

Technical Requirements to 3-Phase 11/11 kV Linear Regulating (Booster) Transformers 40000 kVA

Item	Description	Unit	Required by NPC "Ukrenergo"	Guaranteed by the Manufacturer
1.	Technical Data in conformity with the requirements of the standard		IEC, DSTU EN, DSTU IEC standards, being valid on the equipment manufacturing date	
2.	Manufacturer and Country of Origin of the transformer			
3.	Works type (grade) of the transformer		Three-phase linear transformer for continuous step-by-step on-load control of the network voltage	
4.	Nominal Voltage of network	kV	10	
5.	Rated Voltage of Network	kV	12	
6.	The test voltages: -power-frequency; -standard lightning impulse Full/chopped lightning impulse	kV kV	28 75/90	
7.	Climatic Version and Location Category in conformity with GOST 15150-69		U1(for the region with moderate climate, to be outdoor located)	
8.	Maximum Installation Altitude, m	m	Up to 1000	
9.	Area's Seismic Stability, not less, MSK-64 points	Points	7	
Rated Parameters and Technical Data				
10.	Rated Power	kV · A	40000	
11.	Rated Line Voltage	kV	11±(10x1,5%)	
12.	Rated Line Current	A	3499±(10x1,5%)	
13.	Rated Frequency	Hz	50	
14.	Voltage Regulation Range	V	±990	
15.	Quantity of steps		± 10	
16.	Control type		OLTC	
17.	Winding Connection Diagram & Group		III/III-Yn _{auto} -0	
18.	Winding Material			
19.	Maximum short time current for both windings	kA	31,5 (3 seconds)	
20.	Regulating Autotransformer Power Supply		On Side of Voltage Having Been Regulated	
21.	No operating (no-load) Current (max)	A	2.0% +30%- - respective of OLTC Position	
22.	Short-Circuit Current Voltage of series transformer - in OLTC 1 - in OLTC 21		10,0±15% 8,0±15%	
23.	No operating (no-load) Losses, max	kW	According to the regulations on eco-design of power transformers	
24.	Short-Circuit Losses (on load), max - in OLTC position 1 - in OLTC position 21	kW	According to the regulations on eco-design of power transformers	

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Requirements to Design				
25.	Series Transformer & Regulating Autotransformer Are to Be Placed in Common Tank with Oil		Yes	
26.	The Transformer is to be Manufactured: - with Cable Leads-in; - with Bushings; - for Connection to SF ₆ Equipment		With Bushings	
27.	Switching Device Drive is to be Installed on the Tank		Yes	
28.	Drive Switching-On		Automatic – By Means of Automatic Voltage Regulator	
29.	Inner insulation of the transformer: insulation level as listed above in “Rated Parameters and Technical Data” according IEC 60076-3 and IEC 60137		Must endure the test voltages in conformity with IEC	
30.	Availability of continuous oil regeneration system in filters (silica gel in set)		Yes	
31.	Availability of air drier of maintenance-free type		Yes	
32.	Oil level indicator on expander		Dial type with the scale enabling the oil level remote monitoring to be carried out	
33.	Painting color		Light - grey	
34.	Cutoff valve		Contacts for the valve position signaling with the valve position indicator at visual inspection	
35.	Safety valves		With contacts for actuation signaling	
36.	Gas relay - with two floats and two pairs of contacts; - with device for gas extraction with the above not to be lifted on to the transformer		Yes	
37.	Temperature monitoring devices		Yes	
38.	Cabinets (control, signaling, terminals) Layout		Mounted	
39.	Stainless steel hose along the transformer tank to protect the control cables laid from the monitoring, signaling, protection devices, leads-out, the current transformers to the terminals cabinets, against mechanical damage and solar radiation		Yes	
Bushings				
40.	Specific Creepage Distance of Bushing External Insulation not less than	cm/kV	4,33 Pollution severity class acc. IEC/TS 60815-1:2008 – d (heavy pollution)	
41.	Rated current for primary/secondary winding bushings	A	2500	
42.	Bushing terminal clamps for connection to flexible buses.		Yes	

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	Current transformer			
	CT final Technical Data are to be clarified at the stage of the equipment purchasing by the Supplier		Yes	
	Built-in Current Transformers on Excitation Winding Taps:			
43.	Quantity		2	
	Primary Current	A	600	
	Secondary Current	A	5	
	Rated Saturation Limit Factor, not less		20	
	Accuracy Class		5P	
	Built-in current transformers on the series winding of the series transformer:			
44.	Quantity		2	
	Primary current	A	4000	
	Secondary current	A	5	
	Rated limit factor, not less than		20	
	Accuracy class		5P	
	Built-in current transformers on the linear terminals of the control winding:			
45.	Quantity		2	
	Primary current	A	600	
	Secondary current	A	5	
	Rated limit factor, not less than		20	
	Accuracy class		5P	
	Cooling System			
46.	Cooling System Type		Combined ONAN/ONAF	
47.	The Cooling system automatics cabinet:			
	- Automatic maintain the temperature inside the cabinet for normal operation in conformity with climatic manufacture version of the transformer equipment;		Yes	
	- The cabinet protection degree not less than IP55;		Yes	
	- Current protection of the fans electric motors.		Yes	
48.	The cooling system fans service life, not less than	Years	30	
49.	Coolers Arrangement		Mounted on the Tank	
50.	Cooling Devices (Radiators) Design		Plated	
51.	Automatic Control in Cooling Systems		Yes	
52.	Combined electrical power of all cooling fans	kW		
	On-Load Tap Changer (OLTC):			
53.	Manufacturer			
54.	Type of OLTC		Vacuum diverter switch	
55.	Rated through current	A		
	Rated step capacity	kVA		
	Mechanical indicator of the On-Line Regulator position on the cabinet of the drive		Yes	

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	Discrete electric signal of the On-Line Regulator each position		Yes	
	OLTC switch vacuum compartment monitoring system		Yes	
	Supply of OLTC control microprocessor-based device		Yes	
	Technical support (servicing in Ukraine)		Yes	
	Reliability Requirements			
56.	Mean-Time-Between-Failures, not less	Hours	25000	
57.	Guarantee time period: - since the date of commissioning - since the date of supply to the Purchaser	Years	5 5.5	
58.	Operation Service Life , not less	Years	30	
	Transportation			
59.	Transformer moving		longitudinal-transverse	
60.	Form of rollers		With ribs	
61.	Width of rail as per GOST 11677-85: - longitudinal movement; - transverse movement	mm	1524 2000	
62.	«Impact-indicators» on the transportation packing for movement conditions monitoring within the supply time period		Yes	
	Complete set, supply support			
63.	Complete set of air drying system; The cooling system automatics cabinet in complete set; The control cables complete set with protection for the cables to be laid along the tank; The transformer oil in amount required for oil additional filling-in and process needs; Spares in conformity with the Supply Complete Set Data Sheet, set		Yes Yes Yes Yes Yes	
64.	Deliver If with no oil, it has to be filled with nitrogen gas during the transportation. (in case of transportation with no oil, the complete set includes the transformer oil in the amount, required for filling-in, process operations during the erection and oil additional filling-in up to the operation oil level).		with or without oil has to be specified	
65.	Technical support of supply (acceptance of the state and complete set together with the Manufacturer and the Supplier, installation supervision)		Yes	
	Documentation (in Ukrainian), to be submitted at the supply			
66.	Complete Set Data Sheet		Yes	
67.	Quality Certificate		Yes	
68.	Origin Certificate		Yes	
69.	Certificates for transformers and completing parts (products) of the system		Yes	

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70.	Technical Description and Operation Manuals or Operation Guidelines (which include the planned repair documentation) for the transformer, completing parts and systems		Yes	
71.	Control diagrams of the Cooling Systems and OLTC		Yes	
72.	Transfer-Acceptance Tests Protocols (Certificates)		Yes	