



**Signal**<sup>®</sup>  
electricals



*power and distribution*  
**power and distribution**  
*transformers*  
**transformers**

## ABOUT US

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### OUR HISTORY...

Our adventure started by cable production in 1975, continuous by offering quality products which are asked in more than thirty countries,

Signal electricals having experience of cable production and marketing for more than 30 years, we offer as a brand "Vatan Cable" and other respected brands to the electricals markets especially West&East africa and middle east.

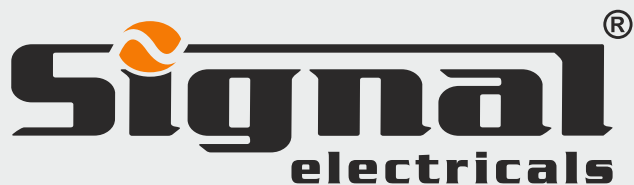
### WE OFFER...

Signal electricals offers "Electric Materials" with wide spectrum of kinds such as in door energy cables to high voltage energy cables, Transformers, in door lightning armature to street and road armatures.

We have been offering high quality products to respected wholesalers, contruction companies and other consumers in ghana markets since 2001.

SIGNAL electricals has been preferred by most of the customers because of high quality, low energy loss and low price.

SIGNAL electricals aims at customer satisfaction all the time.



## PRODUCT RANGE

- Between 25kVA – 4000 kVA power range  
Distribution Transformer up to 36 kV. On Hv side.
- Between 4000 kVA – 25000 kVA power range  
Power Transformer
- Transformers in various power and voltage for  
Special Purposes Transformer



# DISTRIBUTION

## *Distribution Transformers Hermetic Type*



### *Hermetically Sealed Distribution Transformers*

- 25-4000 kVA in power range, high voltage level up to 36 kV, single or three phase, oil immersed, ONAN ONAF cooling, no-load tap changer or with load automatic tap changer, both outdoor and indoor, are designed at form
- Hermetically Sealed transformers being closed to atmosphere and pressure of hermetically sealed transformer are manufactured at figure adjusted in factory.
- There is not the conservator tank on hermetically sealed transformer. The oil is filled into tank after air of the oil is got inside of special vacuum rooms. Since the humidity consequently is not exist inside of tank, born of from oxidation deterioration of the oil is reduced to zero.

# TRANSFORMERS



## *Distribution Transformers Conservator Type*

### *With Oil Conservator Tank*

- 25-4000 kVA in power range, high voltage level up to 36 kV, single or three phase, oil immersed, ONAN ONAF cooling, no-load tap changer or with load automatic tap changer, both outdoor and indoor, are designed at form
- Oil of the transformers expand with rise of temperature. Dimensions of oil conservator tank of transformers is designed this its increase will store at form.
- Transformers with oil conservator tank are open atmosphere. Pressure of the oil changes in consequence of thermal effects. The silica gel (air dryer) that being on conservator tank is got humidity of the air and it provides ingress-egress of the air.
- Silica gel of transformer with oil conservator tank that works in the enterprise loses its feature in the course of the time. The oil is got humidity and is broken down its structure. Therefore the silica gel must change in specific period and by-pass voltage of sample that gets from the oil must measure.

# GENERAL VIEW FO



## Main Production Stages

- CORE DEPARTMENT
- WINDING DEPARTMENT
- MECHANIC DEPARTMENT
- DRYING DEPARTMENT
- ASSEMBLY DEPARTMENT
- PAINTING DEPARTMENT

## CORE (Stackcore)

Transformers made from aluminium or copper windings depends on customer request and general country or zone specifications. In both windings high quality materials are used.

## CORE (Stackcore)

It is of laminated core type and manufactured from silicon alloy sheet steels like M5, M4, M3, MOH and ZDHK with directed crystalline orientation (grain oriented) and having thicknesses of 0.30 mm, 0.27mm and 0.23 mm. The sheet steel cut to a mitered form of 45 degrees angle at the section where the magnetic flux passes are slitted into intended shape and stacked with CNC slitting machine and packed to form a magnetic circuit. Cutting and packing operations for magnetic circuit are handled with a method known as step-lap which reduces iron losses to a minimum. The core is packed by applying step-lap method .



# R TRANSFORMERS

## MANUFACTURE, TESTS, PROTECTION OF THE TRANSFORMERS



### *Main Production Stages*

Our tanks are manufactured with corrugated walls for the transformers up to 3150 kVA rated power. Tanks for the transformers above 3150 kVA are equipped with radiators. After welding and assembly work finished, tanks are tested under pressure for leakage in accordance with IEC standards. Tanks with corrugated walls are designed to withstand 0.65 bar vacuum pressure and tanks with radiators are designed to withstand 1 bar vacuum pressure. Cover of the tank is designed in such a way the winding terminals can go out. There are insulators, phase markings, lifting lugs for taking out the active

### *Paint*

In our ongoing paint proses, a gray colour known as RAL7033 is used as standard, but we can also manufacture with different colours on customers' request. Our transformers which are painted by way of spilling and spraying methods are primed once and then painted secondary on the automated assembly line. Eventually the paint thickness reaches to an extent not less than 105microns.

### *Assembly - Drying - Oil Filling*

After drying the transformers whose assembly of active part is completed, in the drying furnaces at 120 °C are put into tanks and filled with oil in the vacuum chamber. The air entrapped in the transformer tank is removed by the suction effect in the vacuum chamber and this helps penetrate the insulating oil into the active part thoroughly. The oil filled serves as insulation and coolant. Drying process is accomplished according to a predefined program depending upon the rated voltage and power of the transformer.

# TRANSFORMER TESTS

## TEST PROCESSES



### Tests

- PRODUCTION TESTS
- DESIGN TESTS
- TYPE TEST
- SPECIAL TEST

### Routine Tests

- Measurement of winding resistance
- Measurement of voltage ratio and vector group
- Measurement of impedance voltage and load loss
- Measurement of no-load loss and no-load current
- Induced overvoltage withstand test
- Separate-source voltage withstand test

### Type Tests

- Temperature-rise test ( IEC 60076-2)
- Dielectric type test ( IEC 60076-3) Between HV-LV-Tank

### Special Tests

- Lightning-impulse voltage test
- Partial discharge test ( For Cast Resin Transformers)
- Dissipation factor (  $\tan\delta$  ), Doble test
- Zero-sequence impedance on three phase transformer
- Noise level test
- Short-circuit withstand test
- Measurement of the harmonics of the no-load current.



# PROTECTION DEVICES

## ACCESSORIES

### **Internal Overpressure Protection**

Pressure Relief Valve(with contacts or without contacts)(for Hermetic Type) This valve protects the transformer tank from sudden overpressure surge. It is fitted to the transformer cover and adjusted (0.35bar) in such a way that it opens briefly in the event of overpressure and creates a compensation between the pressure inside the tank and outside air pressure then automatic reclose.



### **Liquid Level Monitoring**

Magnetic Oil Level Indicator (with contacts or without contacts) The magnetic oil indicator is used in order to display the level of the transformer oil in conservator tank. The transformation of the oil movement to display itself is effected by two permanent magnets. This oil level indicator depends on the diameter of conservator tank. If required, the level indicator with contacts can be used.



### **Protection Of The Liquid Against Moisture Ingress**

Silicagel Air Breather (for Conservator Type Transformers) It is a uni-directional breather, where air circulation is controlled by the liquid seal located in the breather. The size of dehydrating breather is determined by the quantity of oil in the transformer



### **Multi - Purpose Protection**

Hermetic Protection Relay (DGPT2) (for Hermetic Type Transformers) This relay is monitored the discharge of gases, the temperature and the pressure in the tank. It is used for bigger than 500kVA power of the transformer. It has got two contacts for each one the discharge gases, the tank pressure and the temperature (alarm trip)



### **Buchholz Relay**

Buchholz Relay (for Conservator Type Transformers →630kVA ) It is fitted in the connection pipe between the transformer tank and conservator tank in order to monitor and protect transformers and other oil filled electrical equipment from faults arising internally, such as inter turn short circuits in windings and against oil loss. Depending on the type of fault which occurs and the switching device which is actuated by the relay, the relay trips an alarm signal or causes the transformer to switch are itself off. Two micro switches are rated at 5A, 250VAC or 0.2A, 250 VDC



### **Alcohol Thermometer**

Alcohol thermometer is used in order to only display oil temperature. It is without contact

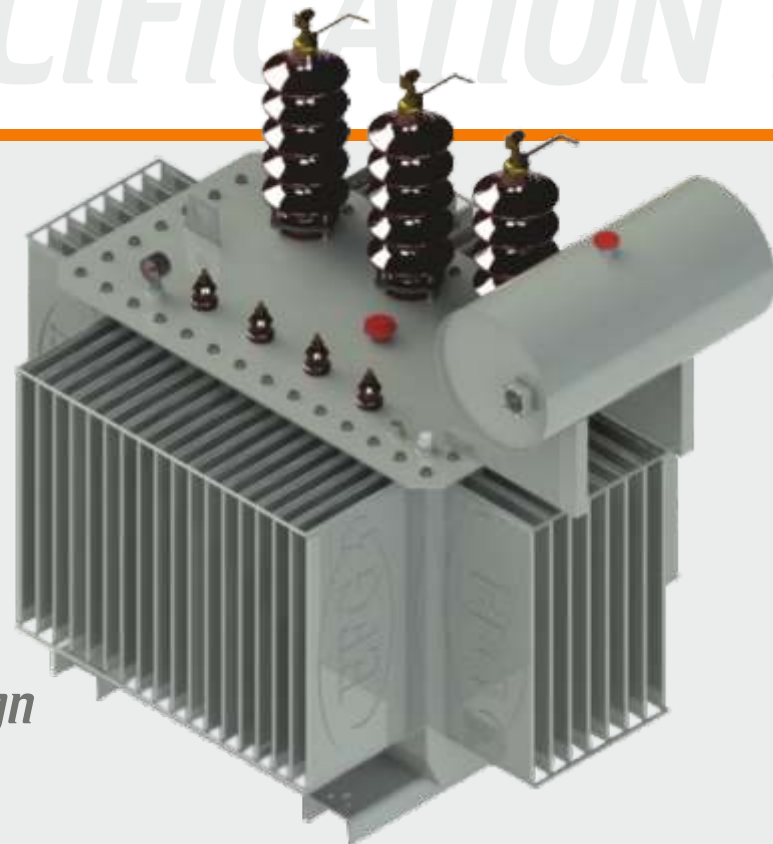


### **Temperature Monitoring**

Indicator thermometer with maximum pointer and two electrical contacts. It has smooth scale up to 120°C . Two micro switches rated at 5 A, 250VAC or 0.2 A, 250 VDC.

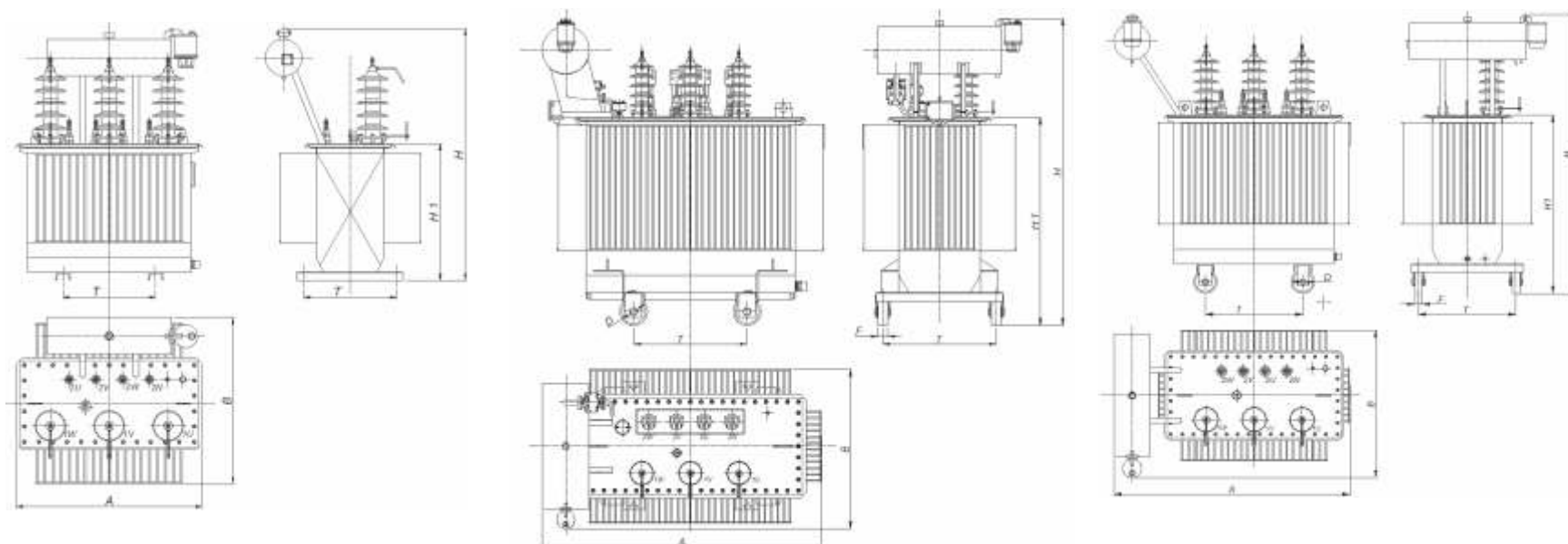


# GENERAL SPECIFICATION S

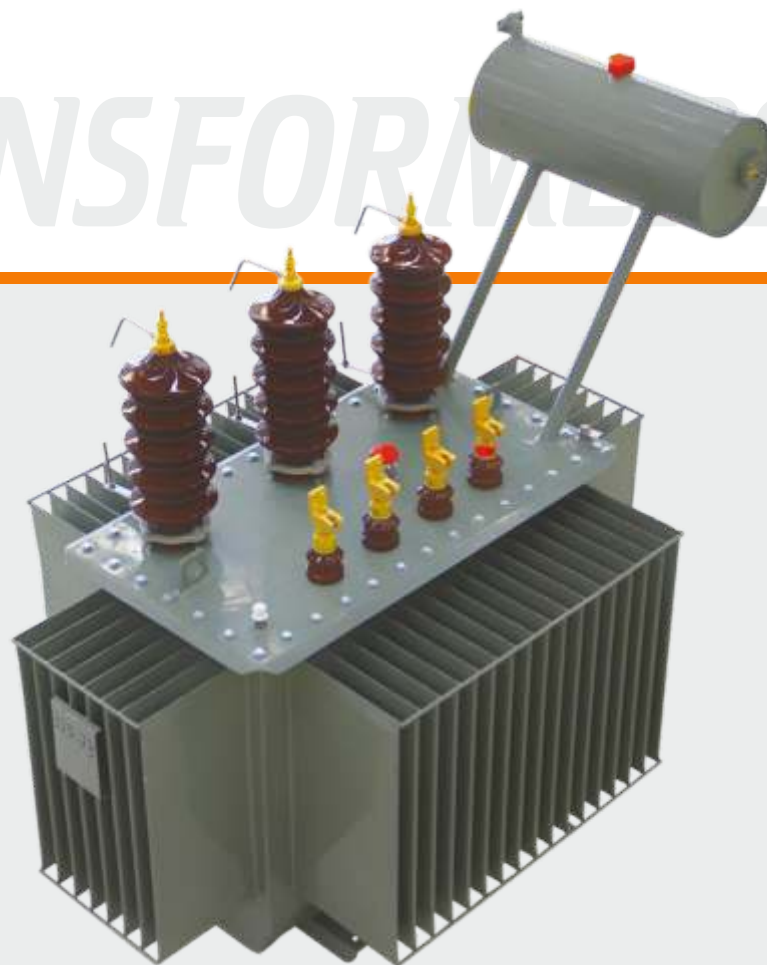


*Three Phase Transformers 25-2500 kVA Design  
Conservator Tank*

## Technical Drawing



# STANDART TRANSFORMERS

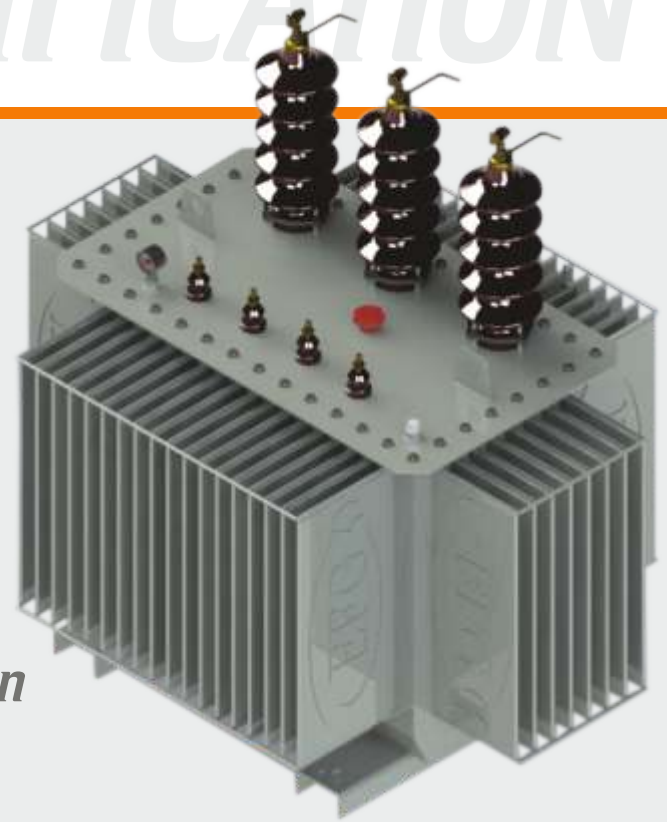


## Standart Transformers

Technical Drawing Tables

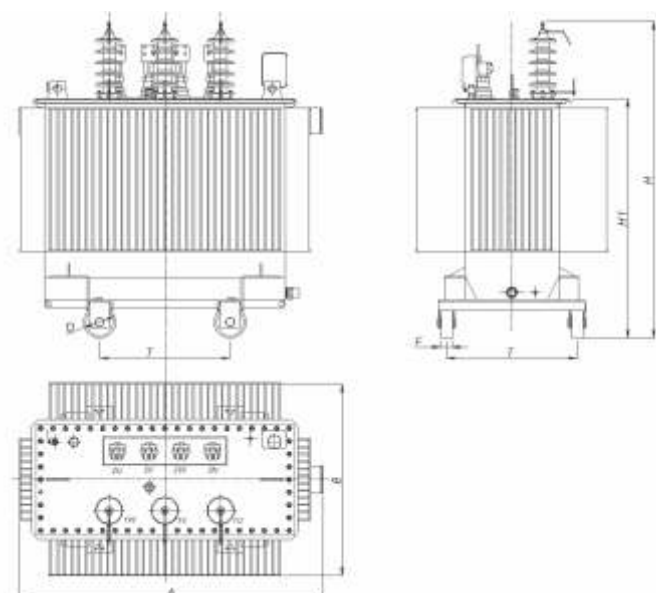
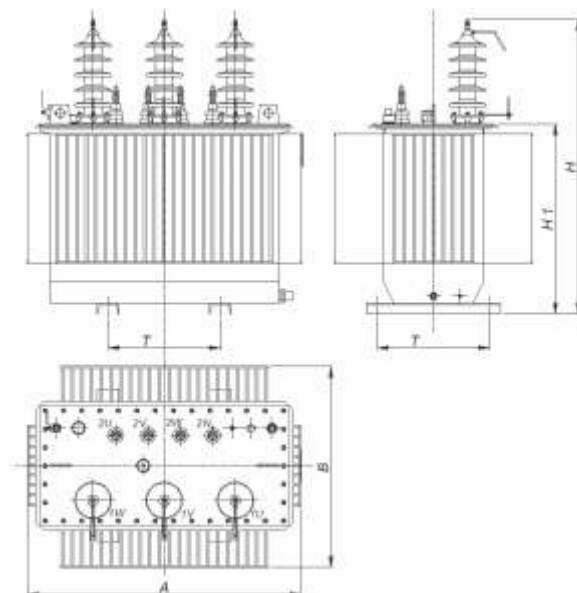
Rated Power kVA/Kv	Vector Group	Imp. Voltg. %	Loses		No-load Current %	Sound Level dB(A)	Length A mm	Width B mm	Hei. H mm	Height Cov. H 1 mm	Oil Weight kg	Total Weight kg	Regulation at Full Load		Efficiency at Full Load	
			Load W	No-load W									pF=0,8	pF=1,0	pF=0,8	pF=1,0
25 / 6,3-15	Yzn11	4	850	140	2.4	53	800	700	1100	700	80	370	3.98	3.42	95.29	96.2
40 / 6,3-15	Yzn11	4	960	160	2.3	53	820	700	1130	700	90	400	3.85	2.45	96.62	97.28
50 / 6,3-15	Yzn11	4	1100	190	2.2	55	850	700	1180	750	100	440	3.77	2.26	96.88	97.48
63 / 6,3-15	Yzn11	4	1280	225	2.1	56	880	720	1200	770	120	470	3.7	2.09	97.1	97.67
80 / 6,3-15	Yzn11	4	1500	280	2.1	58	900	720	1220	790	135	500	3.63	1.94	97.29	97.82
100 / 6,3-15	Yzn11	4	1750	320	2	59	950	720	1250	820	160	620	3.57	1.81	97.48	97.97
125 / 6,3-15	Yzn11	4	2050	360	1.9	60	980	800	1270	840	180	700	3.52	1.71	97.65	98.11
160 / 6,3-15	Yzn11	4	2350	460	1.8	62	1100	850	1310	870	240	930	3.43	1.54	97.85	98.27
200 / 6,3-15	Yzn11	4	2850	650	1.8	63	1140	860	1340	900	250	980	3.41	1.49	97.86	98.28
250 / 6,3-15	Dny11	4	3250	650	1.6	65	1450	700	1450	950	340	1250	3.33	1.37	98.09	98.46
315 / 6,3-15	Dny11	4	3900	770	1.5	66	1500	850	1520	990	350	1350	3.3	1.31	98.18	98.54
400 / 6,3-15	Dny11	4	4600	930	1.5	68	1580	850	1450	950	390	1610	3.24	1.22	98.3	98.64
500 / 6,3-15	Dny11	4	5500	1100	1.4	69	1700	950	1700	1120	430	1650	3.2	1.17	98.38	98.7
630 / 6,3-15	Dny11	4	6500	1300	1.4	70	1700	950	1850	1300	520	2250	3.17	1.11	98.48	98.78
800 / 6,3-15	Dny11	6	8500	1500	1.3	71	1900	900	1900	1330	630	2600	3.9	1.28	98.33	98.66
1000 / 6,3-15	Dny11	6	10500	1700	1.2	73	2050	1200	2030	1320	650	3050	4.47	1.22	98.47	98.77
1250 / 6,3-15	Dny11	6	13000	2100	1.2	74	2100	1300	2050	1340	820	3600	4.46	1.21	98.51	98.8
1600 / 6,3-15	Dny11	6	17000	2600	1.1	76	2100	1320	2100	1500	950	4200	4.48	1.24	98.49	98.79
2000 / 6,3-15	Dny11	6	21000	3200	1	77	2250	1280	2200	1530	1100	5050	4.47	1.22	98.51	98.8
2500 / 6,3-15	Dny11	6	24000	3600	0.9	78	2350	1350	2300	1600	1250	5700	4.41	1.14	98.64	98.91

# GENERAL SPECIFICATION S

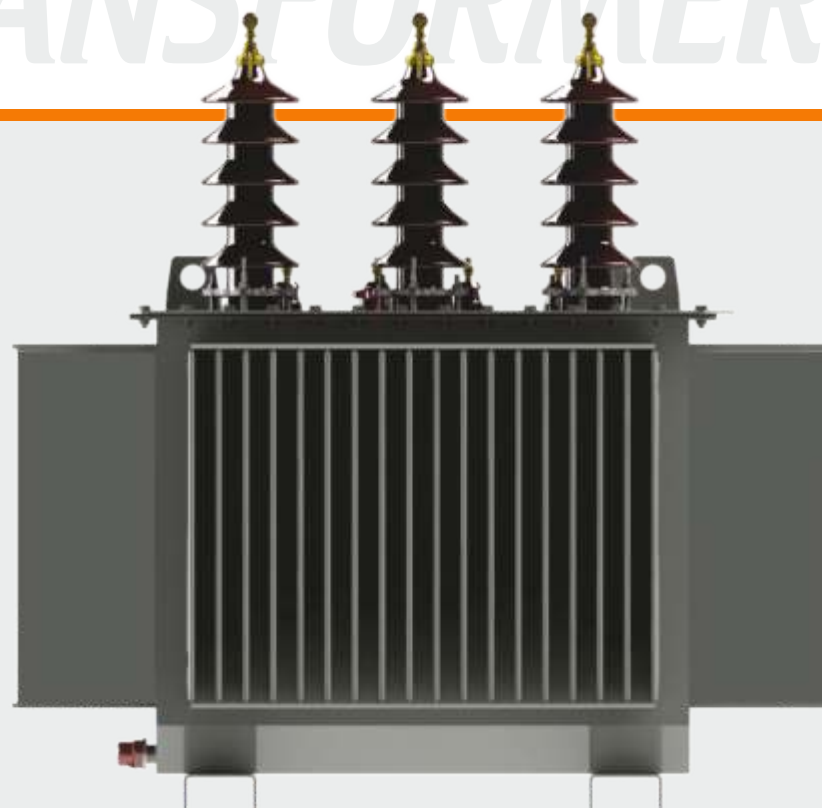


*Three Phase Transformers 25-2500 kVA Design  
Hermetically Sealed Type*

## Technical Drawing



# STANDART TRANSFORMERS



Standart Transformers

Technical Drawing Tables

Rated Power	Vector Group	Imp. Voltg.	Loses		No-load Current	Sound Level	Length A	Width B	Hei. H	Height Cov. H 1	Oil Weight	Total Weight	Regulation at Full Load		Efficiency at Full Load	
			Load	No-load									pF=0,8	pF=1,0	pF=0,8	pF=1,0
kVA/Kv	-	%	W	W	%	dB(A)	mm	mm	mm	mm	kg	kg				
25 / 30	Yzn11	4.5	880	160	3	50	880	750	1250	730	120	420	4.5	3.56	95.06	96.01
40 / 30	Yzn11	4.5	980	190	2.9	50	900	750	1290	740	140	470	4.25	2.52	96.47	97.16
50 / 30	Yzn11	4.5	1250	230	2.7	52	950	800	1320	770	160	490	4.26	2.57	96.43	97.13
63 / 30	Yzn11	4.5	1250	260	2.6	53	980	820	1340	790	180	530	4.03	2.07	97.06	97.66
80 / 30	Yzn11	4.5	1750	320	2.4	54	930	820	1350	810	200	600	4.13	2.26	96.87	97.48
100 / 30	Yzn11	4.5	1950	380	2.2	56	1050	820	1380	830	220	800	4.01	2.03	97.17	97.72
125 / 30	Yzn11	4.5	2400	420	2	57	1050	830	1410	860	240	920	4	2	97.26	97.79
160 / 30	Yzn11	4.5	2550	520	1.9	59	1120	890	1430	880	260	960	3.83	1.68	97.96	98.12
200 / 30	Yzn11	4.5	3500	580	1.8	60	1280	900	1470	920	290	1020	3.91	1.84	97.51	98
250 / 30	Dny11	4.5	3500	780	1.7	62	1500	700	1550	960	370	1290	3.72	1.49	97.9	98.32
315 / 30	Dny11	4.5	5150	850	1.6	63	1550	850	1580	1020	390	1450	3.76	1.55	97.93	98.34
400 / 30	Dny11	4.5	4900	1120	1.6	65	1600	850	1650	1050	430	1650	3.62	1.32	98.15	98.52
500 / 30	Dny11	4.5	6750	1250	1.5	66	1700	1000	1750	1160	450	1700	3.69	1.44	98.04	98.43
630 / 30	Dny11	4.5	6650	1450	1.5	67	1700	1000	1850	1340	640	2350	3.51	1.15	98.42	98.73
800 / 30	Dny11	6	8700	1750	1.4	67	1980	950	2000	1350	740	2750	4.57	1.39	98.28	98.62
1000 / 30	Dny11	6	10500	2000	1.3	68	2080	1150	2050	1300	640	3250	4.47	1.22	98.47	98.77
1250 / 30	Dny11	6	13000	2250	1.3	69	2100	1300	2070	1380	840	3700	4.46	1.21	98.51	98.8
1600 / 30	Dny11	6	17000	2800	1.2	71	2100	1350	2150	1520	1000	4300	4.48	1.24	98.49	98.79
2000 / 30	Dny11	6	21000	3200	1.1	72	2300	1320	2280	1580	1200	5300	4.47	1.22	98.51	98.8
2500 / 30	Dny11	6	24000	3600	1	73	2400	1450	2280	1650	1350	5800	4.41	1.14	98.64	98.91



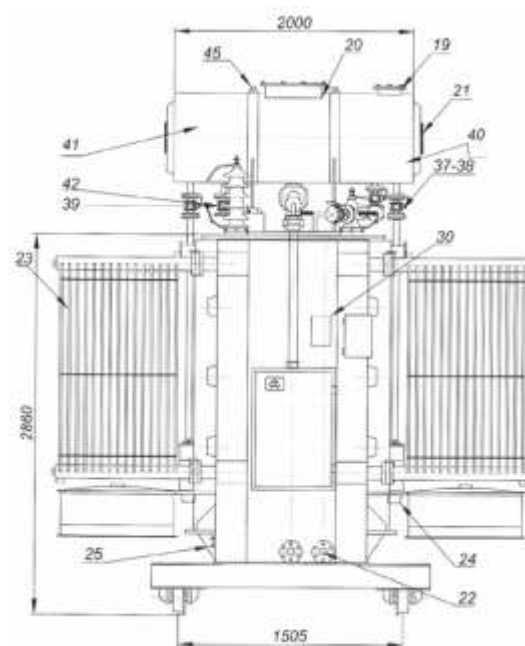
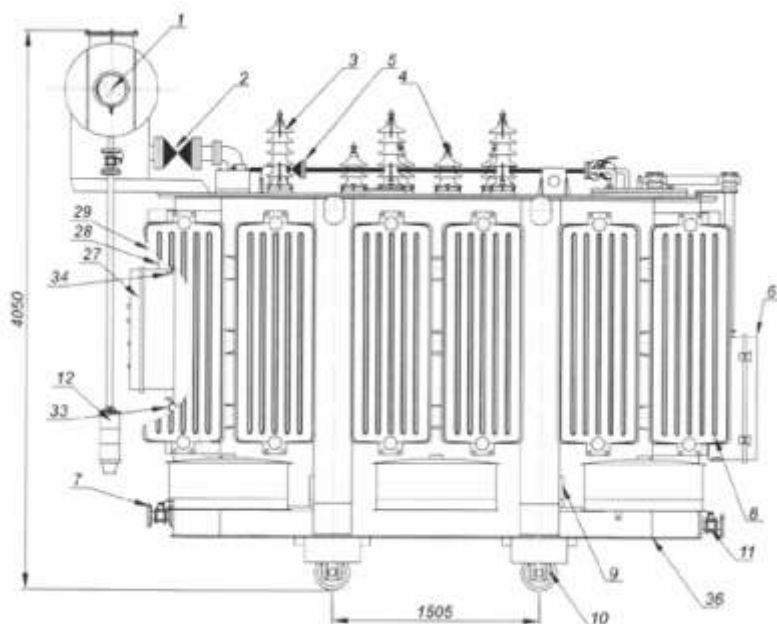
# POWER TRANSFORMERS

## POWER TRANSFORMERS

We are manufacturing power transformers with rated capacity ranging between 3.500 kVA - 100.000 kVA. We are responding to customers' demands without a moment's delay with our engineering staff well experienced on power transformers.



### Technical Drawing

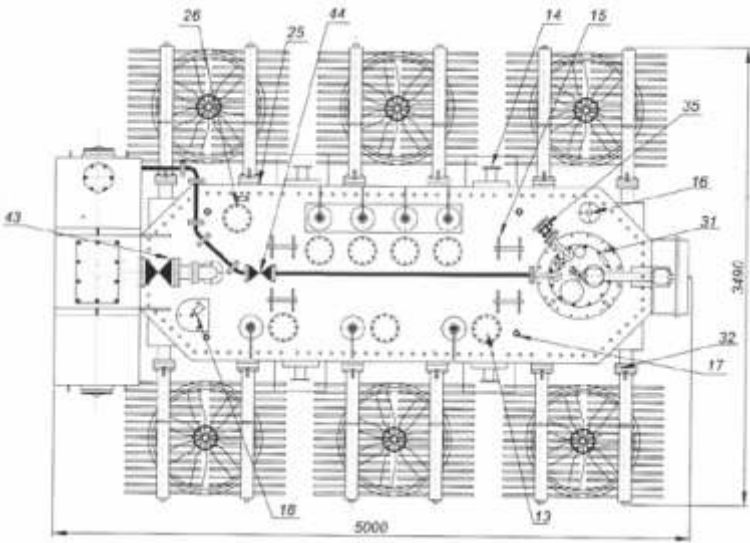


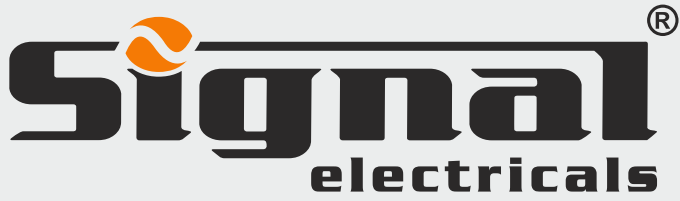
# TECHNICAL DRAWING

## TECHNICAL DRAWING SPECIFICATION

- |   |   |  |
|---|---|--|
| 1. Oil Level Indicator (Transformer)    | 16. Vacuum Valve                                    | 31. On-Load Tap Changer                            |
| 2. Buchholz Relay (Transformer)         | 17. Thermometer Pocket                              | 32. Radiator Butterfly Gates                       |
| 3. H.V. Bushings                        | 18. Pressure Safety Valve                           | 33. Valve To Take Sample (Bottom)                  |
| 4. L.V. Bushings                        | 19. Expansion Reservoir Cover (On-Load Tap Changer) | 34. Valve To Take Sample (Top)                     |
| 5. Buchholz Relay (On-Load Tap Changer) | 20. Expansion Reservoir Cover (Transformer)         | 35. Pressure Relay (On-Load Tap Changer)           |
| 6. Motor Drive Unit                     | 21. Oil Level Indicator (On-Load Tap Changer)       | 36. Transformer Pulling Slot                       |
| 7. Oil Refination Valve (Bottom)        | 22. Oil Refination Valve (Top)                      | 37. Oil Filling Valve of On-Load Tap Changer       |
| 8. Cooling Fans                         | 23. Radiators 15/1000                               | 38. Oil Drain Valve of On-Load Tap Changer         |
| 9. Jack Basis                           | 24. Dehydrating Breather (On-Load Tap Changer)      | 39. Oil Drain Valve of On-Load Tap Changer         |
| 10. 90° Orientable Wheels               | 25. Earthing Terminals                              | 40. Oil Expansion Reservoir of On-Load Tap Changer |
| 11. Oil Drain Valve                     | 26. Earthing Survey Hole                            | 41. Oil Expansion Reservoir of Transformer         |
| 12. Dehydrating Breather (Transformer)  | 27. Fan Control Panel                               | 42. Oil Filling Valve of Transformer               |
| 13. Survey Holes                        | 28. Thermometer with double contact                 | 43. Buchholz Butterfly Gates (Transformer)         |
| 14. Transformer Tank Crane Lifting      | 29. Fan Control Thermometer                         | 44. Buchholz Butterfly Gates (On-Load Tap Changer) |
| 15. Active Part Crane Lifting           | 30. Power Plate                                     | 45. Oil Expansion Reservoir Crane Lifting          |

Technical Drawing





*power and distribution  
transformers*



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