

# Distribution transformers Efficiency over life-cycle

# ABB – a global leader

ABB is a global leader in Power and Automation technologies that enable utility and industry customers to improve performance while lowering environmental impact. The ABB Group of companies operates in around 100 countries.

In India, ABB has a vast installed base, extensive manufacturing facilities and a countrywide marketing and service presence.

The Power Technologies business offers electric, gas and water utilities as well as industrial and commercial customers a wide range of products, systems and services for power generation, transmission and distribution. ABB's turnkey solution capabilities in the sector range from bulk power transmission, turnkey substations and complete electrification to utility automation and distribution systems.

The product offering covers a wide spectrum of technologies across the entire voltage range including indoor and outdoor circuit breakers, air and gas insulated switchgear, instrument transformers, disconnectors, capacitor banks, reactive power compensators, power and distribution transformers and a range of power distribution products like Compact Secondary Substations (CSS) and Ring Main Units (RMU).

## Distribution transformers and grid losses

With their widespread application and continuously energized state, distribution transformer losses make up a considerable fraction of the total losses incurred in distribution systems. Even a minor increase in transformer efficiency would lead to significant energy savings.

Two types of transformer losses are commonly evaluated for loss reduction: core or no-load losses and coil or load losses. Transformer no-load losses can be reduced by using superior grade magnetic core steel materials or optimizing their geometries. However this may increase load losses and vice-versa. Transformer loss reduction is therefore an optimization process involving physical, technological, and economical factors tempered by life-cycle performance analysis. ABB transformer designs make evaluations for maximizing efficiency, taking into account initial cost of the transformer as well as life cycle costs including losses.

# ABB - the largest single manufacturer of distribution transformers

ABB transformers are providing faultless service for over five decades across the world and offer solutions for every need including urban, industrial and rural applications.

In 23 facilities spread across the world, ABB manufactures oil type distribution transformers for indoor and outdoor

applications, dry type for reliability and efficiency under critical conditions and transformers for special applications such as for variable speed drives, pad mounted and Boosterformers™.

## Oil filled, pole and plinth mounted distribution transformers



### 10 kVA, 6.35kV/240V 1 phase distribution transformer

- Completely self-protected with HV expulsion fuse, LV MCCB and surge arrester
- Hermetically sealed
- Powder coating polyurethane liquid paint on tank



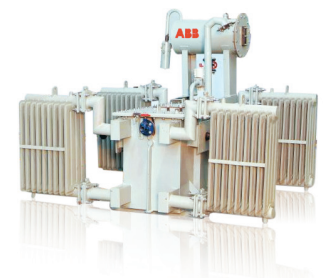
### 25 kVA, 11kV/433V, 3 phase distribution transformer

- Side mounted HV & LV bushings
- Low loss design
- Polyurethane liquid paint on tank
- With CSP devices



### 63 kVA, 11kV/433V, 3 phase distribution transformer

- Tank cover mounted core-coil assembly
- Top mounted HV & LV bushings
- Conservator and pressed steel radiators
- Low loss and low temperature rise design
- Polyurethane liquid paint on tank and radiators
- With CSP devices



### 630 kVA, 11kV/433V, 3 phase distribution transformer

- Breather, Buchholz relay
- Pressed steel radiators
- Polyurethane liquid paint on tank and radiators

Applicable Standards : IS 1180 / IS 2026 / IEC 60076 / ANSI C57.12.20 or customer specific standards

Single phase	Round tank	5, 10, 15/16, 25, 75 kVA	Pole mounted
Three phase	Rectangular tank	10 to 630kVA	Pole / plinth mounted with option of off circuit tap changers

## ABB distribution transformers

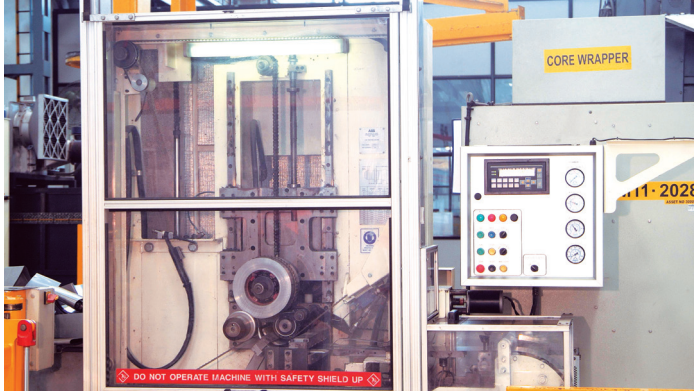
### Ensure performance reliability

- Automated, state-of-the-art manufacturing processes with wound core design
- Short circuit proof - use of epoxy dotted paper and curing of coils in a special press
- Long life - special process of oil-filling under vacuum ensures void free core coil assembly
- Leak proof - 100% transformers tested for oil leakage test

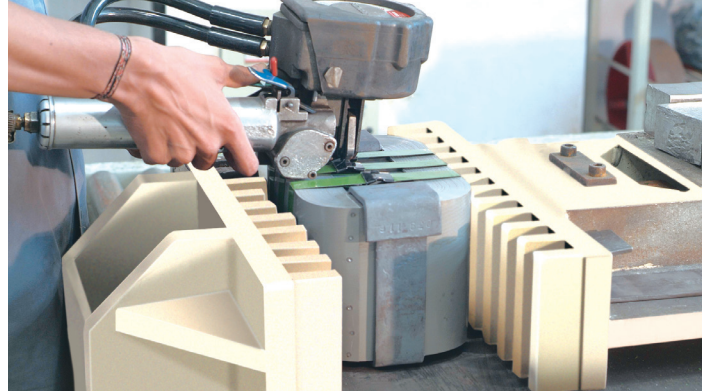
### Ensure performance efficiency with minimal losses

- Use of best-in-class materials - core made from prime grade imported CRGO
- Advanced technology - wound core design with single coil windings and step lap core construction
  - Low magnetizing current
  - Low no-load and load losses
  - Low noise levels

# State-of-the-art manufacturing facilities and processes



Core wrapping



Core forming

**The ABB Vadodara facility for distribution transformers provides a clean and dust-free environment with ideal humidity and ventilation levels and standards and processes common to ABB facilities worldwide.**

## Transformer design

The transformers are designed on specialized software for:

- Cost optimization over lifetime considering material cost and loss capitalization as specified by customers.
- Verification of design for rated short circuit and impulse withstand strength carried out by design software.

## Core and coil assembly

Use of unique designs and special insulating materials make ABB distribution transformers reliable, efficient and compact.

## Wound core design

The core is manufactured using wound core design with prime grade, grain oriented silicon iron sheets. The result is minimal core losses, low noise levels and increased automation in manufacturing processes.

## Windings and insulation

The windings are made of copper or aluminum and manufactured to withstand short circuit forces. State-of-the-art precision equipment is used for accurate dimension control and tightness. The winding coils are processed in a special purpose press developed by ABB, to cure the resin on the insulation paper for imparting high short circuit strength.

## Microprocessor controlled processes

Core wrapping is microprocessor controlled for accurate process control. The core is annealed in inert atmosphere to eliminate induced stresses.

The core wrapping, annealing, winding and pressing processes are controlled by microprocessor controlled units, ensuring automation and accuracy in process and quick trouble shooting.

The complete core coil assembly is dried in an oven to remove the moisture from insulation.

## Transformer tank

Tanks are constructed from mild steel. Welded joints are tested for air pressure for 100% transformers, ensuring leak proof tank joints. Rollers can be provided and these are suitable for either longitudinal or transverse movement.

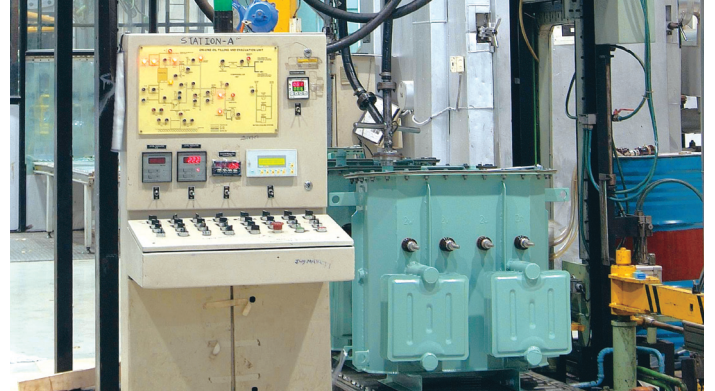
## Accurate process control

Pre-treatment of transformers tanks is carefully carried out by blast cleaning or chemical cleaning method. The tanks are either powder coated or polyurethane liquid painted to improve corrosion resistance and aesthetics as per customers requirements.

Mineral oil is filled in the tanks under vacuum ensuring excellent dielectric properties. The oil filling system is controlled by programmable logic controllers for accurate process control. The electrical and chemical properties of mineral oil are checked for compliance with IS/IEC standards.



Coil winding



Oil filling under vacuum

### Features and Options

#### Standard features

- Single-phase transformers - hermetically sealed oil filled transformers
- Three-phase transformers - hermetically sealed type or provided with conservator and breather
- High and low voltage bushings in accordance with IS 3347 standards
- Lifting lugs
- Earthing terminals
- Rating and terminal marking plate

#### Options and accessories

- Completely self protected with expulsion fuse, LV breaker and surge arrestors
- Thermometer pocket
- Oil filling pipe and drain valve
- Conservators
- Oil level indicator
- Thermometer pocket
- Off-circuit tap changer
- Arcing horns
- Pressure release device
- Terminal connectors
- Cable boxes
- Integrated pole mounting brackets / base channels on tank
- Skid base with rollers

ABB also offers customized transformers based on required dimensions and technical specifications.

- Dial type thermometer
- OTI and WTI
- MOG
- Marshalling box
- Buchholz relay



Oil leakage testing



Core annealing

# Testing

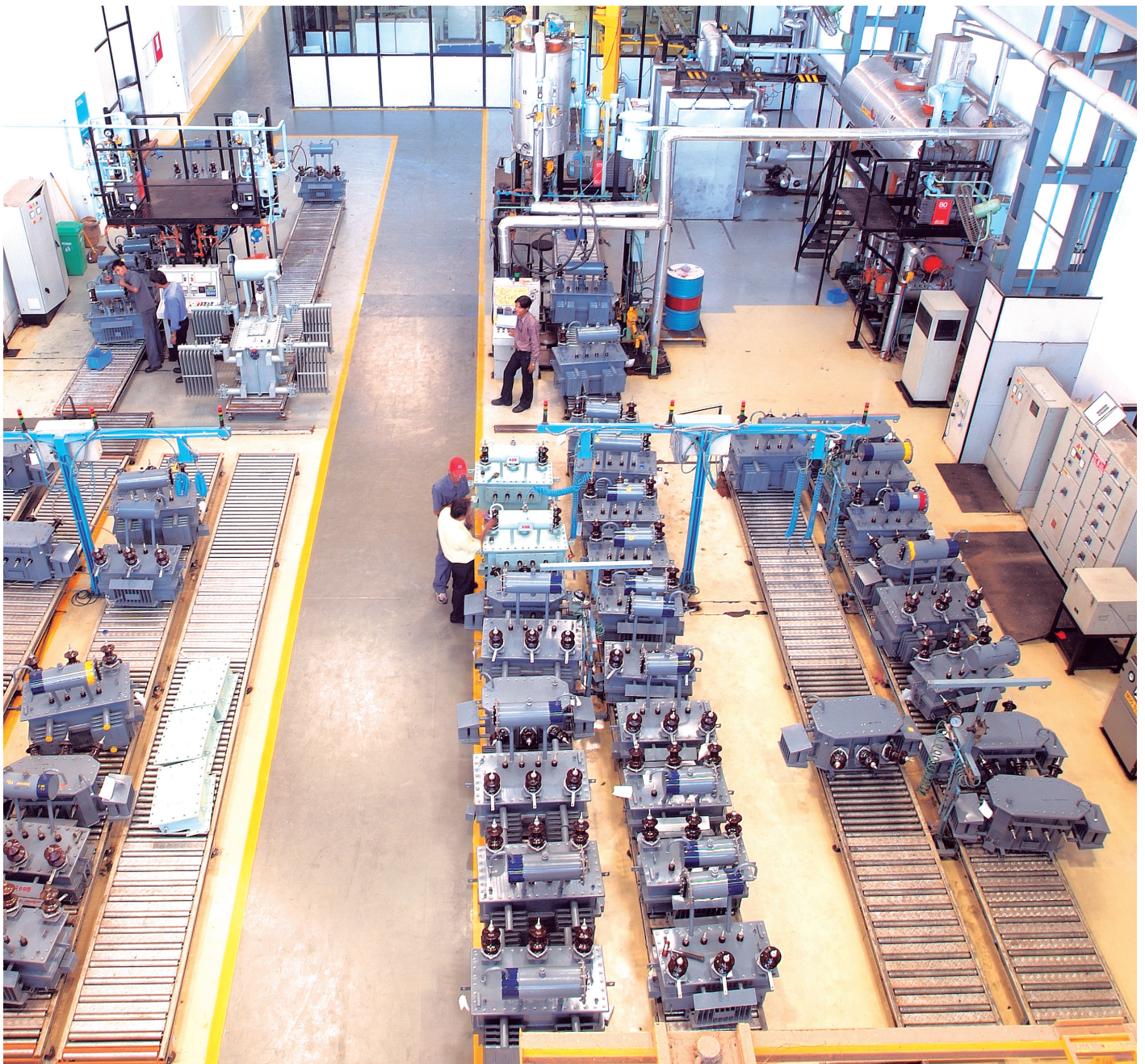
The transformers are individually tested in accordance with IS/IEC standards and routine tests include:

- Measurement of voltage ratio and check of vector group
- Measurement of winding resistance
- Measurement of Insulation Resistance
- Power frequency over voltage test and Induced over voltage test
- Measurement of impedance voltage and load losses
- Measurement of no load losses and no load current

Type tests & special tests can be carried out on request.

ABB distribution transformers are practically leak proof. 100% transformers are pressure tested with advanced & fully automated set up.

Over 40 designs successfully type tested at NABL accredited laboratory.



Transformers ready for testing

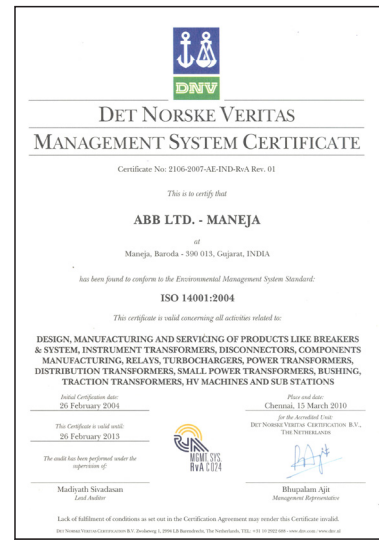
# Quality and environment-friendly systems

All aspects of product quality are ensured by integrated quality systems in the manufacturing process. Environment-friendly processes are followed to ensure minimum footprint.

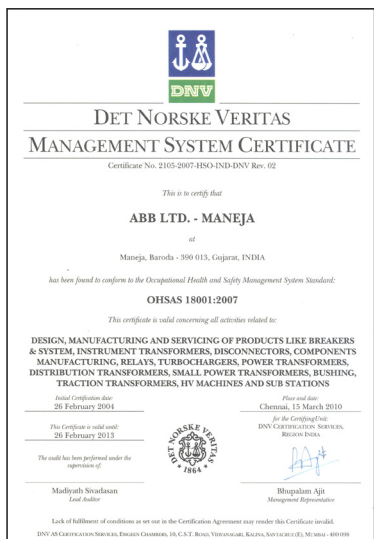
The manufacturing facilities are certified for ISO 9001-Quality Systems, ISO 14001 – Environment Management and ISO 18001 – Occupational Health and Safety Systems.



ISO 9001 - 2008 QMS



ISO 14001 - Environment Management



ISO 18001:1999 Occupational Health and Safety Systems

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