



FABRYKA TRANSFORMATORÓW w Żychlinie

Spółka z ograniczoną odpowiedzialnością

ISO 9001:2000
ISO 14001:2004
PN-N-18001:2004

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POWER TRANSFORMERS

2.5-80 MVA

6-132 kV



Applications

Power transformers are mainly used for voltage reduction in power grids from high voltage HV to medium voltage MV (transformer/switching stations) or for transmission of MV/HV electric energy in combined heat and power stations and wind farms (unit transformers). In addition, power transformers are built for the purpose of MV/MV power switching and transmitting in power grids.

Operating conditions

The transformers in standard version are designed for operation in the conditions of moderate climate.

Maximum installation height for the transformer: 1000 m a.s.l.

Operating place: Open space or the room with sufficient ventilation; atmosphere free of dust and chemically active or explosive gases.

Ambient temperature range: -25°C up to +40°C (248°K up to 313°K), average annual temperature not exceeding +20°C (293°K).

Rated frequency: 50 Hz

The transformers are designed for continuous operation and load conditions comply with the PN-EN 60076-1 and PN-EN 60076-2 standards.

NOTE:

Special versions of transformers complying with other requirements are available on request.

Design

Transformer cores: Three-legged cores made of cold-rolled, low power loss transformer plates covered with inorganic insulating material. Stepped cross-section of the core leg is near-circular with optimal structure designed with the aid of computer software, taking into account the cross-section filling factor and suitable flux density. Both leg and yoke sheets made in the form of strips with chamfered ends are carefully assembled in packets, thus ensuring reduction of no-load losses and noise level. In the splicing area several sheets are mutually offset by several millimeters and form so called Step-Lep cycles.

<i>Transformer windings:</i>	The windings of transformers are made of electrolytic copper with paper insulation consisting of several up to a dozen or so parallel conductors. The cooling system is usually made in the form of wedges and inserts made of insulating pressboard.
<i>Regulation:</i>	The transformer is equipped with in-built on-load tap changer on the HV side. The tap changer is operated by 3x400/230 V, 50 Hz electric motor. Control voltage is 230V, 50 Hz. The tap changer drive can be electrically controlled, both remotely and locally. Moreover the tap changer can be operated manually by using a crank. The tap changer drive is equipped with tap position indicator.
<i>Tanks:</i>	The tank with no additional equipment can withstand the pressure difference between inner and outer pressure equal to ± 500 hPa. The tank design allows lifting the transformer by using hydraulic jacks or by overhead travelling cranes or other types of cranes. The tank is coated with lacquer resistant to atmospheric conditions.
<i>Oil conservator:</i>	The conservator may consist of one or two chambers (in the latter case the separate chamber is designed for on-load tap changer).
<i>Radiators:</i>	Radiators are installed on transformer tank in detachable manner, so they can be removed if a need be. The radiators are equipped with oil draining plugs and deaerating plugs. Since the radiators are mounted to the tank through gate valves, oil in transformer's tank can be separated from radiators. The radiators are available in galvanised or painted version.
<i>Undercarriages and housings:</i>	Transformers are mounted on standard undercarriage with railway gauge of 1505 mm (1435 mm between rails). On Customer request the transformer can be equipped with undercarriage with other rail gauge or be mounted on skids.

Equipment of the transformer

- sample taking valves for testing of oil from top and bottom part of the tank;
- oil draining and filling valves on the tank and conservator and valves for oil filtering;
- plugs in the tank bottom for draining of deposit and oil residues;
- earthing terminals on the tank;
- brackets and lugs for lifting and pulling the transformer;
- adjustable flanged wheels in undercarriage for moving the transformer in two directions; wheel track of 1505/3010 mm.

Bushings:

The following bushings are installed in the transformer cover: three upper side line bushings, one upper side neutral bushing and three lower side bushings.

Control and measuring devices:

- Buchholz relay with contacts for signalling and transformer de-energizing;
- pressure relay for on-load tap changer;
- one or two magnetic indicators for oil level in the conservator (for transformer and tap changer) with signalling contacts operating when oil is below the minimum allowable level;
- two air dehumidifiers;
- dial-type contact thermometer for measuring of oil temperature, with maximum temperature indicator and contacts for signalling and de-energising of the transformer;
- resistance thermometer with indicator, for installation in switching station.
- safety valve with triggering contacts;
- control circuits for protecting devices are connected to terminal box installed on the transformer.

Tolerances:

- no-load losses +15%
- load losses +15%
- total losses +10%
- no-load current +30%
- short-circuit voltage +10%

International standards and requirements:

PN-EN 60076-6	- Power transformers. Reactors)
PN-EN 60076-1	- Power transformers - Part 1. General requirements
PN-EN 60076-2	- Power transformers - Part 2. Temperature rise for liquid-immersed transformers
PN-EN 60076-2	- Power transformers - Part 3. Insulation levels, dielectric tests and external clearances in air
PN-EN 60076-8	- Power transformers - Part 8. Application guide
PN-EN 60076-10	- Power transformers - Part 10. Determination of sound levels
PN-EN 60296	- Fluids for electrotechnical applications. Unused mineral insulating oils for transformers and switchgear

NOTE:

It is possible to build transformers according to other specified standards and requirements.

Exemplary specifications:

Transformers with on-load voltage regulation

Item	Type	Power	Upper side voltage	Lower side voltage	Regulation	Short-circuit voltage	Vector group	No-load losses	On-load losses	Mass, total	Oil mass
		kVA	V	V	%	%	-	W	W	kg	kg
1.	TORc 4000/16,5	4000	16500	6300	±10/±8st	6	YNd11	4000	25000	12000	3300
2.	TORc 6300/16,5	6300	16500	6300	±12/±8st	7	YNyn0	5500	40000	14800	3800
3.	TORc 6300/115	6300	115000	16500	±10/±8st	7,5	YNd11	7500	37000	18200	4500
4.	TORc 8000/10,5	8000	10500	6300	±11	7	Yy0	6000	50000	22000	7000
5.	TORc 10000/30	10000	31500	6300	±2x2,5	7	YNd11	11500	59000	16500	3200
6.	TORc 10000/115	10000	115000	16500	±10/8st	10,5	YNd11	7000	65000	24600	6900
7.	TORc 16000/10,5	16000	10500	6300	±10/8st	8	Yy0	10000	80000	28700	6800
8.	TORc 16000/30F	16000	31500	6300	±10/6st	8	YNd11	11000	95000	31200	7500
9.	TORc 16000/115	16000	150000	16500	±10/8st	12	YNd11	11000	95000	31000	7500
10.	TOTRc 16000/115	16000/16000/10000	115000	16500	±10/9st	11/16/18	YNy0d11	15000	90000/30000/50000	41000	10800
11.	TORc 20000/31,5	20000	31500	6300	±10/8st	8	YNd11	11000	95000	31600	7100
12.	TORc 20000/115	20000	115000	10500	±10/8st	11	YNd11	13900	119000	32500	7500
13.	TORc 25000/13,8	25000	13800	6300	±10/6st	15	Yy0	12000	175000	39800	9800
14.	TORc 25000/115	25000	115000	16500	±10/8st	12	YNd11	14000	130000	42000	9500
15.	TORc 25000/115F	25000	115000	15750	±15/12st	11	YNd11	12000	155000	39000	9000
16.	TORc 31500/115	31500	115000	6300	±10/8st	12	Ynd5	19000	145000	42000	9500
17.	TORc 31500/115F	31500	115000	16500	±10/8st	18	YNd11	15000	155000	41000	9700
18.	TORc 32000/115	32000	115000	15750	±10/8st	16	YNd11	14000	160000	51200	9500
19.	TORc 40000/115	40000	115000	22000	±15/10st	13	YNd11	21000	180000	50000	12400
20.	TORc 40000/115F	40000	115000	21000	±10/8st	11	YNd11	21000	158000	46600	11000
21.	TOTRc 40000/115	40000/25000/40000	115000	6300/15750	±15/12st	18/11/6	YNd11d11	13100	171000	61000	12500
22.	TOTRc 40000/115F	40000/20000/20000	115000	10500/10500	±16/9st	10,5/10,5/25	YNd11d11	21500	150000	58000	13100
23.	TORc 45000/110F	45000	110000	6300	±10/8st	15,75	YNd11	26000	193000	57200	12400
24.	TOTRc 50000/15	50000/25000/25000	15750	6300/6300	±10/8st	8/8/16,5	Yy0y0	21000	120000/120000/280000	66500	17200
25.	TOTRc 50000/115	50000/50000/16670	115000	15750(10500)	±15/10st	18	YNyn0(d5)	17500	245000	67000	19000
26.	TORc 53000/110	53000	110000	20000	±15/10st	14,5	YNd11	25000	230000	65000	14500
27.	TORc 60000/115F	60000	115000	15750	±10/8st	18	YNd11	23000	235000	61000	12500
28.	TORc 69000/112F	69000	112000	20000	±12,5/10st	11,5	Yd11	28000	300000	75000	16200
29.	TORc 80000/121	80000	121000	10500	±10/8st	13,5	YNd11	33000	310000	74500	15000

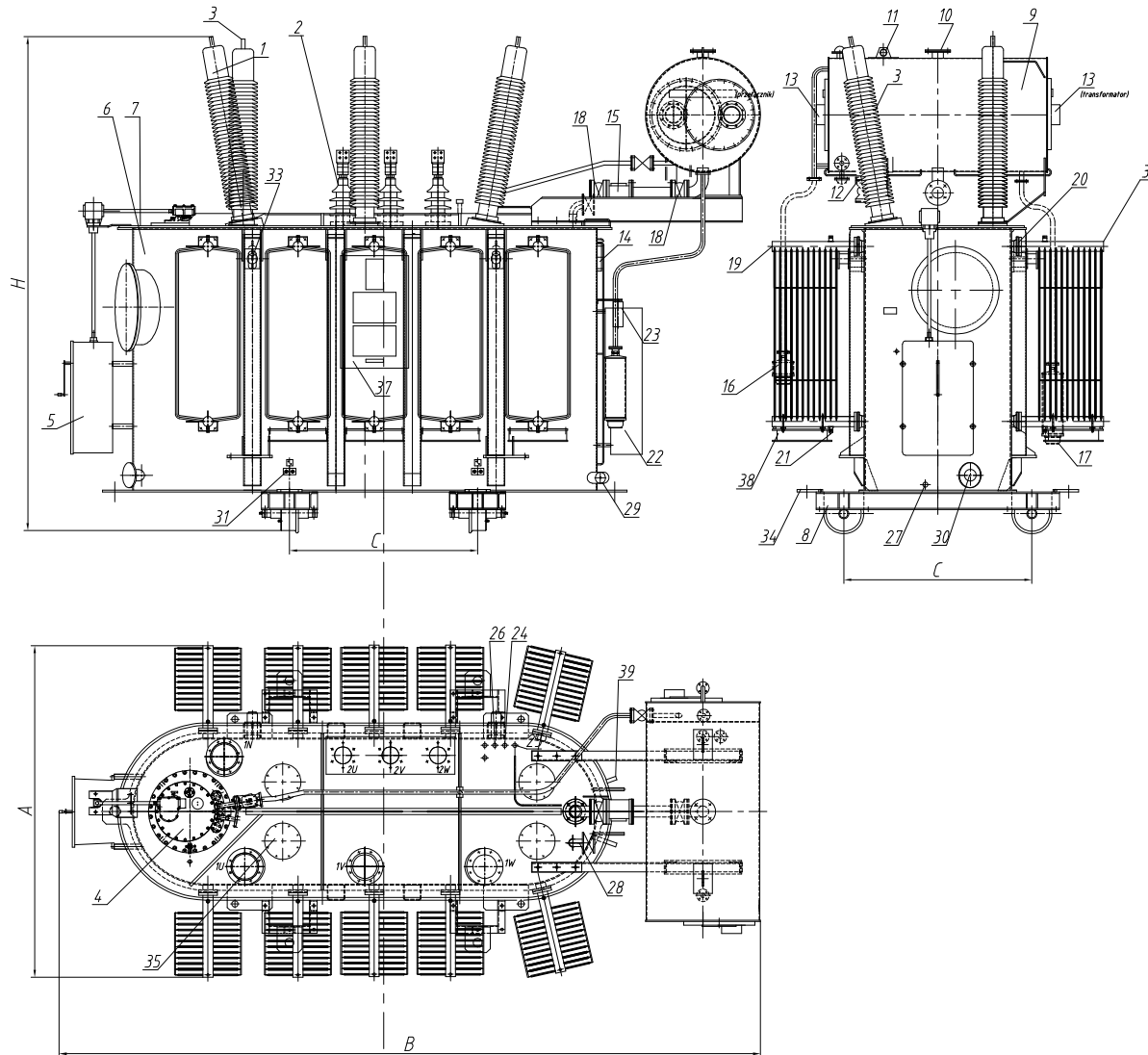
Transformers with off load voltage regulation

Item	Type	Power	Upper side voltage	Lower side voltage	Regulation	Short-circuit voltage	Vector group	No-load losses	Load losses	Mass, total	Oil mass
		kVA	V	V	%	%	-	W	W	kg	kg
1.	TOc 4000/35	4000	35000	6300	±2x2,5	6,5	YNd11	4300	28000	11600	2250
2.	TOc 6300/20	6300	21000	6300	±2x2,5	7	YNyn0	6500	42000	14000	2750
3.	TOc 7500/15	7500	15750	11000	±2x2,5	7	Dd0	6500	46000	15300	3600
4.	TOc 8200/15	8200	15750	15750	±2x2,5	6	Dd0	7500	43000	14500	2900
5.	TOc 10000/15	10000	15750	10500	±2x2,5	7	YNd11	11000	63000	16000	3700
6.	TOc 10000/30	10000	31500	6300	±2x2,5	7	YNd11	11500	59000	16500	3200
7.	TOc 12500/33	12500	32950	1050	±5,335/2st	8	YNd5	6000	67500	23500	3900
8.	TOc 16000/20	16000	21000	10500	±2x2,5	8	YNyn0	17000	100000	32400	6700
9.	TOc 16000/22	16000	22000	22000	±2x2,5/5st	8,5	YNd11	9500	85000	20000	3500
10.	TOc 16000/30	16000	31500	6300	±2x2,5/2st	8	YNd11	9500	85000	22500	3900
11.	TOc 25000/30	25000	31500	6300	±2x2,5	8	YNd11	18000	120000	37000	7500
12.	TOc 30000/110	30000	110000	10500	±10/8st	11	YNd11	21000	145000	42500	8900
13.	TOc 40000/115	40000	150000	10500	±10/4st	12,5	YNd11	20000	140000	68000	16000
14.	TOc 63000/30	63000	33000	10500	±2x2,5	13	YNd11	28000	280000	71000	13600

NOTE:

- *The transformer can be made for the voltage complying with the standard: 6, 10, 15, 20kV or other (from the range of 1-37.5 kV), as well as for various short-circuit voltages, no-load losses and on-load losses.*
- *It is also possible to build the transformer with other, previously agreed additional equipment.*

Dimensional drawing :



1. Upper voltage bushing
2. Lower voltage bushing
3. Neutral bushing
4. Tap changer
5. Tap changer drive
6. Tank
7. Cover
8. Undercarriage
9. Oil conservator
10. Conservator oil filling cap
11. Conservator lifting lugs
12. Oil drain from conservator
13. Magnetic oil level indicator
14. Safety valve
15. Buchholz relay
16. Tap changer air dehumidifier
17. Transformer air dehumidifier
18. Ball valve
19. Radiators
20. Radiator gate valve
21. Residual oil drain from radiator
22. Electric junction box
23. Dial type contact thermometer
24. Contact thermometer sensor
25. Maximum reading thermometer
26. Resistance thermometer socket
27. Residual oil drain
28. Oil filler ball valve
29. Bolts for oil tests
30. Ball valve for oil filling and filtering
31. Earthing bolt
32. Deaerating bolt
33. Pins for lifting the transformer
34. Lugs for pulling the transformer
35. Manholes for lifting of transformer removable part
36. Brackets for lifting the transformer
37. Rating plates
38. Fans
39. Buchholz relay

Approximate dimensions:

Transformers with on-load voltage regulation

Item	Type	A	B	C	H
		mm	mm	mm	mm
1.	TORc 4000/15	2560	4150	1505	2730
2.	TORc 6300/16,5	2740	4150	1505	2890
3.	TORc 6300/115	2810	4995	1505	3350
4.	TORc 8000/10,5	2630	4535	1505	3844
5.	TORc 10000/30	2880	3715	1505	3270
6.	TORc 10000/115	2900	5500	1505/3010	3715
7.	TORc 16000/10,5	2900	5410	1505	3935
8.	TORc 16000/30F	2730	5200	1505	3800
9.	TORc 16000/115	3090	5400	1505/3010	3900
10.	TOTRc 16000/115	3365	5960	1505/3010	5165
11.	TORc 20000/31,5	3115	5080	1505/3010	4030
12.	TORc 20000/115	3090	5320	1505/3010	4050
13.	TORc 25000/13,8	3150	5620	1505/3010	4035
14.	TORc 25000/115	3350	6180	1505/3010	4200
15.	TORc 25000/115F	2900	5700	1505/3010	4180
16.	TORc 31500/115	3110	5730	1505/3010	4320
17.	TORc 31500/115F	3360	6100	1505/3010	4230
18.	TORc 32000/115	3225	6185	1505/3010	4290
19.	TORc 40000/115	3430	6210	1505/3010	4450
20.	TORc 40000/115F	3030	6010	1505/3010	4470
21.	TOTRc 40000/115	3150	6100	1505/3010	4750
22.	TOTRc 40000/115F	3080	5730	1505/3010	4670
23.	TORc 45000/110F	4060	6260	1505/3010	4990
24.	TOTRc 50000/15	3940	7040	1505/3010	4515
25.	TOTRc 50000/115	3440	6550	1505/3010	4850
26.	TORc 53000/110	3800	6300	1505/3010	4660
27.	TORc 60000/115F	3500	6120	1505/3010	4700
28.	TORc 69000/112F	3905	6510	1505/3010	5225
29.	TORc 80000/121	3950	6480	1505/3010	5265

Transformers with off load voltage regulation

Item	Type	A	B	C	H
		mm	mm	mm	mm
1.	TOc 4000/35	2400	3135	1505	3040
2.	TOc 6300/20	2180	3240	1505	3485
3.	TOc 7500/15	2630	3620	1524	3350
4.	TOc 8200/15	2890	3435	1505	2815
5.	TOc 1000/15	2460	3860	1505	3610
6.	TOc 10000/30	2880	3715	1505	3270
7.	TOc 12500/33	2750	4000	1505	3300
8.	TOc 16000/20	3010	4720	1505	4065
9.	TOc 16000/22	2380	4040	1505	3580
10.	TOc 16000/30	2750	3910	1505	3280
11.	TOc 25000/30	2940	4450	1505	4430
12.	TOc 30000/110	3670	5435	1505/3010	4325
13.	TOc 40000/115	3920	6570	1524/2000	5100
14.	TOc 63000/30	4170	5980	1505/3010	4800

NOTE:

- *The manufacturer reserves the right to change specifications presented in the catalogue and resulting from product modernisation.*
- *Other versions can be agreed with the factory.*
- *The Factory is providing in-warranty and post-warranty service, inspections and repairs of its products.*