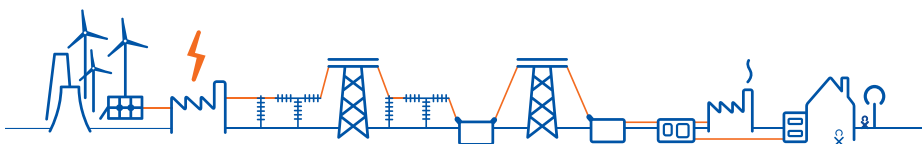
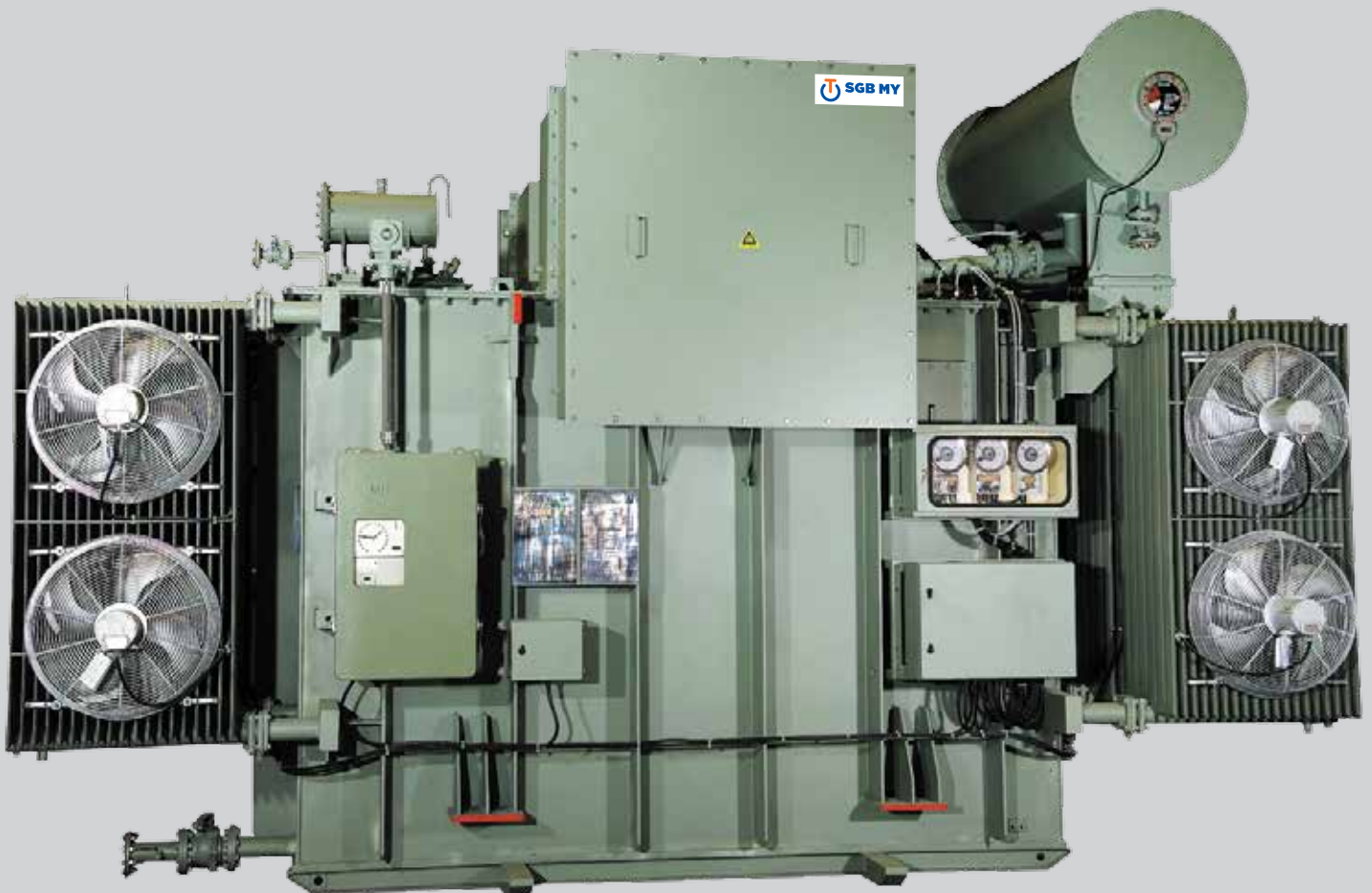


# POWER TRANSFORMER



# SGB-SMIT AT A GLANCE

Combined, more than

# 450



## YEARS OF EXPERIENCE

Basis for know-how and  
for know-why

More than

# 3,500



## EMPLOYEES

take care of  
your project

In more than

# 80



## COUNTRIES

satisfied  
customers



## READY FOR YOUR MARKET

The SGB-SMIT Group manufactures transformers for applications worldwide. Sales and service centers on all continents ensure optimum processes.

Our products meet the requirements in accordance with the applicable national standards.



## PRODUCTS

- large power transformers
- medium power transformers
- large liquid-cooled distribution transformers
- liquid-cooled distribution transformers
- cast resin transformers
- shunt reactors
- series reactors
- phase shifters
- Lahmeyer-Compacts substations

Transformers from 30 kVA up to incl. 1,200 MVA in the voltage range up to 765 kV.



## QUALITY MANAGEMENT

The SGB-SMIT Group is certified in accordance with:

- DIN ISO 9001
- DIN ISO 14001
- DIN ISO 50001
- OHSAS 18001



## TECHNOLOGIES

Technologies for conventional and renewable energy.

# POWER TRANSFORMER



## PRODUCTS

- Power transformers from 5 to 40 MVA, up to Um 72.5kV  
ONAN / ONAF  
50 Hz / 60 Hz

## REPAIR

- All types of transformers up to 40 MVA
- Manufacture of complete spare parts

## MAINTENANCE

Provider of services for everything to do with transformers

## QUALITY MANAGEMENT

The complete operational process is controlled by a tested quality management system. The SGB MY is certified in accordance with

- ISO 9001
- ISO 14001
- OHSAS 18001

SGB MY power transformers with a power range from 5 to 40 MVA and a voltage up to 72 kV are used as network and generator-step-up transformers. This type of transformer is normally a 3-phase application and designed according to national and international standards. The low-voltage windings should be designed as foil, layer or helical windings. The high-voltage windings should use layer or disc execution, including transposed conductors. Normally, the cooling type is ONAN (oil-natural, air-natural) or ONAF (oil-natural, air-forced). The tapping can be designed with off-circuit or on-load tap changers (OCTC or OLTC).

## CORE

SGB MY Power Transformers are manufactured as core type. All cores are stacked, using high-quality grain-oriented silicon steel laminations and coated with carlite to increase the interlamination resistance and to reduce eddy current losses. Depending on the requirement, laser scribed or plasma treated silicon steel will be used. All cores utilize the step lap principle in the corner joints to reduce losses, magnetizing current and sound level. The cores are fully-mitred on all joints in order to improve the flux distribution. The laminations are stacked in steps, resulting in a circular core shape which gives the windings optimum radial support, especially during short-circuit conditions. The core is clamped using structural steel clamps which provide high strength while lifting and during dynamic short-circuits.

# POWER TRANSFORMER



## WINDINGS

For high electrical and mechanical stress windings in Power Transformer are made of Layer or disc windings. Low voltage windings are either helical windings or Foil type depending on the rated current.

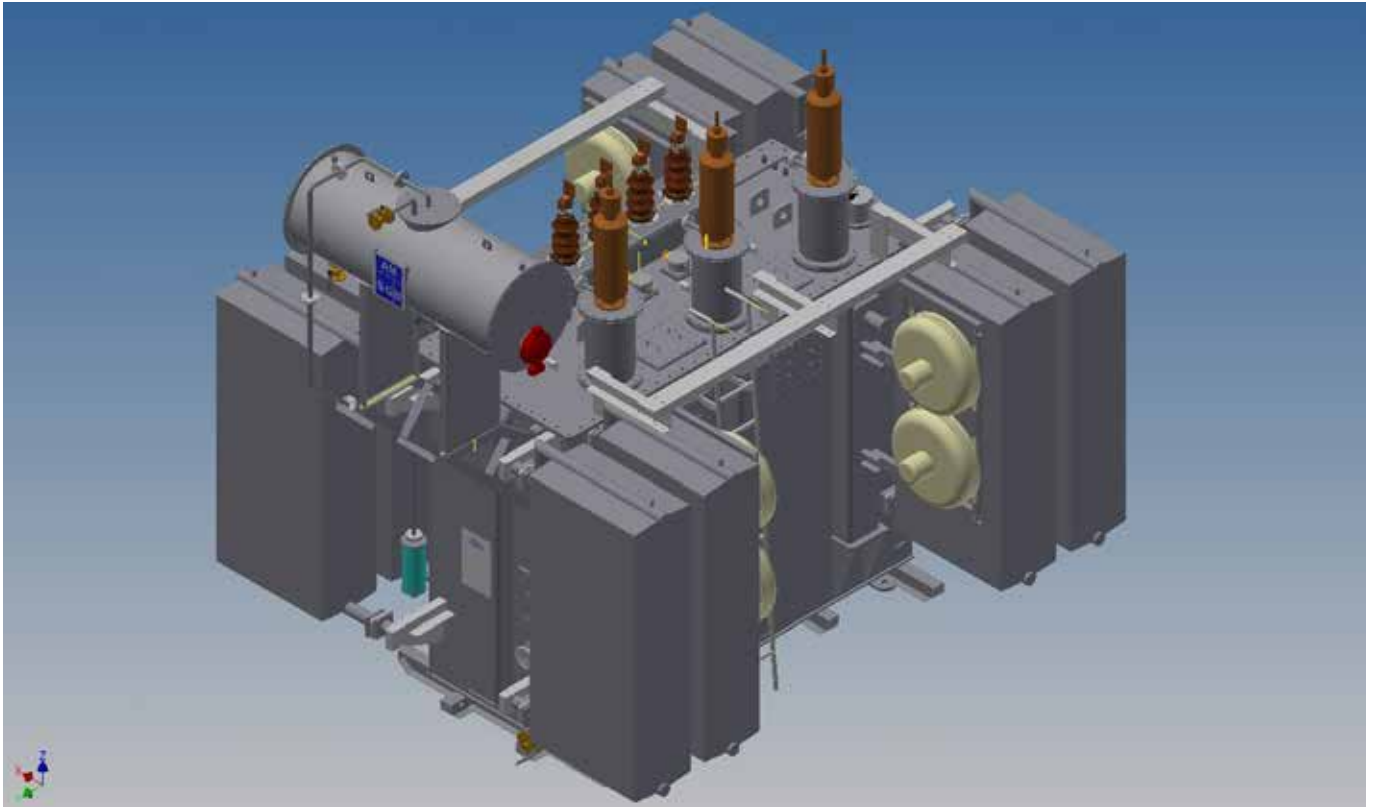
Windings are of circular design, with concentric coil placement which offers greater short-circuit strength. Conductors are either paper covered or continuously transposed.

All major insulation is manufactured from the highest quality transformer board fully oil impregnable to eliminate internal partial discharges from voids. Winding keyspacers are manufactured from pre-compressed transformer board to provide high mechanical and short-circuit strength.

Tapings are provided on the high voltage winding thereby the ratio of Power Transformer can be changed gradually; either in no-load condition via off circuit tap-changers or under load by means of on-load tap changers.

Windings area in SGB MY is facilitated with controlled temperature for less humidity and dust. SGB MY winding machines are computer based to minimize manual errors and consistent manufacturing of windings.

# POWER TRANSFORMER



## OIL PRESERVATION SYSTEM

Unless otherwise specified, SGB MY use a conservator for oil preservation system as a standard. The conservator oil preservation system uses an expansion tank to and from which the transformer oil may flow freely as it expands or contracts due to oil temperature changes. This system always provides a head of oil above the main tank and keeps it completely filled. An oil level gauge is mounted on the conservator and indicates the change in liquid level.

The oil expansion of the On-Load Tap Changer diverter is completely separate from the transformer oil. A separate compartment is mounted to the main conservator. Both conservator compartments are equipped with an oil level gauge with a minimum alarm contact, pipes for oil draining, air inlet from the breather and connection to the transformer or OLTC. The breather is filled with silica gel that removes all moisture and dust particles from the air that is inhaled by the conservator. To reduce maintenance and to save the environment, the standard silica gel breather can be replaced

by an automatic breather with repetitive heating cycle on request.

The main conservator can be fitted with a nitrile membrane (air bag) to avoid all contact of ambient air with the transformer oil. This eliminates the possibility of moisture entering the transformer oil and oxidation of the oil in the conservator.

## COOLING MEDIUM

Mineral oil as per IEC 60296 is our standard transformer Oil. Other choices are available upon request. Midel Oil or FR3 liquid may be the perfect choice to lower the risk of fire or explosion in equipment located indoors or near buildings or hazards. FR3 and Midel oil are less flammable transformer fluid that provides an even greater flash/fire point and is also biodegradable to lessen the impact on the environment.

# POWER TRANSFORMER



## COOLER TYPE

SGB MY transformers are commonly provided with detachable panel radiators, providing a reliable and low maintenance cooling solution. To boost the efficiency of the radiators fans can be used (ONAF cooling).

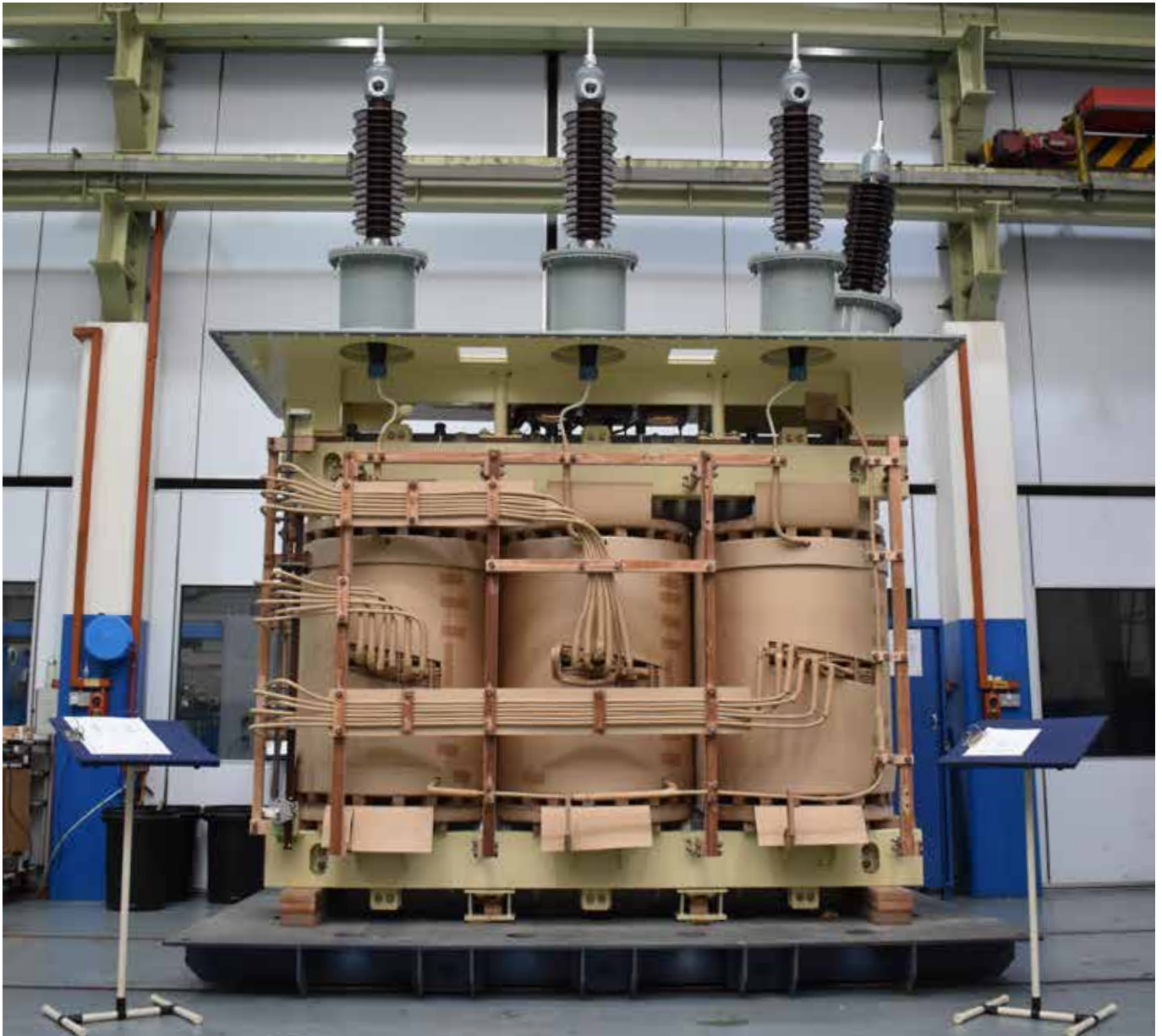
## TANK

All tanks are manufactured from high-quality steel plate. Facilities for lifting, jacking and pulling are provided on each transformer tank. Handholes and manholes are placed for easy access to interior components such as deenergized tap switches and bushing connections. Tank bottom is either skid base or roller suitable for skidding in two directions, as required by the specification. All metal parts are grit-blast cleaned to remove weld splatters providing an excellent surface for the adherence of the primer and paint. The inside of the tank is painted with a oil-resistant paint to create good visibility during internal inspection.

All metal parts are extensively tested on oil tightness via penetrant and pressure test at the tank manufacturer and followed by leakage test after complete assembly.



# CORE COIL ASSEMBLY



Core coil assembly activity is one of the key process in transformer manufacturing. It is very important to secure core coil assembly free from dust and excess humidity for better quality control. SGB MY is facilitated the coil assembly area with controlled temperature for less humidity and dust.

# TESTS



## FINAL TESTING

The final electrical testing is an essential part of quality assurance when manufacturing these products. Tests include routine tests and also type tests and special tests. They are carried out in accordance with the relevant standards or as agreed with the customer. The test facilities at SGB MY consist of test laboratory for distribution transformer and large distribution transformers. The test laboratory is designed for testing the following items:

- Oil type distribution transformer upto 5MVA, 36kV
- Oil type large distribution transformer upto 40MVA, 72.5kV
- Dry type distribution transformer upto 6.3MVA, 36kV

Tests can be carried out in SGB MY laboratory:

### ROUTINE TESTS:

A test to which each individual Transformer is subjected.

- Ratio measurement and vector group test
- Winding resistance measurements
- Measurement of no-load losses and no-load currents

- Measurement of load losses and short-circuit impedances
- Test with induced voltage
- Test with applied voltage
- Tests on on-load tap-changers, where appropriate
- Check of the ratio and polarity of built-in current transformers
- Functional test of the transformers

### TYPE TESTS:

A test made on a transformer which is representative of transformers, to demonstrate that these transformers comply with specified requirements not covered by routine tests. These are intended in principle to prove a new design or a series of transformers.

- Temperature rise measurement
- Lightning impulse voltage test
- Determination of sound level for each method of cooling for which a guaranteed sound level is specified
- Measurement of the power taken by the fan and liquid pump motors
- Measurement of no-load loss and current at 90 % and 110 % of rated voltage

# TESTS



## SPECIAL TESTS:

A test other than a type test or a routine test, agreed by the manufacturer and the purchaser.

- Zero-sequence impedance measurement
- Capacitance and loss factor ( $\tan\delta$ ) measurement
- Measurement of the insulation resistance
- Measurement of frequency response (Frequency Response Analysis or FRA)

## EXTERNAL SPECIAL TEST:

- Dynamic short circuit test, can be performed in international laboratories like CESII/KEMA/ASTA etc.



# TECHNICAL DATA

Note: The table shows technical parameter of standard design. SGB MY can offer transformers as per customers specification and different performance figures upon request.

Rated Power (kVA)	Cooling	HV (Volts)	LV (Volts)	Freq (Hz)	No Load Loss (W)	Load Loss (W)	% Z	Vector Group	Overall Weight	Overall Dimensions		
										L	W	H
5000	ONAN	11000	433	50	4250	50000	7	Dyn11	12.4	3.2	3.3	3.1
5000	ONAN	11000	6300	50	4100	40000	7	Dyn11	10.9	3.3	2.5	2.7
5000	ONAN	33000	11000	50	5000	30000	7	Dyn11	12.75	3.4	3.0	3.1
10000	ONAN	20000	10000	50	9500	48500	6.5	YNd11	22	3.9	4	3.7
10000/12500	ONAN/ONAF	11000	3450	50	8500	54000	8.35	Dyn11	17.3	4.3	3.6	3.6
10000/15000	ONAN/ONAF	33000	11000	50	10000	55000	10	Dyn11	24.5	5.3	3.9	3.8
12500/16000	ONAN/ONAF	33000	11500	50	9500	68000	10	Dyn11	25.3	4.9	3.8	4.2
15000/20000	ONAN/ONAF	33000	11000	50	10000	80000	10	Dyn11	30	5.4	4.6	3.8
16000/20000	ONAN/ONAF	33000	11500	50	11500	82000	10	Dyn11	29	4.7	4.1	4.2
16000/20000	ONAN/ONAF	11000	3450	50	12000	82000	10	Dyn11	28.4	4.7	4.3	4.1
20000	ONAN	34500	11000	50	13000	98000	8	YNd11	35.9	4.3	2	3.3
20000/25000	ONAN/ONAF	69000	13800	50	20000	80000	8.5	Dyn11	38	6.9	2.7	3.3
21000/28000	ONAN/ONAF	11000	6300	50	14000	112000	10	Dyn11	27	4.6	2.8	4.2
24000/30000	ONAN/ONAF	33000	11000	50	15500	128000	10.8	Dyn11	42	6	4.5	4.4
25000/31500	ONAN/ONAF	33000	11000	50	14500	115000	9.92	Dyn1	41	5.9	4.6	4.6
5000	ONAN	23000	433	60	5000	47000	7	Dyn11	10.6	3.2	3.4	2.9
10000/13330	ONAN/ONAF	67000	13800	60	14000	48000	7	Dyn11	25.5	4.6	2.1	3.3
15000/18000	ONAN/ONAF	69000	13800	60	15500	67000	8	Dyn11	30.9	5.6	3.3	4.4
20000/25000/31000	ONAN/ONAF1/ONAF2	67000	13200	60	16000	70000	7	Dyn11	38.2	5	4	5.1
30000/35000	ONAN/ONAF	34500	13800	60	19000	125000	10	YNd11	42	6.7	4	4.6

# AFTER SALES AND SERVICE

ACTIVITY BY SGB MY



SGB MY offers after sales and service support for all kind of power and distribution transformers. Dedicated service team of experienced staff (Electrical & Mechanical) is offering you an on-site investigation and complete support at site in case of minor issues or recommendation for repair at factory in case of major problems.


Below are the services offered being an OEM and transformer specialist.

1. Visual inspection and functional tests (Yearly or half yearly, based on equipment criticality)
  - Complete visual checks for any leakage, rusting or any other abnormalities
  - Check of bushing condition and termination check
  - Check of gasket joints
  - Check of silica gel condition
  - Functional tests for protection accessories
  - Tap changer operation check
  - Oil level check
2. Major maintenance at every five years
  - Low voltage electrical tests
  - Functional tests for protection accessories
  - Oil sampling and oil analysis
  - Oil filtration or replacement if required
3. Complete transformer servicing/overhauling at site for aged transformers
  - Low voltage electrical testing
  - Thermal imaging to check internal hot spots
  - Gasket replacement
  - Oil filtration/replacement
  - Tank repair for any leakage
  - Paint touch-up
  - Check of protection wiring and repairing
4. In-factory repair/overhauling
  - Complete refurbishment of transformer
  - Replacement of major components
  - Oil replacement
  - Drying of active part
  - Tank replacement
  - Routine testing



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