Transformer insulation & components

The world’s broadest and most reliable portfolio of transformer components
We offer a full range of insulation and components for your transformer – all from one supplier. Delivering safety, reliability and fast lead times for you and your customers.
Delivering flawless customer experience

- Technical competence and cost consultancy
- Pre-sales & after sales customer support
- Highest quality and health & safety standards
- Fast delivery
- Value-added solutions to optimize performance and lifecycle value
- Full portfolio of insulation, components and services
- Local presence with global experience
- Most reliable components & service offering throughout the complete transformer life cycle
- First class project management and logistics
- Low risk, reliable supplier
- One-stop-shop offering

Reducing complexity of your daily business
- Unique “One-stop-shop” offering for customers
- Full engineering-to-order solutions
- Customized bundling solutions
- Simplified and cost-effective customer procurement and logistic processes
- Local presence to support every customer worldwide

Supporting you throughout the complete customer journey
- Technical competence and cost consultancy
- Extensive pre-sales and after sales customer support
- Product trainings

Customer Connect Center:
Your single point of entry for any questions on products & services across our wide portfolio
- Available 24/7
- abb.com/grid/customer-connect
The partner of choice for your business with 100+ years of expertise in components

We can support your transformer business with the broadest portfolio of insulation, bushings, tap-changers, measurement & safety devices and solutions for continuous online asset monitoring and services throughout the complete transformer life cycle.

**Scope**
We provide solutions for any transformer design and application all around the world.

**People**
We are committed to serving our customers. This is only possible through our exceptional, highly trained and motivated people.

**Footprint**
We are close to you. Our extensive manufacturing capabilities, coupled with a comprehensive knowledge base, enables us to meet regional/local standards and specifications.

**Lead times**
We continuously improve the process towards faster lead times, as we know, that our components deliveries are critical for your business.

**Technology**
We are active in research and development of competitive products that improve equipment safety, power reliability and efficiency - while at the same time minimizing environmental impact.

**Digital solutions**
Our digital monitoring open platform enables full digitalization of any transformer.
Tap-changers and motor-drives

Tap-changers are used to change the turn ratio between windings in a transformer. This ratio determines the voltage ratio between the windings and is essential for the stabilization of network voltage under variable load conditions. This adjustment may be made by an on-load tap-changer, or by a de-energized tap-changer, or by the selection of bolted link positions.

We offer a comprehensive portfolio of on-load tap-changers (both the conventional and vacuum type), for high-voltage and low-voltage regulation, with in-tank and on-tank solutions. Our offering includes a wide range of de-energized tap-changers.

Our tap-changers are paired with robust, dependable motor drives that are configurable to meet a wide range of customer specifications.

**Our offering:**
- Conventional on-load tap-changers (OLTC)
- Vacuum on-load tap-changers (OLTC)
- Motor-drive mechanisms
- De-energized tap-changers (DeTC) & switches
- Solution for continuous tap-changer monitoring
- After sales and customer support
**OLTC (On-Load Tap-Changer) portfolio overview**

### Conventional

<table>
<thead>
<tr>
<th>Product name</th>
<th>UZF</th>
<th>UZE</th>
<th>UBB</th>
<th>UCG short</th>
<th>UCG/C</th>
<th>UCG/III</th>
<th>UCG/F</th>
<th>UCL/III</th>
<th>UCL/F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max voltage [kV] in delta connection*</td>
<td>145</td>
<td>145</td>
<td>72,5</td>
<td>245</td>
<td>245</td>
<td>245</td>
<td>245</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>Max BIL [kV]</td>
<td>650</td>
<td>650</td>
<td>350</td>
<td>1050</td>
<td>1050</td>
<td>1050</td>
<td>1050</td>
<td>1175</td>
<td>1175</td>
</tr>
<tr>
<td>Max current [A]** 3-phase</td>
<td>600</td>
<td>600</td>
<td>500</td>
<td>300</td>
<td>600</td>
<td>600</td>
<td>925</td>
<td>925</td>
<td>925</td>
</tr>
<tr>
<td>Max current [A]** 1-phase</td>
<td>600</td>
<td>600</td>
<td>500</td>
<td>900</td>
<td>1500</td>
<td>1500</td>
<td>1500</td>
<td>2400</td>
<td>2400</td>
</tr>
<tr>
<td>Max positions</td>
<td>33</td>
<td>33</td>
<td>27</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
</tr>
</tbody>
</table>

* For Δ-connection. Y-connections is restricted by insulation of neutral point to ground.
** Maximum current in Y-connection.

### Vacuum

<table>
<thead>
<tr>
<th>Product name</th>
<th>VRLTC</th>
<th>VUBB</th>
<th>VUCG short</th>
<th>VUCG/C</th>
<th>VUCG/III</th>
<th>VUCG/F</th>
<th>VUCL/III</th>
<th>VUCL/F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max voltage [kV] in delta connection*</td>
<td>34,5</td>
<td>72,5</td>
<td>245</td>
<td>245</td>
<td>245</td>
<td>245</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>Max BIL [kV]</td>
<td>200</td>
<td>380</td>
<td>1050</td>
<td>1050</td>
<td>1050</td>
<td>1050</td>
<td>1175</td>
<td>1175</td>
</tr>
<tr>
<td>Max current [A]** 3-phase</td>
<td>2000</td>
<td>600</td>
<td>600</td>
<td>600</td>
<td>800</td>
<td>800</td>
<td>1000</td>
<td>1600</td>
</tr>
<tr>
<td>Max current [A]** 1-phase</td>
<td>N/A</td>
<td>600</td>
<td>1500</td>
<td>1500</td>
<td>1800</td>
<td>1800</td>
<td>2400</td>
<td>2400</td>
</tr>
<tr>
<td>Max positions</td>
<td>33</td>
<td>19</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
</tr>
</tbody>
</table>

* For Δ-connection. Y-connections is restricted by insulation of neutral point to ground. ** Maximum current in Y-connection.
### DeTC (De-energized Tap-Changer) portfolio overview

<table>
<thead>
<tr>
<th>Product name</th>
<th>KDV</th>
<th>DPC</th>
<th>DT/DV</th>
<th>DTW</th>
<th>COT</th>
<th>KD</th>
<th>AT</th>
<th>DTU</th>
<th>DTL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max voltage [kV] in delta connection*</td>
<td>24</td>
<td>300</td>
<td>24</td>
<td>300</td>
<td>36</td>
<td>72.5</td>
<td>245</td>
<td>145</td>
<td>145</td>
</tr>
<tr>
<td>Max BIL [kV]</td>
<td>150</td>
<td>1050</td>
<td>150</td>
<td>1050</td>
<td>200</td>
<td>350</td>
<td>1050</td>
<td>650</td>
<td>650</td>
</tr>
<tr>
<td>Max current [A]</td>
<td>300</td>
<td>3200</td>
<td>150</td>
<td>4000</td>
<td>63</td>
<td>1800</td>
<td>650</td>
<td>1500</td>
<td>2000</td>
</tr>
<tr>
<td>Max positions</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>7</td>
<td>11</td>
<td>9</td>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>

* For Δ-connection. Y-connections is restricted by insulation of neutral point to ground.

### Motor-drive mechanisms

The main objective of an electric motor-drive unit is to drive the connected on-load tap-changer or large de-energized tap-changers to a higher or lower tap of a transformer. From modular BUL and versatile BUE for in-tank on-load tap-changers to the digitally controlled SMD with integrated Tap Logic Monitoring System (TLMS) for the type VRLTC tap changer.
Bushings

Bushings are critical components in all electrical networks, as their chief role is to bring current at high voltage through a grounded barrier. We offer a broad range of bushing for transformers, reactors, switchgear, breakers, traction and wall applications. Our portfolio, tailored to individual requirements, ensures users can rely on the highest possible safety and reliability.

Our offering:
- Voltage range from 1 kV to 1,200 kV
- Comply with all national standards, including IEC, IEEE, GB, ANSI and GOST
- AC and DC bushings
- All bushing technologies:
  - Dry type and oil-filled
- Solution for continuous bushing monitoring
- After sales and customer support

### Bushing technologies

<table>
<thead>
<tr>
<th></th>
<th>OIP</th>
<th>RIP</th>
<th>RIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year of market introduction</td>
<td>1920 – present</td>
<td>1960 – present</td>
<td>2012 – present</td>
</tr>
<tr>
<td>Main insulation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil</td>
<td>Impregnated Paper</td>
<td>Impregnated Paper</td>
<td>Impregnated Paper</td>
</tr>
<tr>
<td>Paper-free</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Moisture resistance</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Easy storage</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>No cellulose decomposition</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Non-fragmentsing design</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>IEC 60137 (2017):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tan delta</td>
<td>&lt; 0.7%</td>
<td>&lt; 0.40%</td>
<td>&lt; 0.40%</td>
</tr>
<tr>
<td>PD at 2xUm/√3</td>
<td>&lt; 10 pC</td>
<td>&lt; 5 pC</td>
<td>&lt; 5 pC</td>
</tr>
<tr>
<td>Temperature class</td>
<td>105°C</td>
<td>120°C</td>
<td>120°C</td>
</tr>
</tbody>
</table>
## Transformer Insulation & Components

World’s Broadest, Most Reliable Portfolio

### Oil Impregnated Paper (OIP) – Power transformer outdoor bushings

<table>
<thead>
<tr>
<th>Product name</th>
<th>GOH (CN TOB)</th>
<th>GOB (CN TOE)</th>
<th>GOE (CN-TOM)</th>
<th>GOM (directly molded)</th>
<th>GOEKK</th>
<th>Type-T</th>
<th>O Plus C (II)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage [kV]</td>
<td>36</td>
<td>52-245 (72.5 - 170)</td>
<td>52-1200</td>
<td>245 (252)</td>
<td>245-800</td>
<td>25-46</td>
<td>15-550</td>
</tr>
<tr>
<td>Max. current [A]</td>
<td>25000</td>
<td>1250 (3150)</td>
<td>5000</td>
<td>1600 (3150)</td>
<td>5000</td>
<td>21500</td>
<td>3000</td>
</tr>
<tr>
<td>Application</td>
<td>Transformer-high current (oil/air)</td>
<td>Transformer (oil/air)</td>
<td>Transformer (oil/air)</td>
<td>Transformer (oil/SF₆)</td>
<td>Transformer-high current (oil/air)</td>
<td>Transformer (oil/air)</td>
<td></td>
</tr>
</tbody>
</table>

### DRY - Resin Impregnated Paper (RIP)/Resin Impregnated Synthetics (RIS) – Power transformer outdoor bushings

<table>
<thead>
<tr>
<th>Product name</th>
<th>RTXF (HIRIP)</th>
<th>RTKF (AirRIP)</th>
<th>GSA-QA (directly molded)</th>
<th>GSB</th>
<th>BRIT/BRIT-S</th>
<th>EasyDRY (directly molded)</th>
<th>O Plus Dry (directly molded)</th>
<th>SeismicRIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. current [A]</td>
<td>40000</td>
<td>5000</td>
<td>2000</td>
<td>2500</td>
<td>2000</td>
<td>2500</td>
<td>3000</td>
<td>2500</td>
</tr>
<tr>
<td>Application</td>
<td>Transformer-high current (oil/air)</td>
<td>Transformer (oil/air)</td>
<td>Transformer (oil/air)</td>
<td>Transformer (oil/air)</td>
<td>Transformer (oil/air)</td>
<td>Transformer (oil/air)</td>
<td>Transformer (oil/air)</td>
<td>Transformer (oil/air)</td>
</tr>
</tbody>
</table>
### Non Condenser (bulk) Transformer Bushings

<table>
<thead>
<tr>
<th>Product name</th>
<th>Cast resin bulk</th>
<th>Porcelain bulk</th>
<th>CRS</th>
<th>Type RJ &amp; LCRJ</th>
<th>Type A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage [kV]</td>
<td>1-34</td>
<td>1 - 52</td>
<td>12 - 72.5</td>
<td>1 – 34.5</td>
<td>1 – 34.5</td>
</tr>
<tr>
<td>Max. current [A]</td>
<td>5400</td>
<td>6500/3150</td>
<td>6300</td>
<td>23000</td>
<td>18000</td>
</tr>
<tr>
<td>Application</td>
<td>Transformer/Switchgear (oil/air) + (oil/gas)</td>
<td>Transformer (oil/air)</td>
<td>Transformer (oil/air)</td>
<td>Transformer (oil/air)</td>
<td>Transformer (oil/air)</td>
</tr>
</tbody>
</table>

### DRY - Resin Impregnated Paper (RIP) – Other Power Transformer/Wall/Switchgear/Breaker/Traction Bushings

<table>
<thead>
<tr>
<th>Product name</th>
<th>RTKK (Oil/RIP)</th>
<th>GSA-OO</th>
<th>GSBK</th>
<th>RTKG (GaRIP)</th>
<th>RMI/RMFF</th>
<th>GSA-AA</th>
<th>BRIL/BRIL-S</th>
<th>RAKF</th>
<th>BRIB</th>
<th>RMI/RMII</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage [kV]</td>
<td>72.5 - 550</td>
<td>52-245</td>
<td>245-550</td>
<td>36-550</td>
<td>24-300</td>
<td>52-123</td>
<td>110</td>
<td>245-550</td>
<td>35-110</td>
<td>12-36</td>
</tr>
<tr>
<td>Max. current [A]</td>
<td>4000</td>
<td>2500</td>
<td>2500</td>
<td>4000</td>
<td>5000</td>
<td>4000</td>
<td>2000</td>
<td>4000</td>
<td>2000</td>
<td>3000</td>
</tr>
<tr>
<td>Application</td>
<td>Transformer (oil/oil)</td>
<td>Transformer (oil/oil)</td>
<td>Transformer (oil/SF₆)</td>
<td>Transformer (oil/SF₆)</td>
<td>Wall (air/air)</td>
<td>Wall (air/air)</td>
<td>Wall (air/air)</td>
<td>Switchgear (SF₆/air)</td>
<td>Breaker (oil/air)</td>
<td>Traction (air/air) (oil/air)</td>
</tr>
<tr>
<td>Standard</td>
<td>IEC</td>
<td>IEC</td>
<td>IEC</td>
<td>IEC</td>
<td>IEC</td>
<td>IEC</td>
<td>IEC</td>
<td>GOST</td>
<td>IEC</td>
<td>GOST</td>
</tr>
</tbody>
</table>

### HVDC Transformer and Wall Bushings

<table>
<thead>
<tr>
<th>Product name</th>
<th>GGF</th>
<th>GSC</th>
<th>GSD</th>
<th>GGFL</th>
<th>GSCL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated DC voltage [kV]</td>
<td>200-1100</td>
<td>150-500</td>
<td>600</td>
<td>150-1100</td>
<td>320</td>
</tr>
<tr>
<td>Max. current [A]</td>
<td>6250</td>
<td>2500-3000</td>
<td>3000</td>
<td>6250</td>
<td>2500</td>
</tr>
<tr>
<td>Application</td>
<td>Transformer (oil/air)</td>
<td>Transformer (oil/air)</td>
<td>Transformer (oil/air)</td>
<td>Wall (air/air)</td>
<td>Wall (air/air)</td>
</tr>
</tbody>
</table>
Insulation components and materials

Electrical insulation is a vital part of transformers, helping them withstand the high temperatures and electric fields that occur during the transformer’s operating life. The lifetime of a transformer depends on the reliability of the insulation used.

ABB pays close attention to the systems and processes used in manufacturing transformer insulation, and continues to improve product quality and reliability by continuously investing in modern equipment and experienced people.

From replacements to upgrades we have been the supplier of choice providing quality insulation materials for over 100 years by meeting the diverse needs of an evolving industry.

Our offering:
For distribution and power transformers, whether it be liquid-filled, dry-type or traction we offer a complete range of insulation products for transformers from 11 kV up to 1,200 kV AC and 800 kV DC:

- Pressboard and transformer insulation paper
- Power transformer winding and active part kits
- Fiber composite laminates and components
- Flexible laminates
- Polymeric insulators
- Machined and molded power transformer components
- High voltage lead exits
Product applications

Dry type transformers, electrical drives

Generators, dry type transformers

Power tools

Generators, dry type transformers

Dry type transformers, capacitors, oil transformers

Electric vehicles

Electrical drives, niche products

Distribution & Power transformers

Traction drives, traction transformers

HVDC – transformers

Generators, electrical drives
Measurement, monitoring & safety devices

To secure reliable and safe service conditions of the transformer, we provide a comprehensive range of measurement & safety devices including digital transformer monitoring open platform solution.

Our portfolio includes the new generation of sensors and smart devices and cost-effective complete solutions that monitor transformer health and improve safety, reliability and efficiency, while minimizing environmental impact.

Our local and global after-sales and service teams and knowledgeable customer support network offers expert support to help select the right device for your application. From replacements to upgrades and mechanical to digital devices, we offer the most complete portfolio in the industry.

Our offering:

**eDevices**
- Self-dehydrating breathers
- Liquid level indicators and digital viewers
- Liquid temperature indicators
- Winding temperature indicators
- Pressure relief devices
- Buchholz relays

**Monitoring systems**
- Dissolved gas analyzer (CoreSense)
- Monitoring platforms (CoreTec)

**Conventional offering**
- Dehydrating breathers
- Liquid level indicators
- Pressure relief devices
- Buchholz relays
- Liquid flow relays
- Sudden pressure relays
- Gas sampling devices
- Shutter valves
- Integrated safety detector for distribution transformers
- Thermometers & thermostats
- Liquid temperature indicators
- Winding temperature indicators
- Temperature control units for dry transformers

**Mechanical components and valves**
- Air venting devices
- Ball valves
- Butterfly valves
- Liquid draining valves
- Plugs
- Thermometer cases
- Transformer wheels
- General mechanical parts
- other

Our offering includes components for distribution transformers.
Digitalization is helping enterprises make better and faster decisions through enhanced asset performance visibility. Monitoring improves the reliability of the assets by constantly keeping a watchful eye on the most critical transformer components.

TXpert, our digital monitoring open platform represents a comprehensive solution that enables continuous monitoring of the most valuable transformer’s parameters like:

- Gas accumulation
- Liquid level
- Winding and liquid temperature
- Internal pressure
- Air humidity
- Liquid dissolved gas and moisture levels
- Bushing insulation and Tap-changer operational performance

CoreTec™ 4, the TXpert Hub, is a truly scalable transformer monitoring platform. It is modular, expandable and can integrate a variety of digital sensors and devices into one unique eco-system.

Through remote access, the status of the equipment can be evaluated with Asset Performance Management, the APM Edge, a new software solution which delivers unique, real-time data to power producers and users on the current and future operational health of their transformer assets.
Cyber Security within Transformers

We are committed to providing our customers with products, systems and services that clearly address cyber security. Proper and timely handling of cyber security incidents and software vulnerabilities is one important factor in helping our customers minimize risks associated with cyber security.

CoreTec™ 4 enables real-time management of a transformer by monitoring its key parameters and warns the operator of any changes in a transformer’s condition using live and off-line data and transformer models based on IEC and IEEE standards.

Benefits:
- Modular
- Configurable and expandable
- Plug and play
- Integrates DGA, bushing & tap-changer monitoring and accessory monitoring into the same platform