RESIBLOC transformers
Product presentation

www.abb.com/transformers
Dry-type transformers
For customers with high requirements

Does your transformer application requires one of the following characteristic? We have the solution according to your specifications:

- safety for people and property
- no fire hazard
- no maintenance and pollution
- reduced civil works
- enhanced withstand to short circuit stress
- applicable for damp and contaminated areas
- improved performance against seismic phenomena
Dry-type transformers
The right solution for your needs

• Three different dry-type technologies:
  • RESIBLOC®
  • Vaccum cast coil (VCC)
  • Open wound

• Ratings from 250 kVA up to 63 MVA
• Primary voltage up to 72.5 kV
• Secondary voltage up to 45 kV
• Frequences: 50 Hz, 60 Hz and 16 2/3 Hz
• Cooling: AN / ANAN / ANAF / AFWF
• Insulation: F and H
### Dry-type transformers
#### Low calorific power

<table>
<thead>
<tr>
<th>Material</th>
<th>Fire energy MJ</th>
<th>Percentage</th>
<th>Flash point °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mineral oil</td>
<td>30000</td>
<td>100</td>
<td>160</td>
</tr>
<tr>
<td>Silicon oil</td>
<td>26000</td>
<td>87</td>
<td>350</td>
</tr>
<tr>
<td>Vacuum cast resin (epoxy + quartz sand)</td>
<td>2600</td>
<td>9</td>
<td>350</td>
</tr>
<tr>
<td>RESIBLOC (fiber glass reinforced)</td>
<td>1500</td>
<td>5</td>
<td>&gt;470</td>
</tr>
</tbody>
</table>
Dry-type transformers
Dry-type comparison - the advantages of RESIBLOC

All technologies are performing according to international standards

**Nevertheless, RESIBLOC has**

- stronger resistance against short-circuit stress
- superior behaviour on load changes
- linear distribution of BIL
- highest possible security against cracks on coils
- no silicone during coil manufacturing
- better performance under dynamic Loads
- more flexibility in design (no molds)
- better performance under severe ambiental conditions (exceeding E2)
- more suitability for extreme cold conditions
- vacuum circuit breaker proven
## Dry-type transformers

### Worldwide transformer production

ABB’s “Focused Factories” for dry-type transformers

*Assembly-units

<table>
<thead>
<tr>
<th>Location</th>
<th>Vacuum cast</th>
<th>RESIBLOC</th>
<th>Open wound</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>DE</td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>KR</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ES</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>US</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>BR</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SA*</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EG*</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IN*</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RU*</td>
<td></td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>

*Assembly-units:*
- USA
- Germany
- Spain
- Egypt
- Saudi Arabia
- India
- Brazil
- Korea
- Russia
- China
RESIBLOC technology
Overview
RESIBLOC technology – Overview

The ABB premium product

- Rated power from 250 kVA to 63,000 kVA
- Voltage up to 72.5 kV
- Unique technical attributes
  - Linear distribution of impulse voltage
  - Vacuum free winding production
  - Mechanical strength
  - Low calorific power
- Designed for extreme environmental conditions

RESIBLOC® offers a great flexibility according customer wishes to meet the highest requirements
RESIBLOC technology – Overview
Various standards and types

RESIBLOC standard designs
- HV winding material: aluminum / copper wires
- LV winding material: aluminum / copper foils
- insulation class: F

Types of RESIBLOC
- standard three phase transformer
- double medium voltage transformer
- multi winding transformer
- low voltage transformer
Application types of RESIBLOC®
- Distribution transformer
- Substation transformer
- Marine propulsion transformer
- Marine distribution transformer
- VSD transformer
- Windmill transformer
- Traction feeder transformer
- Rectifier transformer
- Booster transformer
- Auto transformer
- Excitation transformer
- Furnace transformer
- …
RESIBLOC technology – Overview
Solutions for demanding requirements

RESIBLOC® characteristics

- Unique mechanical strength and short circuit behaviour
- Satisfies different economical and safety requirements
- Certified for many standards and organisations
- High design flexibility and product variety

Customer advantages

- Fits for most demanding applications
- Great variety of applications
- Long service life with minimum maintenance requirements
- Excellent and global ABB service
- Certified for many standards and organizations
RESIBLOC technology – Overview

Industrial applications

- Oil & Gas
  - Compressor drive transformers
  - Electrification
  - Thruster drive transformers
  - Refineries

- Mining & Minerals
  - Hoist drives
  - Mill drives
  - Conveyor belt systems

- Marine
  - Propulsions transformers
  - Thruster transformers
  - Auxiliary transformers

- Metals
  - Rolling mills
  - General electrification

- Pulp & Paper
  - LV drive system transform.
  - General electrification
High presence of RESIBLOC Transformers all over the world
Installed kVA

More than 30.000.000 kVA at all!
RESIBLOC technology
Suitable for harsh conditions
RESIBLOC technology
Testing

**Routine tests**
(Performed on each unit)
- Gear ratio
- No-load losses and current
- Impedance voltage, short circuit impedance and load losses
- Partial discharge

**Type and special tests**
(Available on request and additional costs)
- Lightning impulse (LI) test
- Temperature-rise test
- Determination of sound levels
**RESIBLOC technology**

Environmental – Climatic – Fire class acc. VDE 0532 / Part 6 I

### Environment

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E0</td>
<td>Normal indoor installation, no condensation, no considerable pollution</td>
</tr>
<tr>
<td>E1</td>
<td>Limited pollution, occasional condensation e.g. off circuit periods</td>
</tr>
<tr>
<td>E2 ✓</td>
<td>Heavy pollution, frequent condensation</td>
</tr>
<tr>
<td>E3 ✓</td>
<td>Intensified conditions for the conductivity of the salt solution (for application of wind turbines)</td>
</tr>
</tbody>
</table>

### Climate

<table>
<thead>
<tr>
<th>Level</th>
<th>Lowest ambient temperatures:</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>- Operation -5°C</td>
</tr>
<tr>
<td></td>
<td>- Storage and transport -25°C</td>
</tr>
<tr>
<td>C2 ✓</td>
<td>- Operation <strong>-60°C</strong> instead of -25°C</td>
</tr>
<tr>
<td></td>
<td>- Storage and transport at <strong>-60°C</strong> instead of -25°C</td>
</tr>
</tbody>
</table>
RESIBLOC technology
Environmental – Climatic – Fire class acc.
VDE 0532 / Part 6 II

<table>
<thead>
<tr>
<th>Fire</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>F0</td>
<td>No special requirements except typical characteristics for dry type transformers</td>
</tr>
</tbody>
</table>
| F1 ✓ | Increased demands
- All materials practically free of halogens
- Limited formation of fumes
- Limited contribution with calorific energy to the source of fire
- Self-extinguishing transformer fire |
RESIBLOC technology
Deep Temperature Storage and Thermal Shock

Test Object
- Power rating 1500 kVA
- Voltage ratio 11 kV / 433 V
- Total weight 4350 kg

Tests
- Requirement for class C2 according to VDE 0532, part 6
- Deep temperature storage test at -25°C
- Thermal shock test with double rated current starting at -25°C

Test of a RESIBLOC® Transformer starting at -60°C.
RESIBLOC technology
Deep Temperature Storage and Thermal Shock

1st
✓ Thermal shock test with double rated current starting at -60°C passed

2nd
✓ Thermal shock test with double rated current starting at -60°C passed

3rd
✓ Thermal shock test with 2.5 times rated current starting at -60°C passed

The tests performed prove RESIBLOC® transformers are very well suited for operation at low ambient temperatures and with varying loads!
RESIBLOC technology
Reference examples
GKM Block 7 & 9
Germany

Customer need

- High voltage power in compact space

ABB response

- 22 units up to 13 MVA RESIBLOC cast-resin transformer for ACS5000 drive application
- ABB offered the RESIBLOC as an individually customized product that met all the stringent requirements by the client

Customer benefits

- Individual produced transformers that enable high voltage power on small place
Preem Lysekil
Sweden

Customer need
- Dry transformer for outdoor installation in cold (min -40°C) harsh climate close to the sea
- Parallel operation with existing oil transformer

ABB response
- 1 unit 25 MVA 22 / 11 kV RESIBLOC cast-resin transformer
- IPX4D enclosure for outdoor installation

Customer benefits
- No need for oil pit, easy installation and almost maintenance free
- Fire risk reduced
Eskom
South Africa

Customer need
- Refurbishment of existing equipment in coal-fired power stations

ABB response
- 34 units 5.8 MVA to 11.7 MVA RESIBLOC transformers
- Air-to-air heat exchanger system
- IP54 for outdoor installation

Customer benefits
- Complete and state-of-the-art ABB solution inclusive transformers, LCI-drives, motors etc.
- Competent ABB installation and service