Grid Solutions
a GE and Alstom joint venture

INSTRUMENT TRANSFORMERS PRODUCT SOLUTIONS

OTEF

Voltage Transformers
72.5 kV to 550 kV

Thousands of Grid Solutions' voltage transformers are in service worldwide, some for more than 30 years. In all types of climates and under the most severe conditions, they give full satisfaction to the most exacting customers.

Grid Solutions manufactures a complete range of high voltage oil-filled voltage transformers. OTEF is a tank-type inductive voltage transformer with post insulator.

DESIGN

For OTEF up to 420 kV, the design incorporates a primary coil housed in the tank at the unit's base. Internal insulation is provided by hermetically sealed oil and oil-impregnated paper system. Outer insulation consists of a one-piece post-type insulator.

For voltages over 420 kV, the design consists of two coils at half potential located in a tank in the center of the voltage transformer. Internal insulation is provided by hermetically sealed oil and oil-impregnated paper system. Outer insulation is in the form of single piece post-type insulators located above and below the transformer tank.

HIGH QUALITY PAPER-OIL INSULATION

The majority of the voltage transformers using GE technology have insulation paper that has been applied mechanically, guaranteeing a homogenous, high-density paper insulation. Defined grading layers with field-optimized electrode rings achieve a uniform field distribution along the insulator between line and ground. Surge protector devices are not necessary.

High quality mineral oil with excellent durability and gas-absorbing properties is used. The oil meets IEC 296 requirements and contains no PCBs during the manufacturing process.

Controlled vacuum and temperature treatments withdraw humidity and gas from the paper insulation and insulation oil.

The impregnation process results in a high-grade dielectric system.

BUILT FOR LONG LIFE

OTEF is built based on Grid Solutions' quality and technology. It is designed for system voltages up to 550 kV. Long life Insulation integrity is measured by a metallic diaphragm assembly that hermetically seals the oil from the atmosphere. All external parts are manufactured from corrosion-resistant material. Regular painting is not required.

CUSTOMER BENEFITS

- Extensive field experience
- Operational security
- Easy installation – no special tools required
- Leak proof design and rugged construction for long service life
- Mineral oil-filled: no PCB
- Maintenance free



INSULATOR

The outer insulation is manufactured from high-quality aluminum oxide porcelain in RAL brown or IEEE/ANSI grey. Composite insulators are available on request.

WINDINGS AND RATINGS

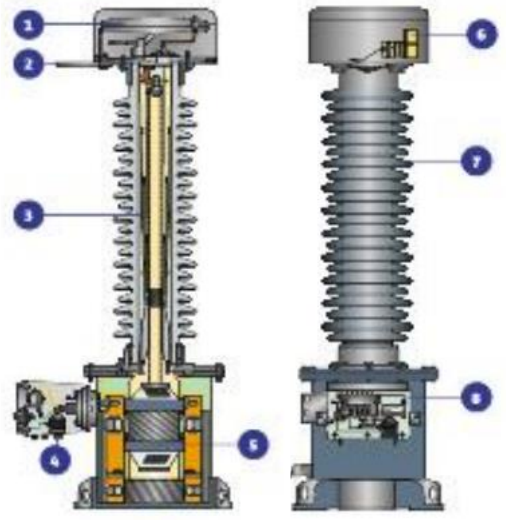
The potential transformer is manufactured according to a modular system. This generally meets all measurement requirements and protection for up to three windings. A separate ground-fault winding is optional.

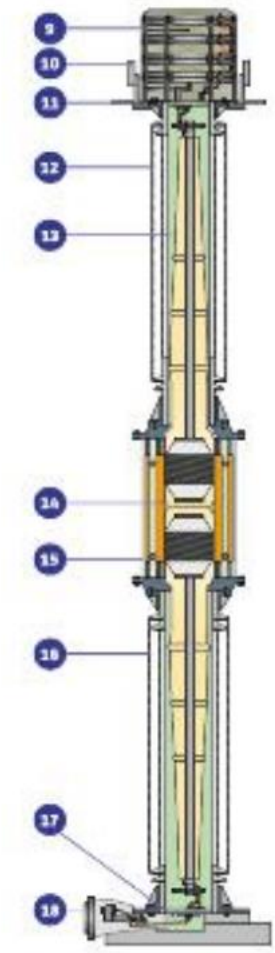
THERMAL BURDEN RATING

2,000 to 4,000 VA
At voltages of U_m = 72.5 kV to U_m = 420 kV it is possible to provide a higher burden rating up to 10 000 VA or more by means of a larger tank.

HERMETIC SEALING SYSTEM

The active part of the transformer is hermetically sealed. Changes in oil volume, resulting from temperature variations, are compensated for by one or more stainless steel expansion chambers. These are connected to the main oil reservoir in the transformer body by a copper tube. Movements in the compensation system are registered by an oil level indicator located behind a window in the transformer head.





OTEF 72.5 to 550 kV

1. Expansion bellow
2. Primary terminal H1
3. Capacitive grading layers
4. Secondary terminal box
5. Core / coil assembly
6. Oil-level indicator
7. Porcelain or composite insulator
8. Secondary terminal box
9. Expansion chamber
10. Lifting eye
11. Primary terminal
12. Post type porcelain insulator
13. Capacitive grading layers
14. Two coil and core assembly
15. Transformer tank
16. Post type porcelain insulator
17. Oil to air seal bock
18. Secondary terminal box

OPTIMAL PROTECTION AGAINST BURSTING

Optimized insulation structures and appropriate structural designs ensure a long life and high-grade dielectric. The following additional measures are taken to prevent the porcelain from bursting in the event of an inner insulation breakdown (e.g., in case of lightning strikes):

- In voltage transformers up to 420 kV, the active part is located below the porcelain in an aluminum head housing. Above 420 kV, the active part is between two porcelains.
- There is an internal fault current connection between the primary terminal and the primary winding and onto the ground terminal located on the base.
- There is a selective wire fuse for each secondary winding which responds in case of a secondary short circuit between the transformer terminals and the marshalling box.
- A pressure relief plate is located in the area of the expansion body on the head.
- Upon customer request: a composite insulator consisting of a fiber-glass reinforced tube and silicone rubber sheds can be supplied.

SERVICE LIFE AND MAINTENANCE

OTEF voltage transformers have been designed for a 30 year life-time and, thanks to the soundness of our technical concepts, many well out-live this service life. They have no specific maintenance requirements and need no painting:

- All hardware is made of stainless steel.
- Housing are made of corrosion-proof aluminum alloy.
- Porcelain fittings are made from spherical or hot-dip galvanized graphite or malleable iron.
- Angle brackets are made of cast aluminum.

Besides regular transformer surface cleaning, no routine maintenance is required. The hermetic seal alleviates the need for oil sampling or moisture checks.

TRANSPORTATION AND INSTALLATION

OTEF can be transported horizontally or vertically depending on the permitted transportation height. The OTEF is supplied ready for energizing and can be simply connected to the system. No special tools are required.

ADDITIONAL INFORMATION

Rating plates are made from metallic anodized weather-proof aluminum or etched stainless steel.

Ambient temperature:
-35 °C...+40 °C on a 24 hour average. Other values are available on request
Seismic withstand capability to 0.5 g Higher values possible on request.

Transient over voltages:
Less than 1,600 V peak according to IEC standard.

Frequency:
50 Hz, 60 Hz or 16 2/3 Hz
Other values on request.

Radio Influence Voltage (RIV):
Less that 2500 µV at 1.1 U_m.

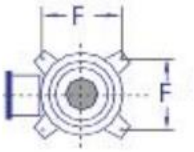
Dielectric loss factor:
Tan δ smaller than 0.005 up to the power-frequency test voltage.

Inner partial discharge:
- Less than 10 pC at 1.2 U_m
- Less than 5 pC at 1.2 $U_m/\sqrt{3}$

Mechanical strength:
According to IEC 61869-1 & -3
Other values on request.

DIMENSIONS

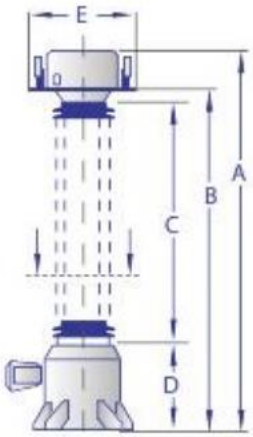
The following dimensions refer to standard versions. Other Um values affect other dimensions. The size of the base tank will change with the greater output requirements and/or frequencies smaller than 50 Hz. Creepage and insulator clearance distances can be adapted to the customer's needs.



DIMENSIONS

Type		OTEF 72.5	OTEF 123	OTEF 145	OTEF 170	OTEF 245	OTEF 362	OTEF 420
Maximum system voltage (Um)	kV	72.5	123	145	170	245	362	420
Impulse test voltage (BIL)	kV	350	550	650	750	1,050	1,300	1,425
Minimum creepage distance	mm	1,813	3,150	3,750	4,583	6,300	9,425	10,720
		mm	mm	mm	mm	mm	mm	mm
Dimensions	A	1,496	1,876	2,116	2,428	3,113	4,847	5,367
	B	1,306	1,686	1,926	2,183	2,868	4,342	4,722
	C	655	1,035	1,200	1,415	2,000	3,000	3,380
	D	566	566	641	763	763	1,200	1,200
	E	680	680	680	950	950	912	912
	F	450	450	450	600	600	900	900
Total Weight (approx.)	kg	260	300	400	520	600	1,510	1,750
Weight of oil (approx.)	kg	25	38	60	90	125	380	400

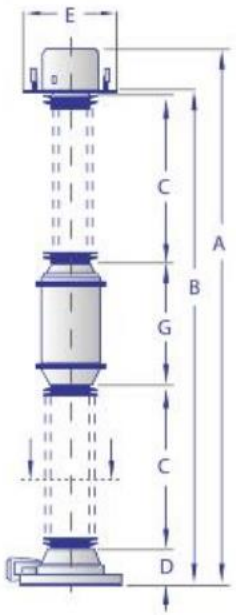
Indicative values only - All indicated dimensions must be confirmed with order. Other values on request

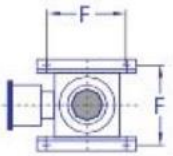


DIMENSIONS

Type		OTEF 550
Maximum system voltage (Um)	kV	550
Impulse test voltage (BIL)	kV	1,550
Minimum creepage distance	mm	16,110
		mm
Dimensions	A	7,077
	B	6432
	C	2220/2270
	D	380
	E	912
	F	900
	G	1470
Total Weight (approx.)	kg	2,150
Weight of oil (approx.)	kg	430

Indicative values only - All indicated dimensions must be confirmed with order. Other values on request





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