



We  
Transform  
energy



Liquid immersed  
distribution transformers

Up to 5000 kVA | Up to 72,5 kV

# Liquid immersed distribution transformers



Diseño Gráfico:  
Departamento de Marketing y Comunicación de IMEfy S.L.

# Introduction

Since its founding in 1973 as a Company dedicated to the manufacture of liquid immersed distribution transformers, IMEFY, has developed a continuous growth, both technological as expansion, becoming a world leader as a manufacturer of a wide range of transformers, including:

- Liquid immersed distribution transformers up to 5000 kVA and 72,5 kV
- Power transformers up to 160 MVA and 245 kV
- Cast resin transformers up to 20 MVA and 36 kV
- Instrument transformers up to 36 kV and 2000 A
- IMGS Line, integration service of our transformers in electric rooms, enclosures for photovoltaic inverters and transformation centers

To this wide range of products, it is joined now transformers designed and manufactured according to the European Regulation n. 548/2014 of the Commission on May 21, 2014 (ECODESIGN), thus offering our customers high-efficiency transformers with low losses according to IMEFY commitment regarding Energy Efficiency, Sustainable Development and Reducing Gas Emissions Greenhouse gas (GHG).

The high standards of quality and reliability of our transformers is one of the hallmarks of IMEFY. This feature, along with the satisfaction and confidence of our customers, and the technological means of the latest generation, have allowed IMEFY develop a global expansion, with our transformers installed all over the world.

To do this, we count on the following Companies which comprise IMEFY GROUP:

- IMEFY SPAIN, located in Los Yébenes, as the central headquarters, manufactures all the range of Transformers
- IMEFY ITALY, located in Arezzo, manufactures cast resin Transformers.
- IMEFY POLSKA, located in Świebodzice, is the distribution agent and store of IMEFY products in Eastern Europe.
- IMEFY CHILE, located in Santiago de Chile, provides service to the emerging renewables sector, with the IMGS Line.
- EUROMATEL, located in Oporto is the distributor and representative of IMEFY transformers to cover Portugal and Portuguese-speaking African countries.
- IMEFY ROMÂNIA located in Buzău is the distributor and representative of the IMEFY transformers to cover Romania and Moldova.

All this technology and international coverage allows IMEFY GROUP cover any requirement of customers, being able to adapt our transformers to particular specifications or standards of the country or specific customer.

# Construction Features

This brochure describes liquid immersed distribution transformers up to 2500 KVA and 36 kV.

(Note: For higher power and insulation level, please consult IMEFY).

These transformers have different fields of application, such as:

- Distribution, pole mounted, indoor and substation.
- Generation, such as wind farms, solar plants, thermal and hydraulic power.
- Special applications, as engine power, railway applications, rectifiers, etc...

Our transformers are designed and manufactured to meet the highest Quality Standards. For this, we use the most advanced technological means both for the calculation and design as production means, processes and manufacture treatments. The main characteristics of our standard manufacture are:

- Automatic cutting and stacking of magnetic cores.
- Step-lap core.
- Copper or aluminium windings, both cylindrical and oval.
- Elastic tanks hermetically sealed or with an oil conservator.
- With different accessories as:
  - HV and LV bushings.
  - Off-load tap changer.
  - Overpressure valve.
  - R.I.S. Device (protection and filling device).
  - Lifting lugs.
  - Oil Vertical level.
  - Magnetic oil level indicator.
  - Buchholz relay.
  - Dehydrating breather.
  - Thermometer.
  - Oil drain valve.
  - Rating plate
  - Orientable wheels.
  - Earthings.
- Different options and accessories are:
  - Polymeric or plug-in H.V. bushings.
  - Busbar L.V. bushings.
  - HV and LV terminal box.
  - Galvanized tanks with different paint processes for adverse environmental or highly corrosive conditions.
  - Forced cooling.
  - Possibility to manufacture transformers with losses lower than those in the Standards, according to Customer requirements, etc...
- Level of losses according to Standards in force, whose designation, according to the nomenclature used in the Standard, can be classified into:



	Normal	Reduced	Extra reduced	Ecodesign
24kV	CkE0	CkD0	BkB0	CkA0 (< 1250 KVA)
				BkA0 ( $\geq$ 1250 KVA)
36kV	BK36C036	BK36B036	AK36A036	Ck+10%A0+15% (< 1250 KVA)
				Bk+10%A0+15% ( $\geq$ 1250 KVA)

Note: See values of losses in tables included below.

Materials used to manufacture our transformers pass strict quality controls before their use to ensure the maximum reliability and security of the end product.

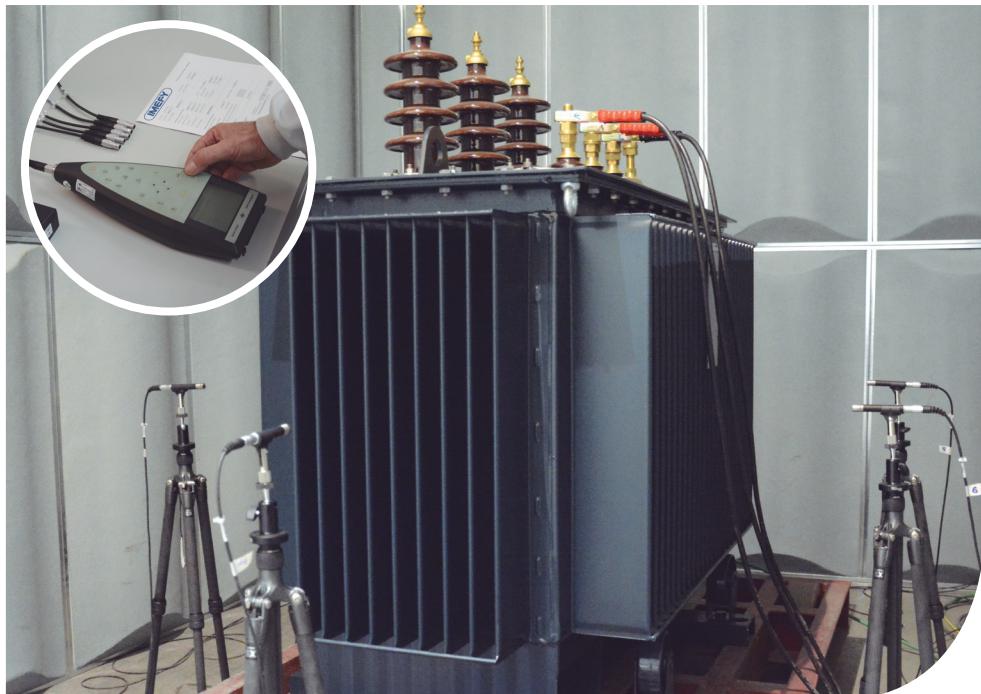
All the above is verified by the "N" Quality AENOR Certificate, Quality, Environmental and Safety and Health at Work Management Systems, according to ISO 9001:2008, ISO 14001:2004 and OHSAS 18001:2007 respectively.

Apart from these certificates, IMEFY transformers are qualified by many Electric Utilities around the world, and tested by Independent Official Laboratories as CESI, KEMA, TECNALIA, LCOE....

To get all these approvals and certifications IMEFY has made significant investments in Electric Laboratories, with all the necessary equipment to perform routine tests on each transformer, as defined in IEC 60076, as well as all the Special and Type tests also included in the Standard, which are made upon request according to requirements agreed with the customer.

IMEFY also has a Chemical laboratory that allows to test raw materials, operational processes and final tests which are necessary to verify the high quality required.

In the same way, with the Standard change (low level of noise in transformers), IMEFY has developed a newly acoustic laboratory, which provides a reduction of background noise around 40 dB thanks to its technology and innovation, using absorbent material which covers the walls and ceiling of the chamber. This material consists of a glass fiber preform with an average coefficient of sound absorption  $\alpha_m=0,84$  (class C).



# Ecodesign Transformers

Due to new trends regarding Legislation, focused on Energy Efficiency and Sustainable Development, IMEFY has created a research team to perform development studies, continuous improvement and energy efficiency of liquid immersed distribution transformers, from the beginning to the end of their useful life.

This R&D team researches and develops mechanism to achieve increasingly efficient products, from:

- Raw materials procurement (vegetable oils, high-quality magnetic steel, etc...)
- Processes Development to reduce potential CO<sub>2</sub> equivalent emissions and development of an Energy Plan.
- Greater Energy Efficiency throughout the useful life of transformers, which means an increase of this useful life.
- Recycling of materials at the end of life of transformer.

All these studies and investigations, some of them in collaboration with Spanish government, allow IMEFY to offer low-losses transformers according to the European Regulation 548/2014 dated on 21th, May, 2014, which is mandatory from 1st July 2015 for all states of the European Union.

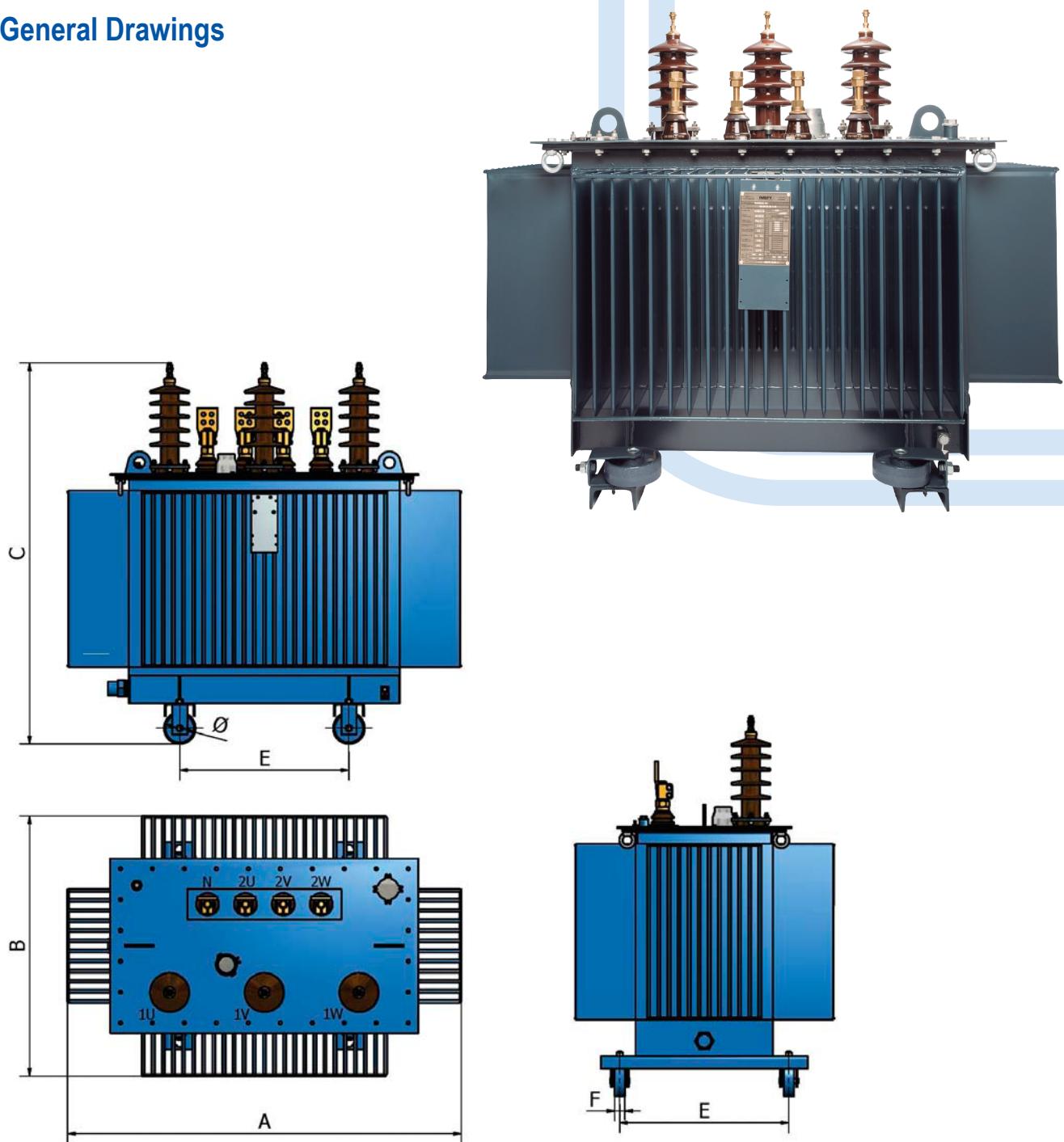
These low losses, which can involve at first an increase in the cost of the transformer due to the special used materials, entail an increased energy efficiency, reduced operating costs and hence in a return on short term investment, according to existing evidence based on mathematical formulas, throughout the lifetime of the transformer.

## Losses Table

Power	Load Losses and No load Losses (W) Um ≤ 24 kV								Rated Impedance Voltage (%)
	Ck	Bk	Ak	E0	D0	C0	B0	A0	
50	1100	875	750	190	145	125	110	90	4
100	1750	1475	1250	320	260	210	180	145	
160	2350	2000	1700	460	375	300	260	210	
250	3250	2750	2350	650	530	425	360	300	
400	4600	3850	3250	930	750	610	520	430	
630	6500	5400	4600	1300	1030	860	730	600	
630	6750	5600	4800	1200	940	800	680	560	
800	8400	7000	6000	1400	1150	930	800	650	
1000	10500	9000	7600	1700	1400	1100	940	770	
1250	13500	11000	9500	2100	1750	1350	1150	950	
1600	17000	14000	12000	2600	2200	1700	1450	1200	
2000	21000	18000	15000	3100	2700	2100	1800	1450	
2500	26500	22000	18500	3500	3200	2500	2150	1750	

Power	Load Losses and No load Losses (W) Um = 36 kV						Rated Impedance Voltage (%)
	Ck36	Bk36	Ak36	C036	B036	A036	
50	1450	1250	1050	230	190	160	4,5
100	2350	1950	1650	380	320	270	
160	3350	2550	2150	520	460	390	
250	4250	3500	3000	780	650	550	
400	6200	4900	4150	1120	930	790	
630	8800	6500	5500	1450	1300	1100	
800	10500	8400	7000	1700	1500	1300	
1000	13000	10500	8900	2000	1700	1450	
1250	16000	13500	11500	2400	2100	1750	
1600	19200	17000	14500	2800	2600	2200	
2000	24000	21000	18000	3400	3150	2700	
2500	29400	26500	22500	4100	3800	3200	

## General Drawings



See dimensions in page 8.



## Dimensions and weights

POWER (kVA)	INSULATION LEVEL (kV)	RATED IMPEDANCE VOLTAGE (%)	LOSSES (W)	APPROXIMATE DIMENSIONS (mm)						WEIGHTS (kg)				NOISE LEVEL dB (A) SOUND PRESSURE	
				COPPER			ALUMINUM			COPPER		ALUMINIUM		0,3m	1m
				Length(A)	Width(B)	Height(C)	Length(A)	Width(B)	Height(C)	Oil	Total	Oil	Total		
50	24	4	CkE0	870	670	1250	960	670	1280	100	420	150	550	46	41
			CkD0	910	670	1200	980	670	1290	110	460	160	590	44	39
			BkB0	920	730	1050	1080	710	1270	100	450	170	600	36	31
			CkA0	940	680	1150	1030	670	1230	110	510	135	590	39	25
	36	4,5	Bk36C036	910	670	1300	1010	670	1350	110	450	170	590	46	41
			Bk36B036	870	670	1300	1010	670	1350	110	450	170	595	46	41
			Ak36A036	950	670	1280	1110	700	1340	100	440	190	590	44	39
			Ck(+10%)A0(+15%)	940	680	1200	1100	700	1280	110	490	160	620	39	25
100	24	4	CkE0	1050	670	1260	1070	690	1340	140	600	200	720	50	45
			CkD0	1050	670	1260	1090	690	1320	140	610	190	730	48	43
			BkB0	990	730	1110	1120	760	1320	130	630	200	750	38	33
			CkA0	1020	720	1240	1090	720	1280	150	780	160	750	41	27
	36	4,5	Bk36C036	1050	670	1310	1120	700	1420	140	590	190	730	50	45
			Bk36B036	1050	670	1310	1070	690	1400	140	600	195	720	50	45
			Ak36A036	1120	670	1290	1170	750	1370	160	620	200	740	48	43
			Ck(+10%)A0(+15%)	1020	720	1290	1120	730	1330	150	750	180	790	41	27
160	24	4	CkE0	1190	710	1260	1230	730	1360	170	810	210	840	53	48
			CkD0	1190	710	1300	1200	730	1370	180	820	220	900	51	46
			BkB0	1130	730	1190	1220	770	1360	180	900	240	990	41	36
			CkA0	1100	760	1280	1180	760	1360	180	1000	220	160	44	30
	36	4,5	Bk36C036	1170	710	1340	1190	730	1450	170	800	240	860	53	48
			Bk36B036	1180	720	1350	1190	730	1430	190	810	245	890	53	48
			Ak36A036	1140	670	1400	1220	760	1410	180	810	240	960	51	46
			Ck(+10%)A0(+15%)	1100	760	1330	1180	760	1410	185	980	220	1080	44	30
250	24	4	CkE0	1270	820	1280	1340	820	1420	200	980	270	980	56	51
			CkD0	1150	820	1280	1330	820	1410	200	970	270	1090	54	49
			BkB0	1190	820	1320	1290	820	1450	230	1110	300	1220	44	39
			CkA0	1130	820	1360	1220	820	1420	220	1360	250	1420	44	39
	36	4,5	Bk36C036	1150	820	1360	1330	820	1420	220	1300	250	1330	47	33
			Bk36B036	1150	820	1310	1330	820	1460	220	1000	270	1080	56	51
			Ak36A036	1220	820	1450	1280	820	1480	220	1000	300	1130	54	49
			Ck(+10%)A0(+15%)	1150	820	1430	1220	820	1470	235	1290	260	1300	47	33
400	24	4	CkE0	1440	950	1300	1460	820	1470	240	1230	360	1370	58	53
			CkD0	1440	950	1300	1440	820	1510	250	1270	360	1460	56	51
			BkB0	1250	820	1400	1400	820	1580	280	1460	410	1750	46	41
			CkA0	1260	820	1460	1290	820	1540	315	1860	340	1850	50	36
	36	4,5	Bk36C036	1380	950	1460	1460	820	1520	270	1230	350	1380	58	53
			Bk36B036	1380	950	1460	1460	820	1520	270	1270	330	1380	58	53
			Ak36A036	1320	870	1470	1400	820	1630	260	1340	400	1700	56	51
			Ck(+10%)A0(+15%)	1310	820	1510	1300	820	1590	310	1780	370	1720	50	36
630	24	4,6,6	CkE0	1570	1050	1400	1580	850	1630	325	1680	470	1890	60	55
			CkD0	1570	1050	1400	1610	850	1630	340	1770	480	2010	58	53
			BkB0	1410	860	1460	1490	840	1670	370	1970	530	2100	48	43
			CkA0	1420	880	1480	1470	870	1690	380	2360	480	2560	52	38
	36	4,5	Bk36C036	1570	1050	1490	1610	850	1700	340	1760	470	1900	60	55
			Bk36B036	1570	1050	1480	1610	850	1690	330	1790	475	2020	60	55
			Ak36A036	1540	880	1640	1500	840	1720	430	2090	530	2050	58	53
			Ck(+10%)A0(+15%)	1500	900	1530	1500	870	1740	390	2250	490	2350	52	38

POWER (kVA)	INSULATION LEVEL (kV)	RATED IMPEDANCE VOLTAGE (%)	LOSSES (W)	APPROXIMATE DIMENSIONS (mm)						WEIGHTS (kg)				NOISE LEVEL dB (A) SOUND PRESSURE	
				COPPER			ALUMINIUM			COPPER		ALUMINIUM		0,3m	1m
				Length(A)	Width(B)	Height(C)	Length(A)	Width(B)	Height(C)	Oil	Total	Oil	Total		
800	24	6	CkE0	1740	1190	1410	1740	910	1640	400	2050	540	2140	61	56
			CkD0	1860	1290	1410	1760	910	1660	440	2160	520	2360	61	56
			BkB0	1650	990	1530	1720	920	1740	500	2390	720	2730	49	54
			CkA0	1520	940	1540	1640	920	1720	490	2730	500	2900	53	39
	36	6	Bk36C036	1860	1290	1550	1760	910	1710	440	2090	510	2300	61	56
			Bk36B036	1860	1290	1550	1760	910	1710	440	2150	510	2350	61	56
			Ak36A036	1810	1130	1650	1720	940	1770	440	2210	710	2560	59	54
			Ck(+10%)A0(+15%)	1640	970	1610	1660	920	1780	500	2700	500	2700	53	39
1000	24	6	CkE0	1940	1340	1500	1910	1070	1670	540	2540	650	2570	61	56
			CkD0	1920	1320	1530	1960	1100	1690	510	2600	665	2670	61	56
			BkB0	1760	1090	1580	1750	960	1780	510	2650	800	2870	50	45
			CkA0	1690	1050	1610	1690	1030	1740	510	3030	510	3300	55	41
	36	6	Bk36C036	1920	1320	1590	1910	1070	1730	510	2510	650	2380	61	56
			Bk36B036	1920	1320	1590	1910	1070	1730	510	2590	650	2380	61	56
			Ak36A036	1870	1180	1680	1750	1000	1790	500	2610	790	2980	59	54
			Ck(+10%)A0(+15%)	1700	1060	1680	1700	1040	1800	510	2900	510	3000	55	41
1250	24	6	CkE0	1970	1300	1570	2100	1230	1840	630	3050	790	3330	62	57
			CkD0	1970	1300	1570	2100	1230	1840	630	3050	790	3330	62	57
			BkB0	2010	1090	1890	2020	1000	1860	810	4090	1020	4040	51	46
			BkA0	1760	1060	1750	1800	1040	1900	670	3800	840	4150	56	42
	36	6	Bk36C036	1950	1300	1710	2100	1230	1890	650	3100	840	3320	62	57
			Bk36B036	1950	1300	1710	2100	1230	1890	650	3100	840	3320	62	57
			Ak36A036	1960	1200	1820	2000	1020	1890	680	3150	930	3620	60	55
			Bk(+10%)A0(+15%)	1730	1080	1020	1820	1060	1960	670	3600	860	3800	56	42
1600	24	6	CkE0	2200	1360	1800	2260	1290	1900	900	4000	1090	4170	63	58
			CkD0	2220	1360	1800	2260	1290	1900	900	4000	1090	4170	63	58
			BkB0	2240	1260	1840	2170	1120	1880	910	4290	1120	4480	53	48
			BkA0	2010	1070	1980	2150	1050	2060	950	5030	1250	5400	58	23
	36	6	Bk36C036	2160	1360	1870	2260	1290	1950	790	3640	1020	4180	63	58
			Bk36B036	2160	1360	1870	2260	1290	1950	790	3750	1090	4180	63	58
			Ak36A036	2210	1290	1900	2170	1160	1990	890	3860	1160	4470	61	56
			Bk(+10%)A0(+15%)	2000	1100	2050	2180	1080	2120	950	4800	1270	4900	58	43
2000	24	6	CkE0	2280	1400	1850	2450	1400	2010	950	4450	1390	5200	65	60
			CkD0	2280	1400	1850	2450	1400	2010	950	4450	1390	5200	65	60
			BkB0	2360	1340	1950	2360	1250	2040	1140	5140	1390	5620	55	50
			BkA0	2210	1150	2070	2300	1090	2220	1180	6120	1480	6500	60	44
	36	6	Bk36C036	2280	1400	1980	2450	1400	2060	950	4310	1370	5210	65	60
			Bk36B036	2280	1400	1980	2450	1400	2060	950	4440	1370	5210	65	60
			Ak36A036	2380	1400	2010	2360	1320	2100	1090	4730	1400	5380	63	58
			Bk(+10%)A0(+15%)	2180	1160	2130	2320	1100	2280	1180	5900	1530	5900	60	44
2500	24	6	CkE0	2420	1470	2000	2590	1500	2100	1280	6000	1530	6290	68	63
			CkD0	2420	1470	2000	2590	1500	2100	1280	6000	1530	6290	68	63
			BkB0	2470	1410	2080	2550	1370	2100	1360	6280	1700	7000	58	53
			BkA0	2380	1410	2100	2450	1410	2290	1320	7000	1750	8150	63	47
	36	6	Bk36C036	2420	1470	2150	2590	1500	2100	1280	5770	1530	6300	68	63
			Bk36B036	2420	1470	2150	2590	1500	2100	1280	5950	1530	6300	68	63
			Ak36A036	2470	1460	2060	2530	1450	2180	1340	5740	1570	6350	65	60
			Bk(+10%)A0(+15%)	2430	1410	2180	2460	1410	2310	1300	6700	1680	7400	63	47

# Standard Accessories



3a



3c



4a



4c



5



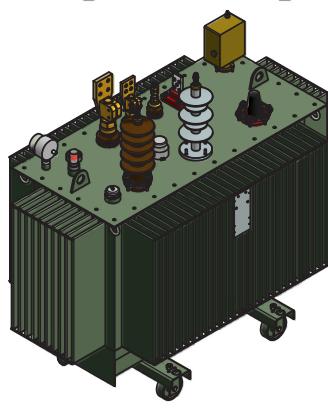
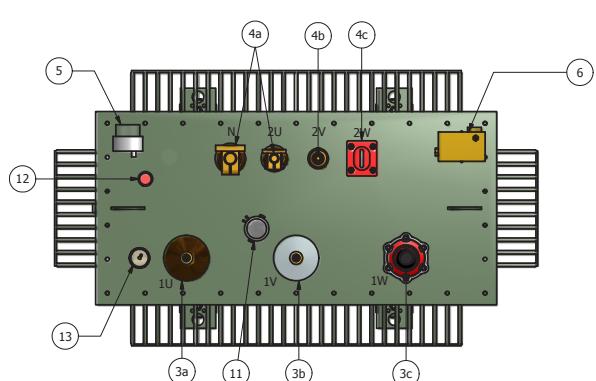
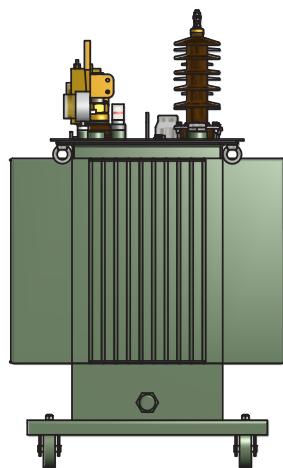
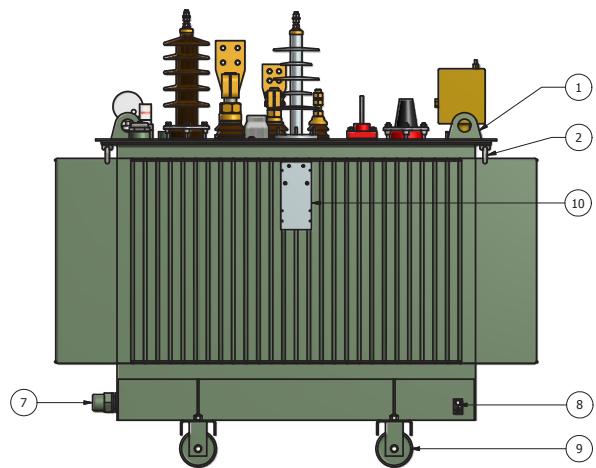
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12



13



- |    |  |
|----|--|
| 1  | Lifting lugs                                     |
| 2  | Pull eyebolts                                    |
| 3a | HV bushings (porcelain)                          |
| 3b | HV bushings (polymeric)                          |
| 3c | HV bushings (Plug-in)                            |
| 4a | LV bushings (porcelain with connection plate)    |
| 4b | LV bushings (porcelain without connection plate) |
| 4c | LV bushings (busbar)                             |
| 5  | Thermometer                                      |
| 6  | Filling and protection device                    |
| 7  | Oil drain valve                                  |
| 8  | Earthings  |
| 9  | Orientable wheels 90°                            |
| 10 | Rating plate                                     |
| 11 | Tap changer                                      |
| 12 | Oil level indicator                              |
| 13 | Overpressure valve                               |

# Tests

## Routine tests according to standard IEC 60076-1

- Measurement of winding resistance.
- Measurement of voltage ratio and check of phase displacement.
- Measurement of short-circuit impedance and load losses.
- Measurement of no-load losses and current at 100% of rated voltage
- Dielectric routine tests.
- Test on on-load tap changers, if necessary.
- Leak testing with pressure for liquid immersed transformers.
- Tightness test and pressure test for tanks for gas-filled Transformers.
- Check of the ratio and polarity of built-in transformers.
- Check of core, frames and tank insulation.

## Special tests according to standard IEC 60076-1

- Special dielectric tests.
- Windings hot spot temperature-rise measurements.
- Measurement of capacitances windings-to-earth and between windings.
- Measurement of dissipation factor ( $\tg \delta$ ) of the insulation system capacitances.
- Determination of transient voltage transfer characteristics.
- Measure of zero-sequence impedance.
- Short-circuit withstand test (performed in Independent Laboratory).
- Measurement of d.c. insulation resistance between each winding to earth and between windings.
- Measurement of frequency response (FRA).
- Vacuum deflection test.
- Pressure deflection test.
- Vacuum tightness test on site for liquid immersed transformers.
- Check of external coating.
- Measurement of dissolved gasses in dielectric liquid.
- Mechanical test or assessment of tank for suitability for transport.
- Determination of weight with transformer arrange for transport.

## Type tests according to standard IEC 60076-1

- Temperature rise test.
- Dielectric type tests.
- Determination of sound level.
- Measure of power taken by the fan and liquid pump motors.
- Measurement of no-load losses and current at 90% and 110% of rated voltage.



Test desk



IMEFY follows a continuous improvement policy, and reserves the right to modify this Handbook without prior notice, not acquiring any responsibilities for it. The content of this handbook is to provide information, it does not imply any commitment. Please, contact IMEFY for information.



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