

# Power<sup>IT</sup> RESIBLOC<sup>®</sup> Dry Type Distribution Transformers

250 kVA through 40,000 kVA



Industrial<sup>IT</sup>  
enabled™



## Mission

ABB is a global leader in power and automation technologies that enable utility and industry customers to improve performance while lowering environmental impact.

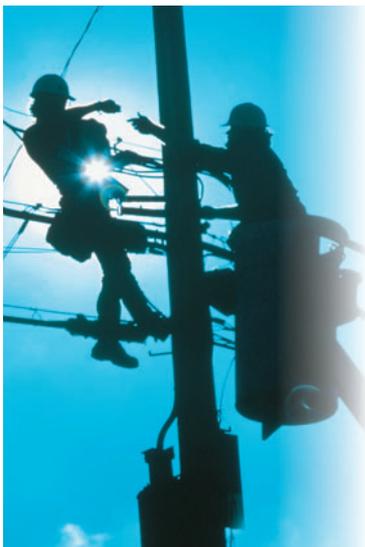
## Introduction to ABB

ABB is the worlds leading supplier of Distribution Transformers. We offer:

- All technologies (Dry/Liquid)
- All standards (IEC, ANSI, etc)
- Applications up to 72.5 kV

## Facts and figures (approx)

- Production facilities around the world: 30
- Countries with Sales and Services centers: 140
- Number of units produced yearly: 400,000



Working with us, you have access to a worldwide network of factories and facilities serving you locally with a full range of products and solutions. Our warrenty provides one ABB quality and service. Working together gives you access to production facilities using Industrial<sup>IT</sup> and the most up to date technologies, providing the highest quality for standard and specialty products as well as solutions.

## Introduction to Industrial<sup>IT</sup>

Industrial<sup>IT</sup> is ABB's name for a powerful commitment to solutions for Real-Time Automation and Information. Industrial IT guides every step ABB takes going forward in technology, business processes, and more. All ABB Distribution Transformer products are Industrial IT certified, which guarantees structured, easy accessible and on-line documentation. It can be viewed on its own but also as a part of a larger system.



## Quality statement

Our production facilities are ISO 9001/14001 certified. Our aim is to deliver your distribution transformers fast, on time and conform to your specifications.

# RESIBLOC® - the clean technology

## The Opportunity

Dry type transformers are being specified more frequently by users seeking to minimize contamination risks to the environment and flammability risks to persons and property. These transformers are required to meet more stringent parameters with respect to electrical system demands as well as extreme operating climates. Applications today include high density office buildings, nuclear power plants, offshore drilling platforms, and high volume industrial process plants. New technology has enabled the transformer engineer to apply new materials with new processes to provide resilience to these environments while ensuring unprecedented reliability.

If your transformer application requires any of the following characteristics, ABB has the solution to meet your needs.

- No risk of any contamination to the application environment
- Non-explosive with high resistance to flame
- Severe load cycles (cold start to maximum load)
- High short circuit withstand
- Exposure to harsh climates (freezing, heat, chemicals, moisture)
- Minimal maintenance

## The solution: RESIBLOC® - the cast resin transformer

For more than 30 years, we have been supplying cast resin transformers all over the world. RESIBLOC® transformers answer the need for a safe, reliable transformer designed to fulfill the most exacting specification requirements while providing a non-flammable, environmentally safe product. The glass fibre reinforced RESIBLOC® transformer offers an extremely robust and proven design for medium voltage transformer requirements and conforms to IEC 60726/IEC 60076-11 standards.

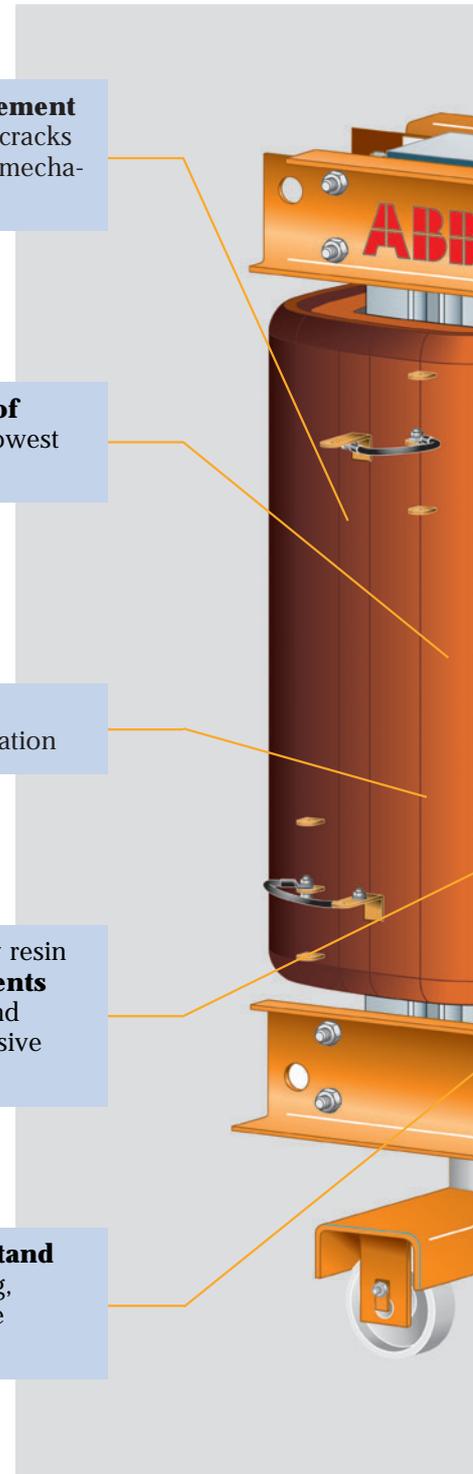
**Glass fibre reinforcement** eliminates the risk of cracks and provides highest mechanical strength

**Thermal shock proof** even at highest and lowest temperatures

**Smooth surface** restricts dust accumulation

Glass fibre and epoxy resin **encapsulation prevents** ingress of moisture and protects against aggressive environments

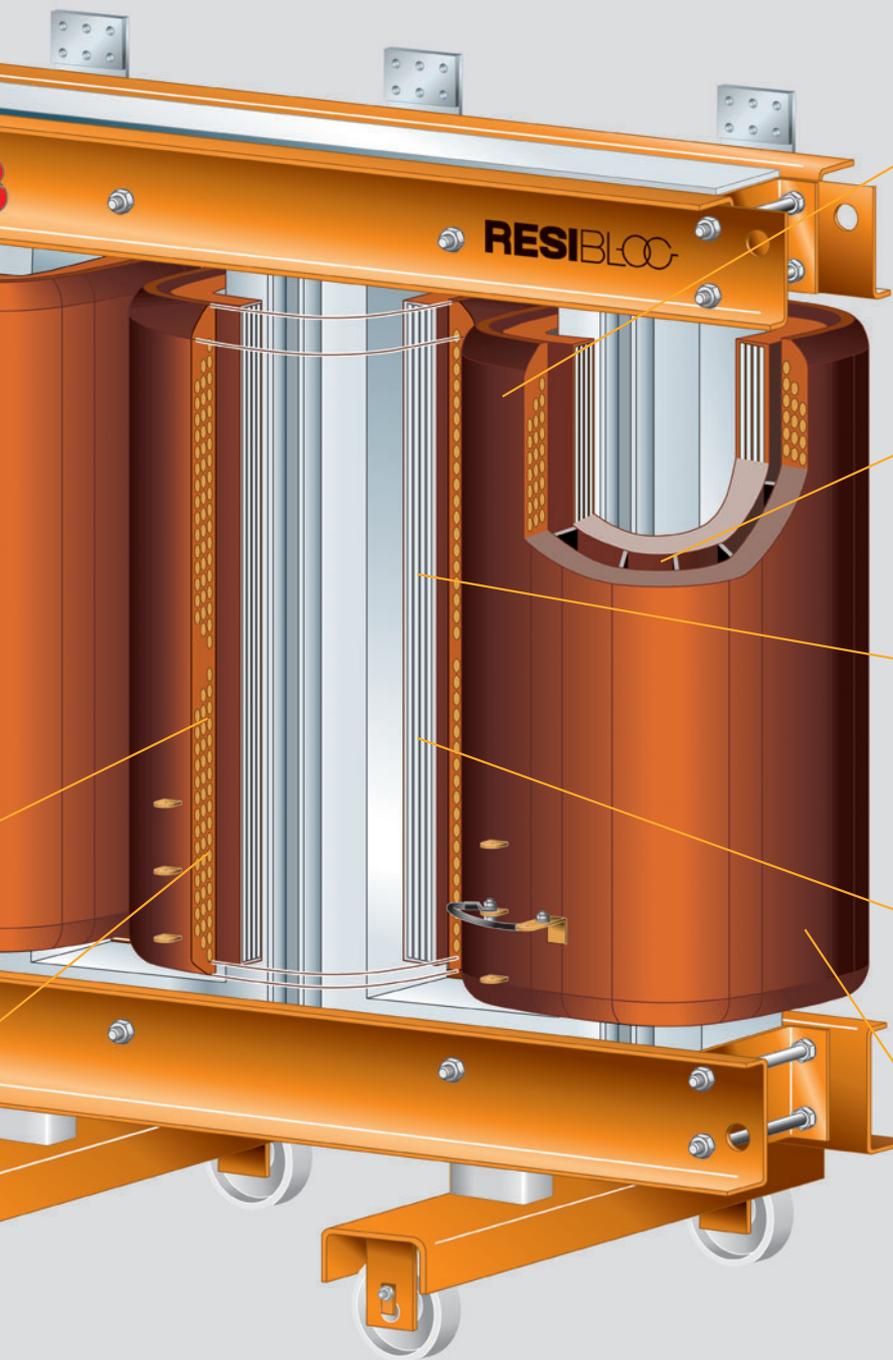
**High impulse withstand** through layer winding, giving a linear voltage distribution



### Main technical data

- Power rating (AN) 250 kVA to 40,000 kVA
- Rated voltage up to 45 kV

- Classification acc. to IEC 60076-11**
- Climatic classification C2
  - Environmental classification E2
  - Fire classification F1



**Compact self-supporting winding** in a one-piece block – optimum to withstand short-circuit-forces

**Cylindrical cooling-ducts** give the advantage of optimal cooling through the coil itself

**Aluminium or Copper foil** in LV-winding

**High short circuit withstand** through glass fibre prepreg resin impregnated LV-foil winding

**Self-extinguishing** in the event of secondary fire or arcing and **no gases released** with high danger potential

## Glass fibre reinforcement - guarantee against cracks



*Glass fibre rovings*

The material epoxy resin, reinforced with glass fibre rovings, is a material of immense strength. Modern winding processes, combined with electronically controlled winding machinery, ensure an even distribution of glass fibre rovings and epoxy resin, and the highest precision in the manufacture of transformer windings. Multi-spaced ribs, built-in during the winding process, integrate the HV and LV windings into a single compact winding block.

*Layer insulation with glass fibre cross bandage*



### Low voltage windings

In RESIBLOC® transformers, either aluminium or copper foils are used for the low voltage winding with thermal class F fibre prepreg windings insulation. A considerable reduction in axial short circuit forces is obtained from the use of a foil winding.

To raise the space factor on transformers with small ratings, the LV-winding is produced using a wire layer winding.

Low voltage windings for use in operating voltages higher than 1.1 kV are produced in the same manner as high voltage windings.

If necessary to provide satisfactory cooling, the LV-windings are equipped with one or more axial cooling ducts.



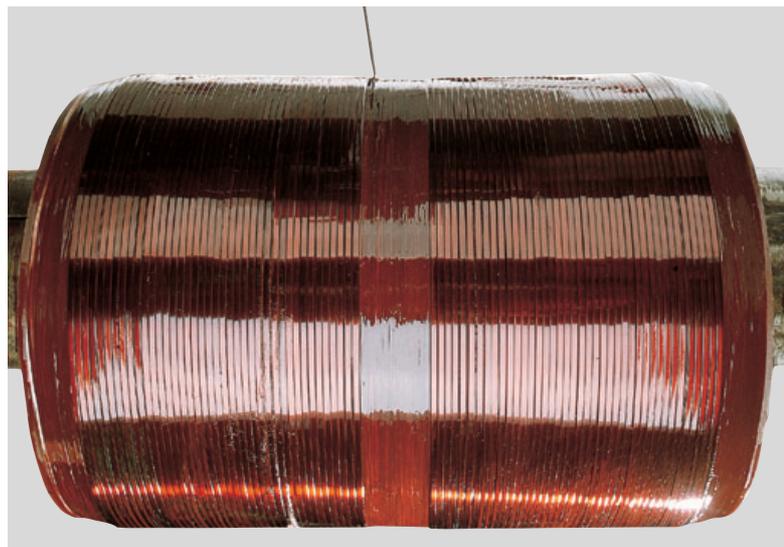
*LV aluminium foil winding  
with glass fibre prepreg insulation*

### High voltage windings

The cylindrical high voltage windings are wound directly onto the low voltage windings. The superior lightning impulse voltage withstand of RESIBLOC® transformers is a result of the linear impulse voltage distribution obtained by using a layer-winding concept.

Circular, or for larger cross-sections, rectangular copper conductor material (insulation class H) is used. The outer encapsulation and the intermediate layer winding insulation, consists of glass fibre reinforced epoxy resin material (insulation class F), applied using the ROVING-winding process.

The completed winding block is finally cured under rotation in specially designed curing ovens.



*HV layer winding*

## RESIBLOC® - short circuit proof block winding



*RESIBLOC® windings*

With approx. 80 % glass fibre content and the favourable combination of glass fibre radial and cross bracings introduced during the winding process, an exceptionally robust winding block is achieved, with high mechanical strength in both axial and radial directions. Furthermore, this results in windings with high short circuit withstand levels and extreme thermal shock stability at both high and low temperature levels. The risk of cracks due to different thermal coefficients of expansion between conducting and solid resin insulation materials is effectively prevented for the transformers whole lifetime. Also, cracks never arise under extreme working conditions, i.e. very low ambient temperatures and following sudden peak overloads.

High rating transformers, e.g. 40 MVA, can be made as self cooled units (AN) as multiple cooling channels can be located direct within the high voltage windings.

Glass fibre roving winding technology makes it possible to build the largest windings in a single piece, due to the exceptionally high mechanical strength achieved from this type of solid insulation.

Through the encapsulation with glass fibre reinforced epoxy resin insulation materials, the windings are effectively protected against mechanical and chemical effects, insensitive to humidity and practically maintenance free. As no moulds are necessary to manufacture RESIBLOC® transformers, minimum restrictions exist to produce windings to suit specific customer requirements. The smooth outer surfaces of the winding restrict dirt and dust from accumulation.

### Block windings

In the block winding principle, both high and low voltage windings are bound together by multi-spaced ribs, forming a solid block. Any movement during a short circuit, due to either axial or radial short circuit forces is therefore prevented. The need for coil-supports to absorb these forces, is with this concept no longer necessary, and the function of the supports used is only as spacers to provide the electrically required distance between the core yokes and the windings. The block winding principle ensures, for the voltage withstand important, spacing between HV- and LV-windings, guaranteeing no changes during a short circuit or any transformer movement.



*RESIBLOC® windings*

## Fire safety

RESIBLOC® transformers can be characterised as hard to ignite and self-extinguishing. Less than 5 % of the materials used can burn if the transformer is drawn into a normal fire. Tests have proven that RESIBLOC® transformers fulfil the requirements of fire behaviour class F1 acc. to Cenelec HD 46451 (later IEC 60076-11):

- No toxic gases, and no gases appear other than those present in any normal fire.
- This very favourable fire behaviour is a direct result from use of approx. 80 % glass fibre content in the insulation material. The good self-extinguishing effect is achieved without using any environmentally undesired halogens.



*Fire test equipment*

# Core design - optimal in materials and geometry

## Core design

The design of the core is an important factor of any transformer's efficiency. The geometric core arrangement and the materials chosen determine the losses and noise levels. Grain oriented transformer sheet steel is used in the core construction. It is cut by the most modern, fully automated core cutting machinery and assembled into limb and yoke sets. This results in high dimensional accuracy, excellent space factor, and low loss values. The core joints between the limb and yoke sections are interleaved and mitred (45°) creating the optimum conformity of the magnetic flux pattern to the preferred magnetic flow. By using the modern step-lap technology (SLT) a multiple stepped joint is created between the limbs and yoke sections. With use of SLT the no-load currents can also be reduced and consequently the size of a possibly needed reactive power compensation unit. For a lasting protection against corrosion, each core is given a protective epoxy resin finish. The block windings are firmly braced to the core using made to measure synthetic resin insulating strips.

## Core clamp design

The yoke sets of RESIBLOC® transformers are held firmly together by exactly located steel core clamps. Core bolts are located where necessary.

RESIBLOC® transformers are provided with flat rollers for longitudinal and traverse movement. To raise the transformer, four lifting holes are situated in the upper core clamps, designed for use with a chain or cable.

## Finish

Core clamps and transformer mainframe is sand-blasted, primed and given a final RAL 2000 top coat colour.

# Tested one by one



## Tests

Every RESIBLOC® transformer undergoes a detailed individual test and inspection, including all routine tests according to IEC 60726/IEC 60076-11 and VDE 0532, prior to dispatch. This includes:

### Routine Tests

- Measurement of voltage ratio and check of phase displacement
- Separate-source AC withstand voltage test (applied voltage)
- Induced AC overvoltage withstand test
- Measurement of no load loss and current
- Measurement of winding resistance
- Measurement of impedance voltage, short-circuit impedance and load loss
- Partial discharge measurement (special test)
- Function- and insulation test of control wiring, auxiliary operation, tests on on-load tap changers, where appropriate

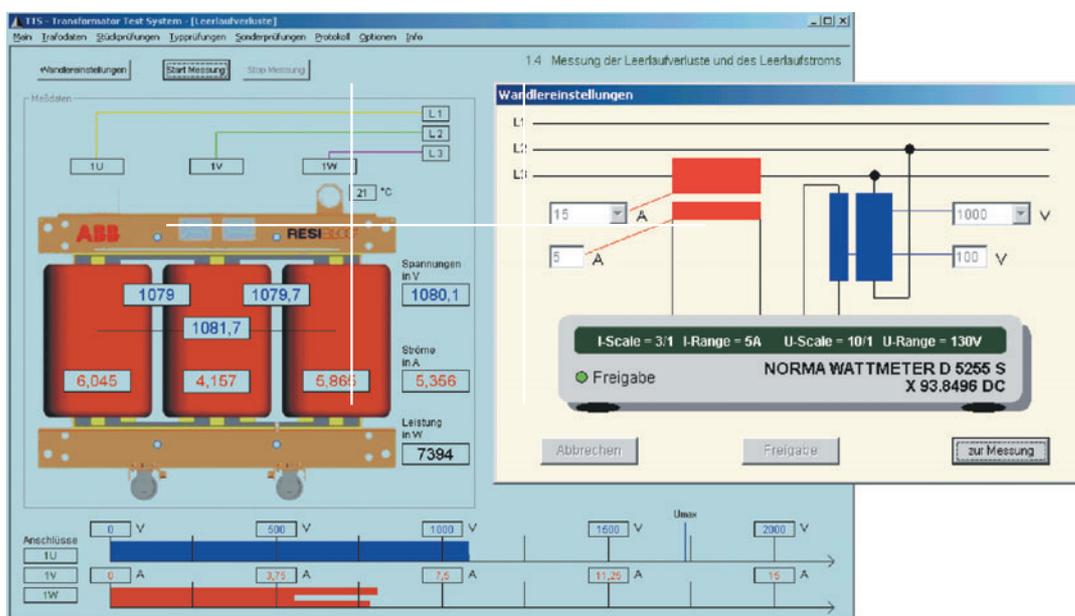
### Optional tests

### Type Tests

- Lightning impulse (LI) test
- Temperature-rise test

### Special Tests

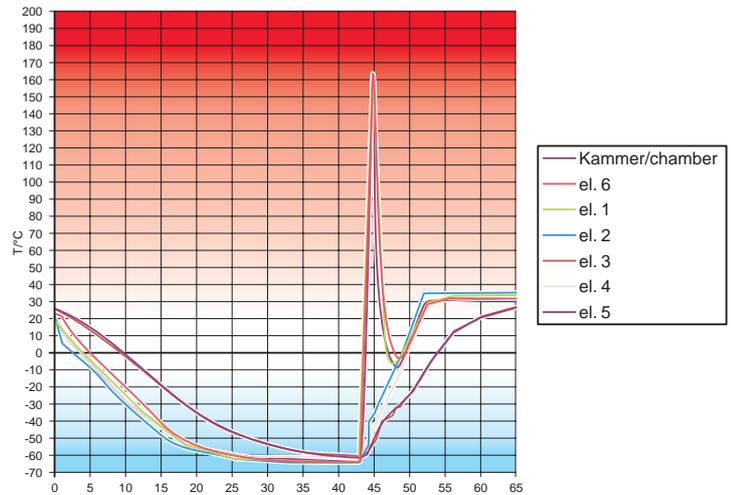
- Determination of sound levels
- Determination of capacitances of windings to earth and between windings
- Measurement of zero-sequence impedance(s) on three-phase transformers
- Measurement of the harmonics of the no-load current
- Measurement of insulation resistance to earth of the windings and between the windings



### Deep temperature test at - 60 °C

A severe test on a RESIBLOC® transformer has been performed at the Department High-Voltage Dielectric Testing of Universität Karlsruhe: The RESIBLOC® has passed a deep temperature storage test at - 60 °C, whereas class C2 according to VDE 0532 part 6 requires only - 25 °C. In addition, 3 thermal shock tests have been made: 2 tests with double rated current at - 60 °C and the 3rd test with 2,55 times rated current at - 60 °C. VDE requires only 1 test at - 25 °C. Before and after this test sequence, a full IEC routine test and partial discharge test was performed successfully.

These tests prove that the RESIBLOC® transformers are exceeding the requirements of VDE 0532 resp. Cenelec HD 46451 (IEC 60076-11) class C2. Therefore the RESIBLOC® is very well suited for operation in arctic conditions and for application with strongly varying loads.



### Thermal shock test

The thermal shock test under extremely severe conditions is documented evidence that the RESIBLOC® cast resin coils even under extreme and rapid fluctuating thermal loads remain completely crack-free. These tests consist of an immersion cycle from hot- to cold-water tanks, involving 6 complete immersion cycles. This results in extreme mechanical and thermal stresses due to the temperature gradient and the materials own separate expansion coefficients.

The visual and electrical tests, including partial discharge tests, carried out and witnessed by KEMA-Test-Institute after completion of the immersion cycles has proven that the RESIBLOC® has retained completely its electrical function despite the thermal loads endured during the test program.

These tests are described in detail in a separate document.



# A suitable enclosure for each site

## Enclosures

Standard RESIBLOC® transformers are supplied without enclosures, i.e., protection class IP 00. Additional protection is offered by use of enclosures of different protection classes.

### IP 21 enclosures

Enclosures class IP 21 protect against entrance of solid objects larger than 12 mm diameter and vertical dripping water. To ensure the free movement of cooling air, this type of enclosure is fitted with perforated sheet floor and air vent grills at both front and rear sides.

### IP 23 enclosures

In addition to IP 21, the IP 23 enclosures offer protection against water dripping at an angle of up to 60° from the vertical. A solid roof is used together with a perforated sheet floor and air louvres at the top of both front and rear sides.

### Special enclosures

Depending on individual customer requirements, specially designed enclosures can be offered, for example:

- Protection class IP X4D which prevents entrance of objects larger than 1 mm diameter and spraying water from all directions.
- Protection class IP 54 provides a safety barrier against accidental live contact. It protects against spraying water from all directions. Enclosures IP 54 are available up to ratings of 1000 kVA with AN cooling. For higher ratings, we can offer air-water cooling (AFWF) - see photo page 15.

Both IP X4D and IP 54 offer protection against spraying water from all directions.

Other protection degrees can be quoted on demand.



*Enclosure IP 23*



*Enclosure IP X4D*



*Enclosure IP 54*



*IP 23 enclosure for outdoor installation with raincover in the North of Sweden*

*Special outdoor enclosure*

### General design

All enclosures are manufactured using galvanized sheet steel. On request, enclosures can be supplied with an additional paint finish. Every enclosure is fitted with removable front and rear panels, for easy reconnection of HV-tappings, and assembling of connecting cables. Cutouts are provided in the enclosure floor to bring cables through.

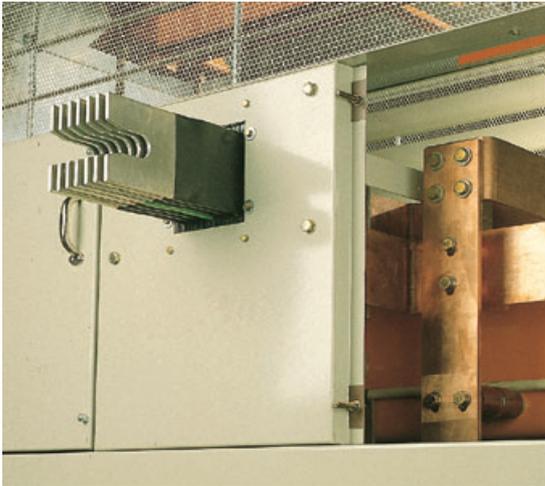
To ensure a satisfactory supply of cooling air, the base of the enclosure for transformers up to 800 kVA must be 150 mm above the ground, up to 1600 kVA 200 mm, and for transformers over 1600 kVA 240 mm. The minimum cooling air requirements are 4 m<sup>3</sup>/kW/minute of dissipated heat loss.

For outdoor installation specially designed enclosures are necessary.



*IP 23 enclosure with raincover and OLTC*

## RESIBLOC® - special designs to meet special demands



*LV busbar termination*



*15 MVA – Offshore platform transformer*

### Special designs

Although the standard design of RESIBLOC® transformers meets most customers needs, special operating or site conditions can require special designs. The flexibility in the RESIBLOC® concept enables most requirements to be fulfilled. Variations such as single phase, 3-winding transformers, or transformers with special terminal arrangements, cable supports, flange connections to match busbar systems, are regularly being dispatched to clients worldwide. RESIBLOC® transformers can be supplied with additional equipment, for example: earthing switches, load or no-load break switches and fuses. In combination with an enclosure, most installations can be tailor-made to suit specific customer specifications.

On request, RESIBLOC® transformers can be supplied for use at other frequencies, e.g. 60 Hz, as well as for operation at higher ambient temperatures.



*RESIBLOC® single phase transformer*



*IP 54 RESIBLOC® transformer with AFWF cooler*



*10 MVA RESIBLOC® transformer with on load tap changer*

### Rectifier transformers

Standard transformers cannot be loaded to their full rating in circuit with a rectifier, due to the harmonics generated in the network with e.g. 6, 12, 18 or 24 pulse rectifiers. The harmonics cause additional losses in the windings, and thereby higher temperatures. It is therefore essential, that transformers intended for use with rectifiers are designed specifically for that purpose. The additional eddy losses have to be minimised and the cooling must be improved to take care of the remaining losses. The extent of the harmonics in the system should be clearly specified in the enquiry and order. On request, rectifier transformers can be supplied with dual LV-windings.



*Special outdoor enclosures*

# Overload without risk

## Overload capability

The long time-constants of cast resin transformer windings allow short-period high overloads during operation. Benefits can be made of this when selecting the transformers size rating. The maximum permitted winding temperature hot spot of 155 °C will not be exceeded by specific loads, when the RESIBLOC® transformer, prior to overload, is only partially loaded and/or operated at a lower ambient temperature than the design value.



2 stage temperature control

## Options for overload protection

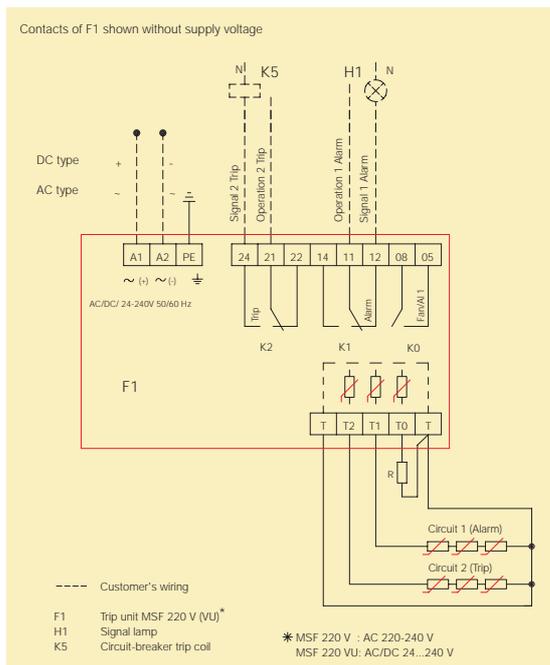
High ambient temperature, inadequate cooling and overloads can lead to thermal overstressing of the transformer. RESIBLOC® transformers can be protected by installing a temperature monitoring system without limiting the transformers maximum power output at all load cycles. The temperature monitoring system consists of two separate circuits, each with three PTC sensors to register different temperatures and values.

## Further options

- Dial type thermometer with maximum pointer, and 2 changeover contacts
- PT 100 sensors with digital indicator

## Forced air cooling

Optionally, RESIBLOC® transformers can be equipped with cross-flow cooling fans. Fans used have low noise levels and can increase the transformers rated output by up to 40 %, ideal for example for longer periods of intermittent overloads. The fans are automatically controlled using thermal sensors, to avoid excessive unnecessary fan use.



Overload protection schematic



Forced air cooling

# Technical data

## Technical data

RESIBLOC® transformers can be supplied with rated voltages up to 45 kV. The high voltage windings can be supplied reconnectable to operate from several voltage supplies. The HV/LV no-load ratio must be stated in both enquiry and order, as voltages can be supplied to suit individual needs. RESIBLOC® transformers with dual high voltage windings can also be supplied.

### Tappings:

The standard tapping is  $\pm 2 \times 2.5\%$  at an impedance voltage of 4% and 6%. Other tappings are available on request.

### Impedance voltage:

For transformers with impedance voltages other than the standard impedance values given in the following table please specify the requested impedance values in your enquiry.

### Connection groups:

On ratings up to 200 kVA the vector group is Yzn 5. On ratings of 250 kVA and above Dyn 5 is used. Other vector groups are available on demand.

### Temperature rise:

RESIBLOC® transformers are designed to ensure that the permitted class F temperature rise of 100 K, according to IEC 60726/IEC 60076-11 and VDE 0532 is not exceeded.

### Noise levels:

Noise levels are expressed in the table as sound-power levels. All these levels apply for IP 00 transformers, measured at 1 m distance.

Tolerances, acc. to IEC:

- 1 a) Total losses  
+ 10 % total losses
- b) No-load or load losses  
+ 15 % of no-load or load losses on condition that the tolerance for total losses are not exceeded.
2. Voltage ratio  
Rated voltage ratio (principal tapping)  
the lower of the following values:
  - a)  $\pm 0.5\%$  of the obligatory rated value
  - b) a percentage of the obligatory voltage ratio which equals  $\pm 1/10$  of the measured rated impedance voltage percentage  
Voltage ratio for other tappings  
 $\pm 1\%$  unless otherwise specified
3. Impedance voltage at rated current (principal tapping)  
 $\pm 10\%$
4. Impedance voltage for other tappings  
 $\pm 15\%$  of agreed value for this tapping
5. No-load current  
+ 30 % of the obligatory no-load current
6. Sound-pressure level  
without tolerance

## Transformer for 60 Hz

Transformers designed for 50 Hz operation can also operate on a 60 Hz supply with the following amendments to the technical data:

Power:	approx. 97 %
No-load losses:	80 - 85 %
Load losses:	approx. 105 %
Impedance:	115 - 120 %

## Notes

Requirements other than shown can be quoted to suit individual requirements.

## Service conditions

### IEC Standards ambient cooling air temperature limits

Below are the maximum temperature limits the standard dry type transformers are designed to, as defined in the standards IEC 60726/IEC 60076-11 and VDE 0532, part 6. The cooling air of the transformer must therefore never exceed:

Maximum ambient temperature	40 °C
Average of the hottest month	30 °C
Average in any one year	20 °C

Special designed units are available for use in other cooling air conditions. Standard RESIBLOC® transformers can also be used in ambient temperatures up to 55 °C, when a calculation for a reduced loading has been carried out. As a guideline the load ability must be reduced by 7 % for every 10 °C increased ambient temperature.

### Minimum temperature limits

The colder temperatures are of special interest for the dry type transformers, not only during transport and storage, but also in service. The RESIBLOC® transformer can be placed in operation at low temperatures down to - 60°C without restrictions following low-load or switch-off periods. The extreme mechanical strength of the glassfibre reinforced cast resin roving windings eliminates any danger of cracking in the windings.

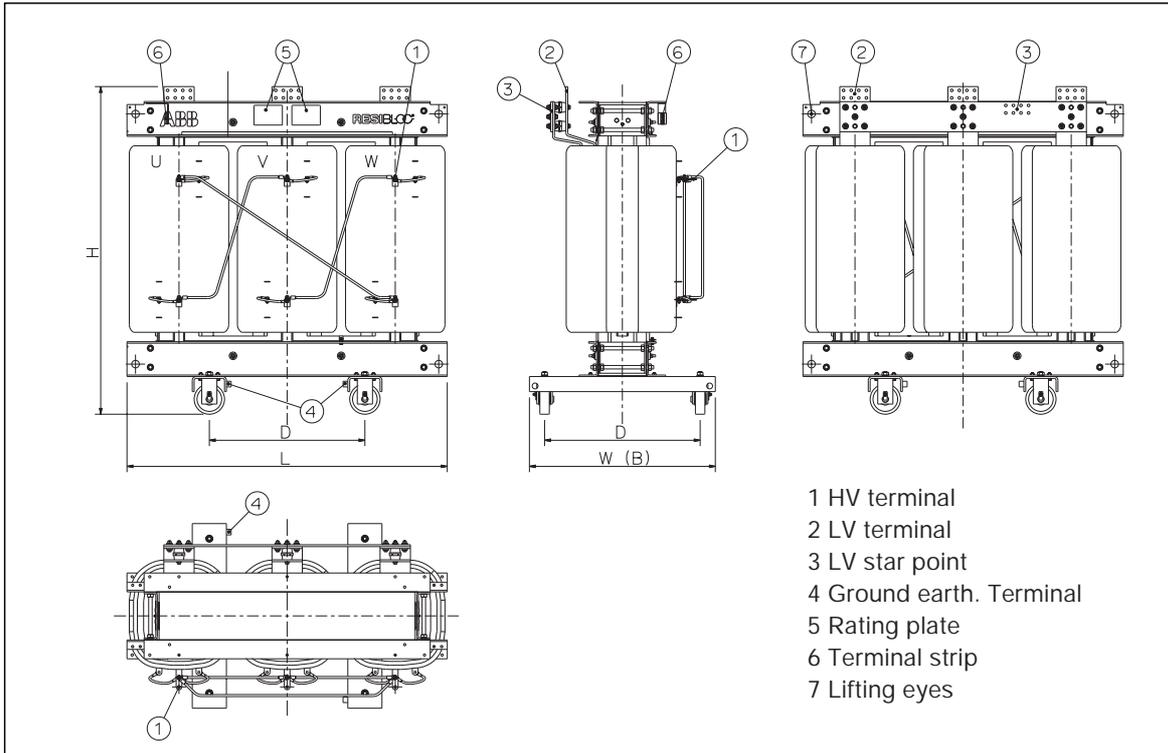
### Altitude

According to IEC 60726/IEC 60076-11 and VDE 0523, part 6, a normal height above sea level of 1000 m (3300 feet) must not be exceeded. For operation at higher altitudes, a special technical design is necessary to allow for the cooling air and the dimensioning of the electrical air insulation distances.

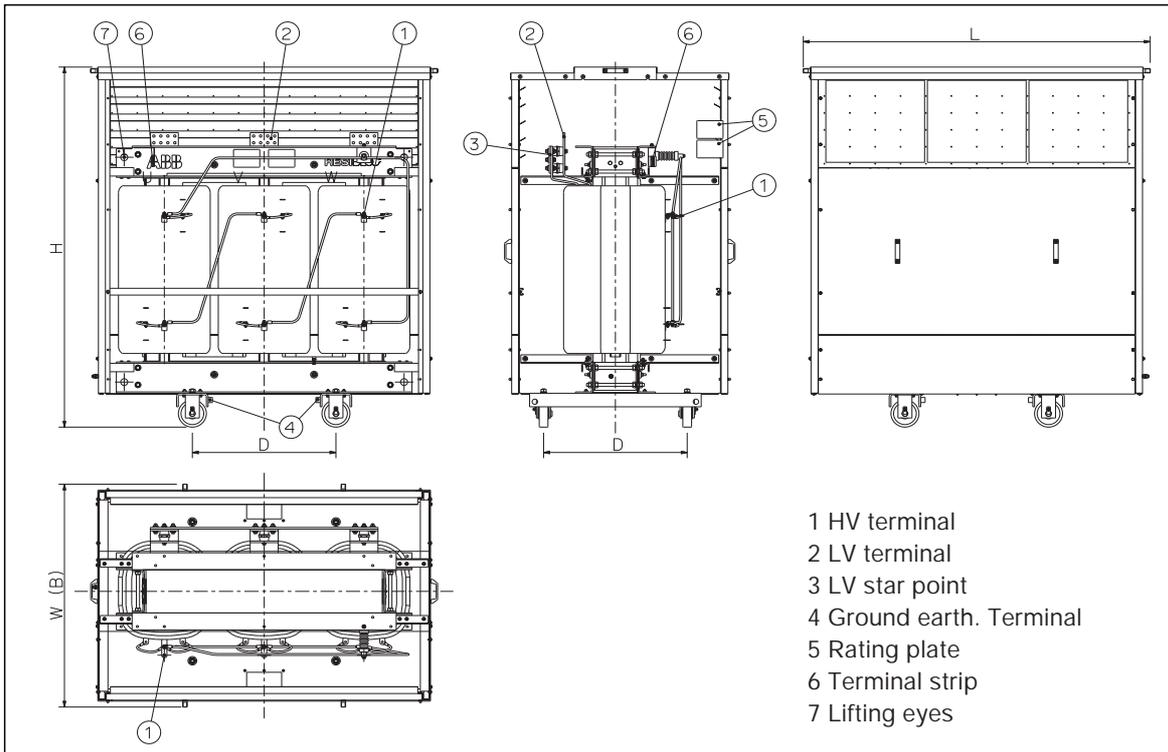
### Humidity and pollution

The RESIBLOC® transformer is designed according to IEC 60726/IEC 60076-11 class E2 for use under extreme service conditions, with high humidity levels, frequent condensation and/or pollution.

Outline drawing - standard ABB RESIBLOC® transformer IP 00

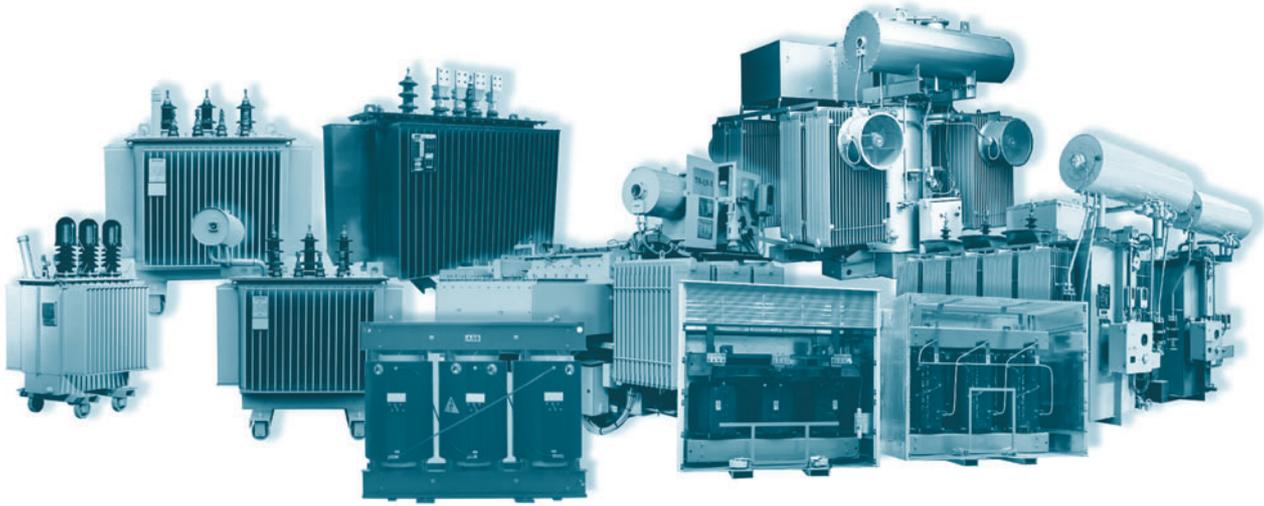


Outline drawing - standard ABB RESIBLOC® transformer IP 23



Power (kVA)	HV / LV (kV)	Impedance (%)	No-Load loss (W)	Load loss (W) T = 75° C	Noise level (dB) Sound power	Vector group	L = Length (mm) IP 00	W= Width (mm) IP 00	H= Height (mm) IP 00	Total weight (kg) IP 00	L= Length (mm) IP 23	W= Width (mm) IP 23	H= Height (mm) IP 23	Total weight (kg) IP 23	D= Roller dist. MAF (mm)
<b>Normal no load loss</b>															
250	10/0.4	6	690	3400	65	Dyn11	1220	660	1280	810	1510	1120	1660	1220	520
400	10/0.4	6	1000	5000	68	Dyn11	1370	810	1360	1420	1660	1170	1710	1580	670
500	10/0.4	6	1200	5700	69	Dyn11	1410	810	1340	1580	1750	1210	1700	1750	670
630	10/0.4	6	1370	6600	70	Dyn11	1470	810	1400	1810	1820	1210	1750	2000	670
800	10/0.4	6	1700	7700	72	Dyn11	1570	810	1430	2250	1940	1250	1760	2450	670
1000	10/0.4	6	2000	8800	73	Dyn11	1490	890	1700	2530	1680	1180	1950	2750	820
1250	10/0.4	6	2400	10500	75	Dyn11	1700	980	1680	2970	1990	1300	2130	3200	820
1600	10/0.4	6	2800	12700	76	Dyn11	1690	980	1890	3690	2060	1340	2260	3950	820
2000	10/0.4	6	3500	15500	78	Dyn11	1770	1050	2070	4460	2150	1360	2540	4740	820
2500	10/0.4	6	4300	19000	81	Dyn11	1790	1300	2230	5350	2170	1570	2800	5690	1070
3150	10/0.4	6	5200	22600	83	Dyn11	1990	1300	2330	6820	2420	1650	2900	7200	1070
<b>Reduced no load loss</b>															
250	10/0.4	6	540	3400	57	Dyn11	1200	660	1260	1290	1480	1140	1650	1440	520
400	10/0.4	6	780	5000	60	Dyn11	1350	810	1360	1570	1660	1250	1730	1750	670
500	10/0.4	6	940	5700	61	Dyn11	1350	810	1440	1800	1660	1230	1810	1980	670
630	10/0.4	6	1100	6600	62	Dyn11	1510	810	1410	2100	1850	1280	1740	2300	670
800	10/0.4	6	1330	7700	64	Dyn11	1630	810	1470	2590	1970	1310	1780	2800	670
1000	10/0.4	6	1500	8800	65	Dyn11	1550	980	1750	3030	1900	1370	2080	3260	820
1250	10/0.4	6	1880	10500	67	Dyn11	1630	980	1940	3540	1960	1350	2370	3800	820
1600	10/0.4	6	2100	12700	68	Dyn11	1750	980	1860	4530	2150	1420	2230	4800	820
2000	10/0.4	6	2750	15500	70	Dyn11	1780	1050	2060	5340	2170	1440	2530	5640	820
2500	10/0.4	6	3000	19000	71	Dyn11	1810	1300	2440	6330	2180	1590	3010	6680	1070
3150	10/0.4	6	3900	22600	73	Dyn11	1940	1300	2450	7160	2330	1630	3020	7530	1070
<b>Normal no load loss</b>															
250	20/0.4	6	880	3300	65	Dyn11	1320	710	1560	1360	1740	1340	1940	1570	520
400	20/0.4	6	1200	4800	68	Dyn11	1410	810	1630	1700	1800	1340	2020	1920	670
500	20/0.4	6	1400	6000	69	Dyn11	1410	810	1770	1950	1800	1350	2160	2180	670
630	20/0.4	6	1650	6900	70	Dyn11	1430	810	1790	2160	1830	1390	2180	2410	670
800	20/0.4	6	1900	8100	72	Dyn11	1530	820	1830	2570	1940	1400	2200	2820	670
1000	20/0.4	6	2300	9600	73	Dyn11	1610	980	2000	3030	2040	1420	2450	3310	820
1250	20/0.4	6	2700	11500	75	Dyn11	1730	980	1910	3490	2150	1460	2370	3770	820
1600	20/0.4	6	3100	14000	76	Dyn11	1730	980	2210	4420	2160	1500	2680	4720	820
2000	20/0.4	6	4000	16700	78	Dyn11	1810	1050	2450	5260	2220	1500	2920	5590	820
2500	20/0.4	6	5000	20000	81	Dyn11	1890	1300	2410	6220	2340	1690	2880	6590	1070
3150	20/0.4	6	6000	24000	83	Dyn11	1970	1300	2590	7170	2430	1730	3160	7580	1070
<b>Reduced no load loss</b>															
250	20/0.4	6	650	3300	57	Dyn11	1430	720	1600	1730	1820	1360	1990	1950	520
400	20/0.4	6	940	4800	60	Dyn11	1410	810	1630	1920	1790	1370	2010	2140	670
500	20/0.4	6	1100	6000	61	Dyn11	1450	810	1780	2200	1850	1390	2160	2440	670
630	20/0.4	6	1250	6900	62	Dyn11	1470	810	1880	2570	1860	1440	2260	2830	670
800	20/0.4	6	1460	8100	64	Dyn11	1590	830	1910	3330	2000	1480	2300	3610	670
1000	20/0.4	6	1800	9600	65	Dyn11	1670	980	1970	3610	2150	1610	2300	3910	820
1250	20/0.4	6	2080	11500	67	Dyn11	1670	980	2190	4090	2060	1450	2650	4390	820
1600	20/0.4	6	2400	14000	68	Dyn11	1730	980	2320	5010	2130	1410	2790	5320	820
2000	20/0.4	6	3100	16700	70	Dyn11	1830	1050	2460	6140	2250	1510	2930	6480	820
2500	20/0.4	6	3600	20000	71	Dyn11	2010	1300	2660	7680	2430	1560	3130	8070	1070
3150	20/0.4	6	4400	24000	73	Dyn11	2090	1300	2630	8510	2540	1650	3200	8920	1070

Subject to change



### Distribution transformers offered by ABB

Liquid filled distribution transformers:

- up to 72,5 kV
- single phase and three phase
- ground mounted, pole mounted or pad mounted

Dry transformers:

- Open Wound
- Vacuum Cast Coil
- RESIBLOC®

Transformers for special applications like:

- Railway application
- Marine: propulsion and distribution
- Carrier Vessel Nuclear
- Rectifier Transformers
- Variable Speed Drive
- Excitation Transformers
- HVDC Converter
- Transformers for windmills
- Autotransformers
- Grounding/Earthing Transformers
- Neutral Earthing Reactors
- Current Limiting Reactors
- Arc Furnace
- Boostertransformers

### Services offered by ABB Distribution Transformers

- Environmental Services - PCB Elimination Services
- Installation and Commissioning
- Training
- Testing and maintenance
- Retrofits, Revamping and up-grading
- Spare parts procurement
- Technical information available from [abb.com/distributiontransformers](http://abb.com/distributiontransformers)





**ABB Distribution Transformers**

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Our transformers are being continually developed and improved. We must therefore reserve the right to make alterations.

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