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THREE-PHASE OIL IMMERSED EARTHING TRANSFORMERS OFF-VOLTAGE REGULATION



100-4000 kVA
6-20 kV

Catalogue Sheet No.

68

Application

Earthing transformers are applied in power networks for getting an artificial neutral point to which arc-suppression reactor or resistor is connected.

The transformers are three-phase and are used for substation auxiliary supply (self service) in case when power network is not earthed. When failure occurs in power network transformers are energised with phase voltage in neutral point.

During transformer operation HV terminals are connected to power network and 1N neutral point is connected to terminal 1A of arc-suppression reactor or resistor.

Transformers can be loaded with continuous power of auxiliary supply. HV winding can be simultaneously loaded with compensating earthing current at secondary winding loaded with continuous rated power.

Operational condition

Transformers in basic execution are suitable to operate in moderate climates.

They can operate outdoors in location of altitudes up to 1,000 metres above sea level or indoors with sufficient ventilation, where ambient air is free from dust and chemically active or explosive gases.

Ambient temperature range is from -25°C to $+40^{\circ}\text{C}$ (248°K to 313°K), annual average temperature should not exceed $+20^{\circ}\text{C}$ (293°K).

The Manufacturer offers also transformers subject to client requirements, for instance for operation in tropic climate.

Operational frequency 50 Hz.

Loading conditions are shown in the Table below:

Compensating current as % of rated current	Permissible operational period in hours
100	2
87.5	4
75	8
62.5	continuous operation
50	continuous operation

General description

Transformer core consists of three columns and is manufactured from cold-rolled electromagnetic steel sheet with non-organic insulation layer. Sheets in core columns are glued or tied and yoke sheets are tied with glass band.

Windings are made of electrolytic copper and used conductors are round with enamel insulation or profile insulated by means of insulating paper. There are oil ducts among winding which provide oil circulation and proper cooling. Winding design and fastening ensure very high dielectric and arc insulation withstand and short-circuit capacity. HV winding has taps for voltage regulation. Voltage regulation range equals to $\pm 5\%$.

Tap changer is installed in transformers main tank and it has manual regulation wheel on tank cover. Regulation of transformer ratio (by means of changing taps) is made after switching transformer off-voltage. Tap changer has blocking facility for each tap position. Transformer windings are connected in ZNyn11 connection group.

Transformer main tank is made of steel and its welded construction is reinforced by means of supports increasing rigidity and proper mechanical withstand. Cooling of transformers is performed by means of steel sheet radiators fixed in position to the main tank wall. Transformer main tank has undercarriage with bi-directional wheels.

Accessories

- 4 porcelain bushings of HV side, placed on transformer main tank cover
- 4 porcelain bushings of LV side, placed on transformer main tank cover
- Maximum thermometer
- Buchholza relay
- Conservator with Oil level indicator
- Earthing bolts
- Oil draining and filling valves
- Nominal plates

Accessories of each transformer are in compliance with Dimensional Drawing.

Tolerance

In accordance with bending Standards tolerance for transformer ratings are as follows:

- No-load loss: +15%
- Load loss: +15%
- Total loss: +10%
- No-load current: +30%
- Impedance voltage: $\pm 10\%$

Reference Standards and International Provisions

EN 60289 - Reactors. (IEC Publication No. 289)

EN 60076-1 - Power Transformers. (IEC Publication No. 76.1)

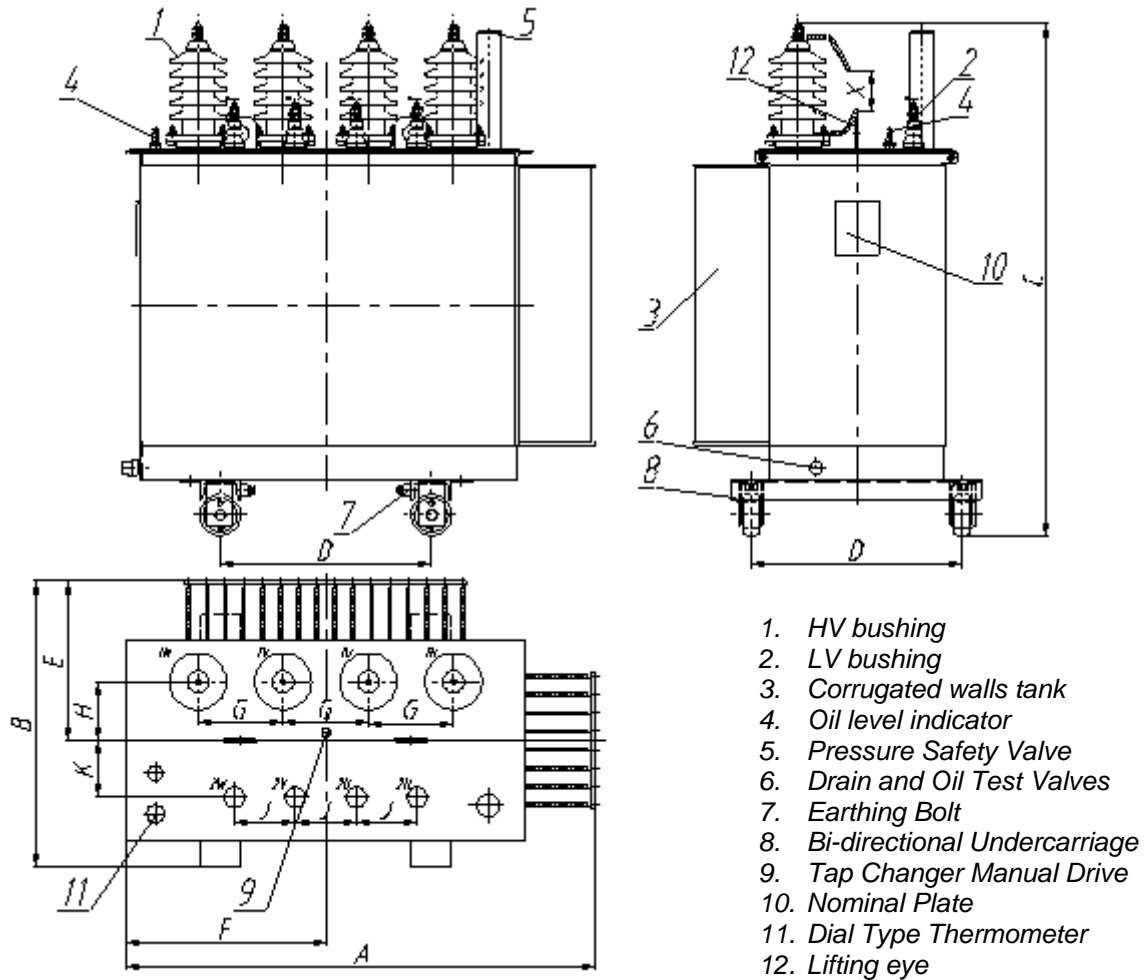
Technical Data

No.	Type	Comp.	Auxiliary	Voltage		Comp.	Imp.	Loss		Z _o	Mass	
		Power	Power	HV	LV	Current	Volta ge	No- load	Load		Total	Oil
		kVA	kVA	V	V	A	%	W	W		Ω	kg
1	TUOd 110/6	109	100	6300	400	30-15	4.5	360	2000	5	800	250
2	TUOd 145/6	145	100	6300	400	40-20	4.5	360	1600	5	840	240
3	TUOd 220/6	218	100	6300	400	60-30	4.5	360	1500	5	870	240
4	TUOd 435/6	436	100	6300	400	120-60	4.5	450	1300	5	1220	340
5	TUOd 485/10	485	100	10500	400	80-40	4.5	450	1300	15	1270	340
6	TUOd 730/10	727	100	10500	400	120-60	4.5	450	1260	15	1250	330
7	TUOd 970/10	970	315	10500	400	160-80	5	950	3500	5	2200	590
8	TUOd 545/15	546	100	15750	400	60-30	4.5	450	1250	30	1300	340
9	TUOd 730/15	727	100	15750	400	80-40	4.5	450	1260	30	1370	340
10	TUOd 1090/15	1091	315	15750	400	120-60	5	950	3500	15	2250	580
11	TUOd 1640/15	1637	315	15750	400	180-90	5	1050	3000	15	2600	600
12	TUOd 485/20	485	100	21000	400	40-20	4.5	450	1300	60	1230	340
13	TUOd 730/20	727	100	21000	400	60-30	4.5	450	1260	60	1310	330
14	TUOd 970/20	970	315	21000	400	80-40	5	950	3500	30	2240	580
15	TUOd 1455/20	1455	315	21000	400	120-60	5	1050	3000	30	2600	600

Other design execution to be consulted with the Manufacturer.

Factory provides guarantee and post-guarantee service, overhauls and repairs of its products.

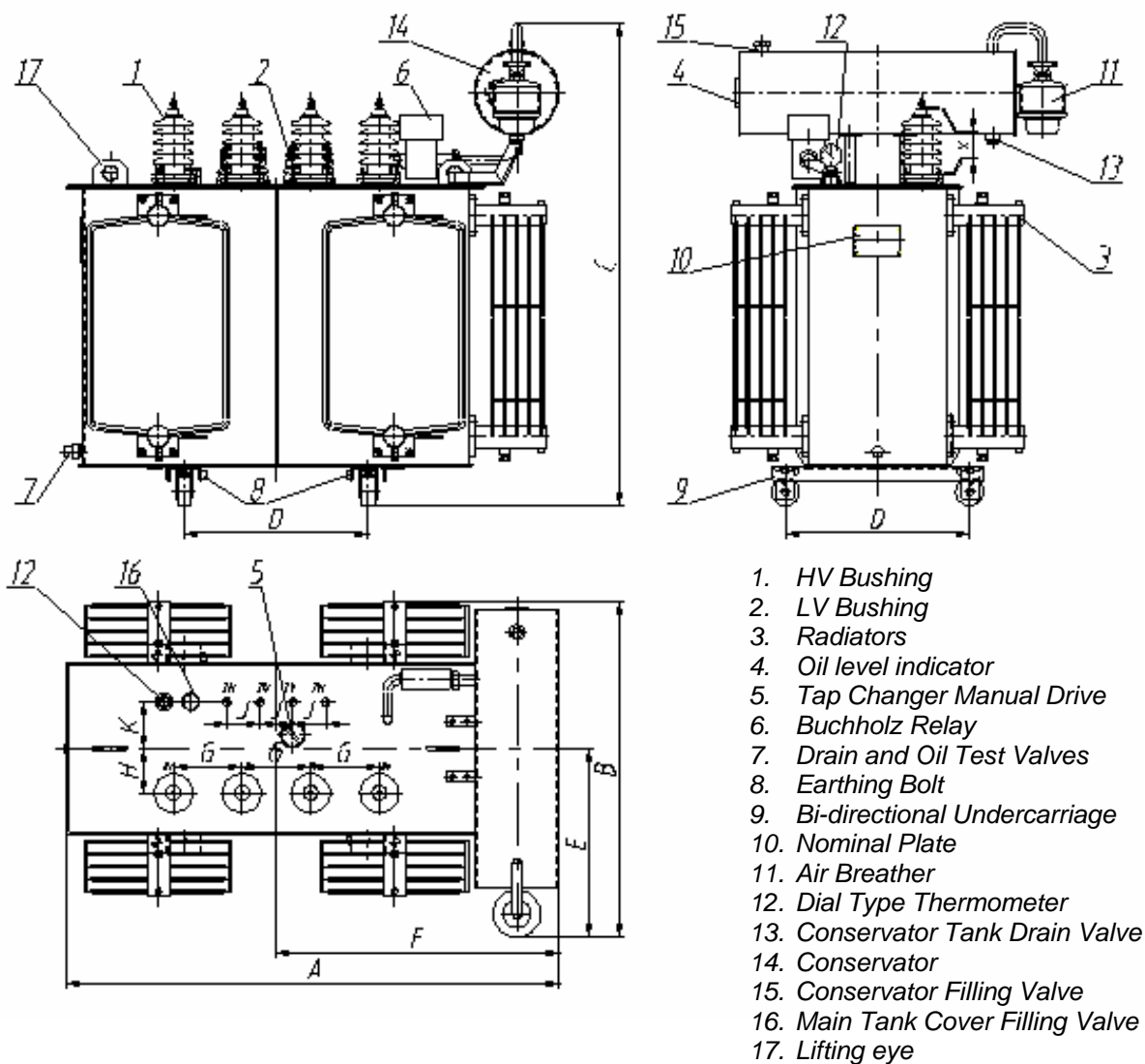
Dimensional Drawing



1. HV bushing
2. LV bushing
3. Corrugated walls tank
4. Oil level indicator
5. Pressure Safety Valve
6. Drain and Oil Test Valves
7. Earthing Bolt
8. Bi-directional Undercarriage
9. Tap Changer Manual Drive
10. Nominal Plate
11. Dial Type Thermometer
12. Lifting eye

Approximate Dimensions in [mm]

No.	Type	A	B	C	D	E	F	G	H	J	K	X
1	TUOd 110/6	1160	700	1260	520	395	665	210	145	150	140	-
2	TUOd 145/6	1160	700	1260	520	395	665	210	145	150	140	-
3	TUOd 220/6	1160	700	1260	520	395	665	210	145	150	140	-
4	TUOd 435/6	1170	800	1450	670	400	585	210	135	150	140	-
5	TUOd 485/10	1170	800	1450	670	400	585	210	135	150	140	-
6	TUOd 730/10	1170	800	1450	670	400	585	210	135	150	140	-
7	TUOd 545/15	1170	800	1450	670	400	585	210	135	150	140	90
8	TUOd 730/15	1170	800	1450	670	400	585	210	135	150	140	90
9	TUOd 485/20	1170	800	1450	670	400	585	210	135	150	140	120
10	TUOd 730/20	1170	800	1450	670	400	585	210	135	150	140	120



Approximate Dimensions in [mm]

No.	Type	A	B	C	D	E	F	G	H	J	K	X
1	TUOd 970/10	1800	1200	1750	670	685	1130	250	160	120	170	-
2	TUOd 1090/15	1800	1200	1750	670	685	1130	250	160	120	170	90
3	TUOd 1640/15	1800	1230	1750	670	685	1130	250	160	120	170	90
4	TUOd 970/20	1800	1200	1750	670	685	1130	250	160	120	170	120
5	TUOd 1455/20	1800	1230	1750	670	685	1130	250	160	120	170	120

The Manufacturer reserves right to change catalogue technical data in the course of product modernisation.