary Voltage	(132 ± 10 x 1.5%) kV
Secondary Voltage	30 kV
Cooling Class	ONAN/ONA
Frequency	50 Hz
Construction and dimensions	
Total Transformer Weight (Including Oil)	74,300 kg
Shipping weight	48,900 kg
Dimension (LxWxH)	7.28 x 5.31 x 6.72m

Table 2: Step-up transformer data

2.2 Technical data

TECHNICAL PARAMETERS DEFINITION	UNIT	OFFER
SYSTEM GENERAL REQUIREMENTS:		
SITE CONDITIONS		
Location		TBD
Seismicity (IEC 60068)	g	0.2
Sea level elevation	m	<1000
Average ambient annual temperature	°C	19
Average ambent temperature of warmest mounth	°C	28
Maximum ambient air temperature	°C	43
Minimum ambient air temperature	°C	-10
Relative humidity	%	64
DESING CONDITIONS		
Short circuit power (symetric three phase value on HV side)	MVA	according IEC 60076-5
Maximum short-circuit duration	s	2
Winding current at HV side:		
Rated value Ir	A	*218.7*
At no load	A	*0.44*
Inrush current	A	≤ 8 x Ir
Winding current at MV side:		
Rated value Ir	A	*555.6*
At no load	A	*1.11*
Inrush current	A	≤ 8 x Ir
Power supply avaiable for:		
Motor Control Centers (3 phase)	Vac	400 ±10%
Lightning and heating (phase neutral)	Vac	230 ±10%
Control units (IED), DGA, TMS, instrumentation, alarms, supervision signals, etc… (Pos-Neg)	Vdc	125 +10% -15%
EQUIPMENT DESCRIPTION AND SPECIFICATIONS		
Manufacturer		
Transformer kind of service		3 phase step-up (GSU)
Type of core	shell or core	core form
Aplicable Standard		IEC 60076
Type of transformer		Oil inmersed
Frequency	Hz	50

Number of phases		3
Number of windings		2
Single or 3 phase units		three phase
Winding connection		YNd11
Rated power (continuous duty without exceeding the specified máximum temperatures in all tap chager positions)	MVA	50
at ONAN cooling	MVA	0,75 x Rated Power
at ONAF cooling	MVA	Rated Power
Voltage rating at nominal tap setting and no-load (primary/secondary)	kV	132/30
On load tap changer	kV ± %	132kV ±10x1,5%
Impedance voltage referred to 75°C of winding temperature and rated values **@ONAF power**	%	9% @ 50MVA
Impedance Highest tap position	%	*9.5*
Impedance Intermediate tap position	%	*9*
Impedance Lowest tap position	%	*8.6*
TRANSFORMER THERMAL CAPACITY		
Average winding temperature rise (measured by resistance variation)	K	65
Top oil temperature rise (measured by thermometer on the top)	K	60
Maximum hot spot winding temperature rise above ambient temperature (40°C) at full load and continuous operation.	K	78
Maximum surface temperature rise of the core (in overexcitation conditions) at full load and continuous operation.	K	75
During 24 hours: include percentage of rated power and Hot Spot temperature	% K	105% 78K
During 4 hours: include percentage of rated power and Hot Spot temperature	% K	110%78K
During 2 hours: include percentage of rated power and Hot Spot temperature	% K	115%78K
During 1 hours: include percentage of rated power and Hot Spot temperature	% K	120% 78K
Maximum capacity in continuous operation with one radiator disconnected at 98°C winding hot spot.	MVA	35MVA (40°C ambient temperature)
Maximum capacity in continuous operation without one fan operating at 98°C winding hot spot.	MVA	35MVA (40°C ambient temperature)
WINDINGS DESIGN		
SYSTEM MAXIMUM VOLTAGE WINDINGS AND INSULATION:		
HV insulation type		non-uniformed (neutral solid grounded)

MV insulation type		uniform
HV Insul. levels (Um/LI 1,2-50/SI/LTAC)	kV	Um145/ LI 650/ SI 540 / LTAC 275
HV neutral insul (Um/LI 1,2-50/SI/LTAC)	kV	Um 72,5 LI 325 LTAC 140
MV Insul. levels (Um/LI 1,2-50/SI/LTAC)	kV	Um 36 LI 170 LTAC 70
Earth capacitance at central tap position HV winding	1E-06 F	*To provide the measured value in FAT*
Earth capacitance at central tap position MV winding	1E-06 F	*To provide the measured value in FAT*
Earth capacitance at central tap position MV (tertiary winding)	1E-06 F	*To provide the measured value in FAT*
ELECTRODINAMIC STRENGTH		
HV winding	kA	min 2,5 x I"k
MV winding	kA	min 2,5 x I"k
CURRENT DENSITY		
HV winding	A/mm^2	<3.6
MV winding	A/mm^2	<3.6
CORE REQUIREMENTS		
Type of steel sheet		
Maximum losses at 50Hz and 1,7Tesla	W/kg	≤1
At rated continuous load conditions, from MV side.	%Vn/fn	105
At no load in continuous	%Vn/fn	110
At no load 2 hours	%Vn/fn	120
At no load 2 seconds	%Vn/fn	135
Maximum induction values		
At rated voltage	Teslas	1.715
at 105% rated voltage	Teslas	1.801
at 110% rated voltage	Teslas	1.887
at 115% rated voltage	Teslas	1.972
Excitation current at 100% rated voltage	%	0.2
Excitation current at 110% rated voltage	%	0.5
GUARANTEE EFFICIENCY AND LOSSES AT NOMINAL RATIO:		
Load Loss at rated power (cos fi 0,85)	kW	*187*
No Load Loss at rated voltage	kW	*23*
Auxiliary losses at rated power (fans and/or pumps)	kW	*4.5*
Efficiency at power factor of 0,85 and 100% capacity	%	*99.49*
Efficiency at power factor of 0,85 and 75% capacity	%	*99.59*

Efficiency at power factor of 0,85 and 50% capacity	%	*99.67*
Minimum Efficiency peack value PEI as per EN 50588-1 and EN 50629) TIER 2021	%	>99,734
Capitalization losses, A no load loss factor	€/kW	7'800.00
Capitalization losses, B load loss factor	€/kW	823.00
BUSHINGS:		
HV bushing type		Oil/Air composite dry type
HV bushing manufacturer and comercial ref.		Nanjing Electric
HV bushing insultation levels (Um/LI/SI/)	kV	Um 145 LI 650 SI 540 LTAC 275
HV neutral bushing type		Oil/Air composite dry type
HV neutral bushing manufacturer and comercial ref.		Nanjing Electric
HV neutral bushing insultation levels (Um/LI/SI/)	kV	Um 72,5 LI 325 LTAC 140
MV bushing type		Oil/Air composite dry type
MV manufacturer and commercial ref		Nanjing Electric
MV bushing insultation levels (Um/LI/SI/)	kV	Um 36 LI 170 LTAC 70
Minimum creepage distance (IEC 60815-3)) highest line to ground.	mm/kV	44
COOLING SYSTEM:		
Type		ONAN/ONAF
Steps (ONAF)		1
Number of radiators		*sufficient*
Fan power and total number of units	kW nº	*4.5/6*
Pump power and total number of units	kW nº	*N/A*
Fan/pump induction motors, protection grade	IP	IP55
Auxiliar relay contacts for motor contactors		YES
ON LOAD TAP CHANGER		
Manufacturer		*MR Germany*
Type (no load, on load)		VACUMM (maintenance free)
Range	%	±15
Number of taps		21
Voltage per tap	%	≤1,5
Maximum rated trough current	A	*400*
Maximum rated step voltage	V	*3300*
Highest Voltage equipment Insulation Um	kV	*72.5*
PHYSICAL CHARACTERISTICS		
Paint treatment for corrosion protection class	grade	C4
DIMENSIONS		

Total dimensions		
Large	mm	*7300×5400×6440*
Height without bushings	mm	*6000*
Height with bushings	mm	*6440*
Width	mm	*5400*
WEIGHTS		
Total	kg	*76000*
Transformer without oil	kg	*60000*
Oil	kg	*16000*
Active part		
- Core	kg	*26000*
- Windings	kg	*10000*
ACCESORIES		
Type of Oil		non inhibited, IEC 60296-2020
Oil Manufacturer		Repsol or equal
MAIN CONSERVATOR TANK:		
Chamber with isolated balloon system for oil and ambient (air breather).		YES
TANK:		
Main tank		YES
Maximum pressure		2 times tank height
Minimum pressure		VACUUM
Wheels		YES
Lifting lugs		YES
Pulling eyes		YES
Flexible connections between tank and covervator		YES
Air breather (dryer, system) maintenance free		YES
Valve for oil samples		YES
Valve for treatment and drain oil		YES
Quick drain valve		YES
Radiators valves for insulation.		YES
Buchholz relay (1contact for alarm, 2 contacts for trIp) antiseismic requirements		YES
Relief valve(2 contacts for trIp)		YES
Magnetic oil level indicator (conservator) minimun level (2 contacts SPDT); maximun level (1 contact SPDT)		YES
Temperature sensitive bulb top tank and dial thermometer (5 contacts SPDT)		YES
Oil level analog transmiter (4-20mA)		YES
Top tank temperature sensor 2x(Pt-100)		YES
Bottom tank temperature sensor 1x(Pt-100)		NO

Ambient temperature sensor 1x(Pt-100)		NO
Partial discharge sensors (HV bushings)		NO
TAP CHANGER		
On load tap changer		YES
No load tap changer		NO
Segregated tank and conservator chamber for tap changer oil		YES
Air breather (dryer, system) maintenance free		YES
Valve for treatment and drain oil		YES
Flux oil relay RS2000 (2 SPDT contacts for trip)		YES
Oil level tank (conservator) minimun level (2 contacts SPDT) maximun level (1 contact SPDT)		YES
Digital BCD tap monitoring (2 units)		YES
OLCT local panel board		YES
OLTC tank temperature sensor 1x(Pt-100)		NO
Relief valve(2 contacts for trIp)		YES
INSTRUMENTS FOR MONITORING AND SUPERVISION		
Conventional winding thermal image (dial type) (3SPDT+4-20mA)		YES (Comen)
Top oil main tank temperature (dial type)		YES (Comen)
Digital thermal control unit (TMS reduced): (SPDT contacts for cooling control, Alarm and trip) Cooling control Oil and Winding temperature (digital thermal image) **AVR voltage regulation**		NO
Transformer monitoring system (TMS): (SPDT contacts for cooling control, Alarm and trip) Cooling control ONAN ONAF Oil and Winding temperature (digital thermal image) Oil level: tank and OLTC OLTC position and motor consumtion OLTC motor torque monitoring and alarm supervision. **AVR voltage regulation** Hot Spot Temp Calculation and Therml Aging DGA and Moisture oil monitoring interface link Comunication link with upper level control system IEC 61850 Patch panel and fiber optic output plugs for connectivity with upper level control.		YES, ETOS-MR, installed in local drive cabinet of tap changer in transformer

Online Transformer monitoring system (TMS advanced): Cooling control ONAN ONAF Oil and Winding temperature Oil level: tank and OLTC OLTC position and motor consumtion OLTC motor torque monitoring and alarm supervision. **AVR voltage regulation** Hot Spot Temp Calculation and Therml Aging DGA and Moisture oil monitoring interface link Bushing and PD monitoring Comunication link with upper level control system IEC 61850 Patch panel and fiber optic output plugs for connectivity with upper level control.		NO
Disolved gas sensor and Moisture DGA integrated or intefaced with (TMS)		YES, MR ETOS including comunication (IEC 61850)
Disolved gas sensor and Moisture type as per ENEL Technical Standard		Type A
Capacitive probes on HV bushings		NO
Fan/pumps circuit breakers supervision; motor switch protection per single motor. contactors auxiliar contacts (open/close) and (trip)		YES
AVR (voltage regulator, OLTC control) integrated or interfaced with the online supervision and monitoring (TMS), voltage transformer out of scope.	-	YES ,ETOS-MR
Control Panel board IP545 stainless steel, installed on board of transformer : Local signalling Switches and selectors 400V 3 phase power suply Cooling motor control Auto and manual selectors Heating resistor Alarm contacts SPDT Lightning and aux power suply 230V F+N DC power supply for online supervision monitoring equipment Centralization of alarms, trips, status and supervision signals of the transformer Centralization of comunication links with IEC 61850 to substation control system. Integration and interface signals and power supply of: OLTC, Gases and Moinsture Sensor, online supervision monitoring equipment and AVR equipment) Terminal blocks for interconexión with protection measurement and control system of substation.		YES,(IP54)

CURRENT TRANSFORMERS BUSHINGS INSTALLED:		
Total current transformers on HV side		as per transformer design
Total current transformers on HV neutral side	nº	1
Total current transformers on MV side		2 CT
HV side min Current thermal and dynamic limit	kA	NA
MV side min Current thermal and dynamic limit		as per transformer design
Current transformers on bushings for WTI:		MV side
Total current transformers	nº	1 CT
Current Primary	A	TBD
Current Secondary	A	TBD
Power	VA	TBD
Precision class		
Current transformers on bushings for TMS:		~~MV side~~
Total current transformers	nº	1 CT
Current Primary	A	TBD
Current Secondary	A	5
Power	VA	TBD
Precision class		-
		-
Current transformers on bushings for protection:		HV Neutral side for protection
Total current transformers	nº	1
Current Primary	A	400
Current Secondary	A	5
Power	VA	15VA
Precision class		5P20
TESTS		
INSPECTIONS ON FACTORY:		YES
Tightness tests and pressure tests for tanks (test performed during manufacturing process of the transformer, and reports given at FAT)		YES
Dimensional checking of all supplied equipment.		YES
Checking of the adherence and thickness of painting		YES
TESTS ON FACTORY:		YES
ROUTINE TEST:		
Measurement of winding resistance (carry out on all taps)		YES

Voltage ratio measurement and check of phase displacement (carry out on all taps and all phases)		YES
Measurement no load losses and current: 90% , 100%, 105%, 110% and 115% rated voltage.		YES
Dielectric routine tests as per IEC 60076-3(depending on Um value): a) Full wave lightning impulse test for the line terminals (LI) b) Chopped wave lightning impulse test for the line terminals (LIC) c) Switching impulse test for the line terminal (SI) d) Applied voltage test (AV) e) Induced voltage withstand test (IVW) f) Induced voltage test with partial discharge measurement (IVPD) g) Line terminal AC withstand test (LTAC) or Switching impulse test. h) Insulation of auxiliary wiring		YES
Measurement of short-circuit impedance and load losses.		YES
On load tap changer test		YES
Leak testing with pressure		YES
Check of the ratio and polarity of built-in current transformers		YES
Check of core and frame insulation		YES
Determination of capacitances windings-to-earth and between windings and measurement of dissipation factor (tan δ) of the insulation system capacitances		YES
Measurement of d.c. insulation resistance between each winding to earth and between windings		YES
Measurement of dissolved gases In dielectric liquid from each separate oil compartment		YES
TYPE TEST:		YES
Temperature rise test at nominal power		YES
Long heating test with gas chromatography. (S>300MVA)		NO
Dielectric type tests as per IEC 60076-3 (depending on Um value): a) Lighting impulse test (LI)		NO
Determination of sound levels		YES
Measurement of the power taken by the fan and liquid pump motors		YES
SPECIAL TEST:		

Dielectric special tests as per IEC 60076-3 (depending on Um value): a) Chopped wave lightning impulse test for the line terminals (LIC) b) Lightning impulse test for the neutral terminals (LIN) – This test is requested on each one transformer with uniform winding insulation included in the scope of supply c) Switching impulse test for the line terminal (SI) d) Induced voltage test with partial discharge measurement (IVPD) e) Line terminal AC withstand test (LTAC)		*NO*
Determination of transient voltage transfer characteristics		*NO*
Measurement of zero-sequence impedances on three phase transformers		*YES*
Short Circuit withstand test: short circuit test certificate calculation report		*YES, only provide third party witness short-circuit test report of similar tranformer, not proferming short circuit test*
Vacuum Withstand Test of Tank and mounted accessories (Coolers and Conservator Included)		YES
Under Pressure Withstand Test of Tank and Mounted Accessories		YES
SFRA (Sweep Frequency Response Analyser)		YES
OTHER TEST:		
Verification of the accessories and components assembled on the Transformer and functionality		YES
Verification of external protective coating		YES
Seismic qualification (IEC60068-3-3) when required.		NO
SITE ACCEPTANCE TESTS:		
Visual checks		YES
Functional checks auxiliary wiring		YES
Measurement of dissolved gasses in dielectric liquid and moisture.		YES
Measurement of oil dielectric strength.		YES
Winding insulation resistant measurement and polarization index.		YES
Core and frame insulation tests at 2kV dc.		YES
Measurement of dissipation factor (tan-delta) and capacitances		YES
Measurement of voltage ratio and vector displacement on three tap positions (upper, lower and rated)		YES
Measurement of short circuit impedance test no load magnetizing current applying low voltage.		YES

Measurement of winding resistance on three tap position (upper, lower and rated)		YES
Measurement of Frequency Response (FRA).		YES
Oil Analysis, Gas chromatographic analysis, physical chemical analysis and dielectric characteristics; (measurement of oil dielectric resistance; measurement of oil water contents; measurement of oil chemical characteristics and analysis of oil-dissolved gasses).		YES

Table 3: Datasheet

3. Tests performed

All tests were conducted by the manufacturer during the transformer's factory acceptance test. Below is the list of tests performed, with detailed results available in the attached documents.

- **Insulating Level Tests:**
  - Basic Lightning Impulse Insulation Level
  - Low Frequency Voltage Insulation Level
- **Performance Data Tests:**
  - Performance based on 20 degrees Celsius reference temperature (no load loss)
  - Performance based on 85 degrees Celsius reference temperature (load loss)
  - Losses and Exciting Current Regulating kVA
  - Excitation (% Ex I)
  - No Load Loss (NLL)
  - Total Loss
  - Power Factor
  - Regulation
- **Auxiliary Losses:**
  - Auxiliary Losses for different kVA classes
- **Efficiency Tests:**
  - Efficiency measurements at various load levels (100%, 75%, 50%, 25%)
- **Impedance Tests:**
  - Percent Impedance Volts (%IZ) between kVA levels

4. Storage status

Figure 1: Storage status 1

Figure 2: Storage status 2

Figure 3: Storage status 3

Figure 4: Storage status 4

Figure 5: Storage status 5

5. Scope of Supply

Position	Quantity	Description
1000	1	Step-up, 37.5/50 MVA ONAN/ONAF, (132 ± 10 x 1.5%) /30 kV, 50 Oil filled large power transformer

Table 4: Scope of supply.

5.1 Exclusions

Scope not explicitly listed in the Scope of Supply (Table 4) is excluded.
The following items are explicitly excluded:

Mechanical
Modification of any existing systems not explicitly cited.
Missing parts and components.
Electrical
Modification of existing systems not explicitly cited.
Civil
Land preparation
Temporary accesses and final accessing roads
Security plan and hardware.
Temporary accommodation
Finishing and fencing
First aid station and ambulances
Waste disposal facility

Table 5: Exclusions from the Scope of Supply.

Project Management
Attainability of installation, commissioning and operation permits, or any other permit.
Assessment and acceptance of safety relevant issues.
Any study, engineering, documentation, or other service.

Additional works resulting from changes in laws or any other reasons, for which EECC is not responsible.
Building of Site Facilities of any kind (lights, water supply and treatment, heating, power supply, etc.).
Custom duties and taxes.
Engineering
Design and detailed engineering of existing equipment.

Table 6: Exclusions from scope of Services.

5.2 Technical documentation

Following documents are part of the technical documentation (list is preliminary):

Pos.	Document	Available
1	General	
1.1	Document & drawing list	yes
1.2	Technical data sheet	yes
1.3	Component manuals	yes
1.4	Quality documentation	yes

Table 7: Technical documentation