



# Distribution Transformers

Sustainable and reliable



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# Long Tradition

## Firmly anchored in Switzerland

Electricity is one of the most important sources of energy and driving forces of modern society.

With almost a century of experience, we are the right partner for high-quality electrotechnical products and energy distribution systems.

### Our product portfolio

- Transformers
- Railway switches
- High current plug-in connectors
- Building junction boxes
- LU switchgear systems

Our flexibility and commitment to innovation makes us a reliable partner that is capable of solving all challenges presented to us by our customers. With our high-quality, electrotechnical products and sustainable, innovative solutions, we are a trusted partner to our customers. Experienced long-term employees and junior employees with the will and ambition to continuously learn are the foundation of our company.

Our company is certified in accordance with all current standards.



Our production site in Sissach, Switzerland

# Quality and Experience

## The key to reliability

To prevail against fierce competition over the long term, you simply have to be better.

We are one of the leading manufacturers in the field of liquid-filled distribution transformers. Based on our longtime experience we are also able to design special low-radiation transformers which fully comply with the Ordinance on Protection against Non-Ionizing Radiation. Liquid-filled transformers are also produced for ripple control applications and as overhead line transformers for railway companies.

Distribution transformers from Rauscher & Stoecklin fully comply with the applicable international standards and regulations. The power range extends from 100 kVA to 2500 kVA with a maximum rated voltage of 36 kV. We design free-breathing or hermetically sealed transformers depending on customer requirements.



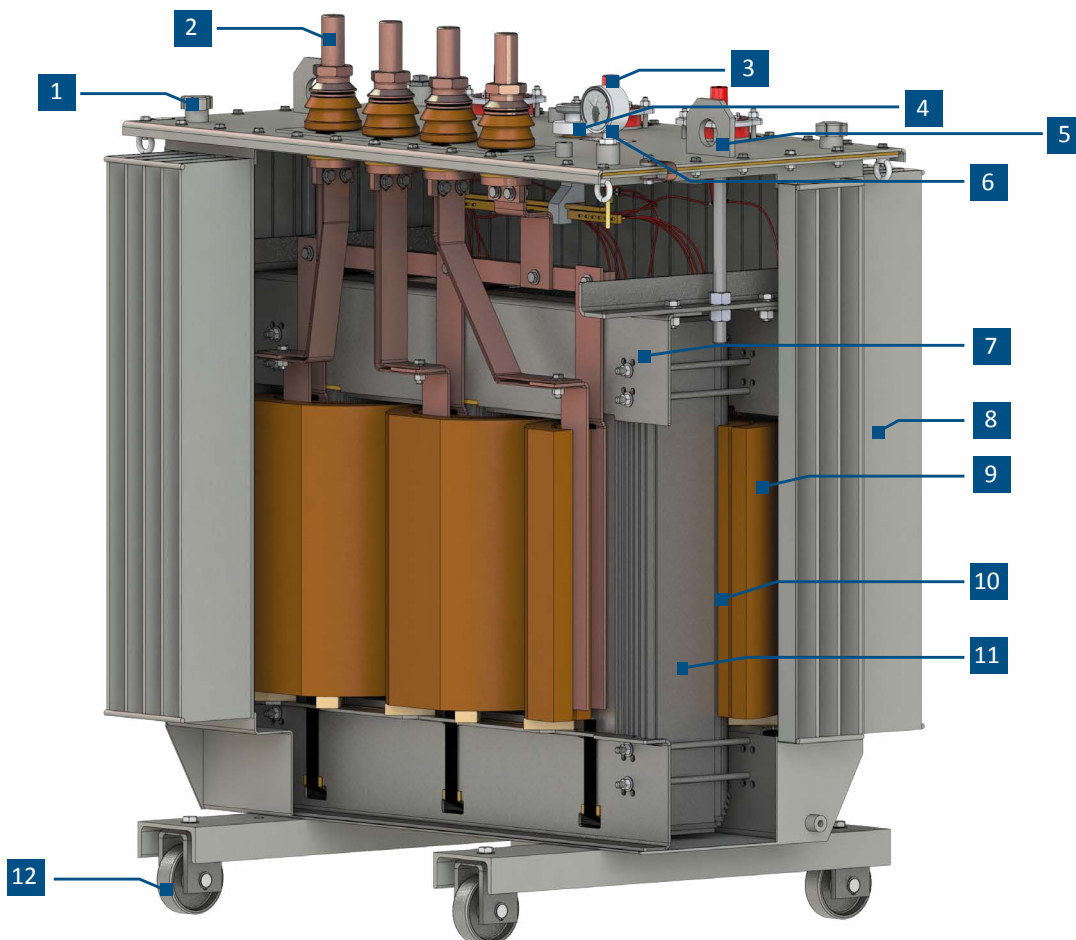
Distribution transformers prior to delivery

# Transformer Design

A various number of applications require technologies that help to achieve a long service life, low operating costs and ensure environmental sustainability.

## Distribution transformer design

1. Pressure relief valve
2. US connections
3. High-voltage plug-in bushings
4. High-voltage tap changer
5. Lifting eyes
6. Thermometer with trailing pointer
7. Iron core clamping angle
8. Tank
9. High-voltage winding
10. Low-voltage winding
11. Iron core
12. Castors for longitudinal and lateral travel



Design of an oil-filled distribution transformer

# Main Features

## Features of our distribution transformers

- Rated power ranging from 100 up to 2,500 kVA, 50 Hz
- Operating voltage up to 36 kV
- Max. losses in accordance with EU 548/2014
- Regulation of the primary voltage  $\pm 2 \times 2.5\%$  or according to customer specifications
- Max. installation altitude 1,000 meters above sea level
- High-voltage bushings: plug-in bushings for outer cone system terminal or with porcelain bushings for indoor or outdoor installation
- Low-voltage bushings: porcelain bushings with or without flat connection plate
- Compact and lightweight design
- Low-radiation design with 8-point symmetric low-voltage bushings on request
- Integrated oil retention vat available on request (mounted between tank and chassis frame)
- Reinforced insulation and grounded shield between high-voltage/low-voltage windings for non-sinusoidal load available on request



Welding the low-voltage connection of the secondary coil

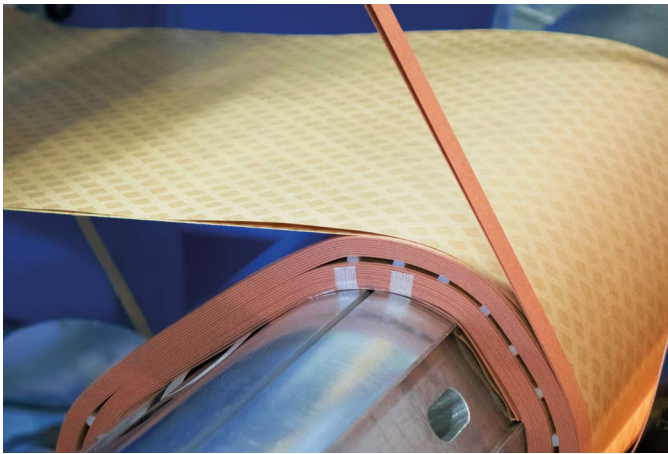
# Distribution Transformers

## Designed in Switzerland

Rauscher & Stoecklin stands for innovation and quality since 1919.

Rauscher & Stoecklin offers a wide range of transformers. Free-breathing transformers, which are the preferred design in Swiss distribution networks, offer the operating company easy maintenance with the smallest dimensions and lowest weights possible. For export markets Rauscher & Stoecklin has a long history in producing hermetically sealed transformers.

Our production site in Sissach has around 95 trained and highly qualified employees and offers genuine Swiss quality.



### Low-voltage winding

Low-voltage strip windings are used for transformers starting with an output of 160 kVA. The axial power distribution can be freely adjusted in the strip windings. This minimizes the thrust forces that occur during short circuits. During the drying process, the active part bonds the layer isolation with the conductor strip into a compact coil.



### High-voltage winding

The high-voltage layer winding is wound directly on the low-voltage winding with the main isolation channel. State-of-the-art automated winding machines with constant winding tension create compact coils with maximum strength. The layer isolation made of high-quality insulating paper is designed using strip isolation technology and meets the highest demands in modern distribution grids.





### Iron core

The semicircular or oval core shape allows for extensive standardization and optimization and makes it easy to adjust the core cross-section. The core is interleaved in a step-lap process. The sheet metal joints have several offsets. This technology coupled with the selection of high-quality magnetic steel plate provides additional benefits in terms of no-load losses and a low noise level. We offer transformers with amorphous core material for applications in which extremely low no-load losses are required.



### Assembling the active part

Using clamping straps made of strip steel, the iron core yoke is optimally pressed together with the columns using profiled steel. This eliminates tie rods that adversely affect the magnetic flux. The active part is securely screwed to the cover and supported against the base of the tank.



### Tank & cover

The transformer tank must withstand all mechanical and thermal loads that occur during transport and operation. Rauscher & Stoecklin uses corrugated tanks made of cold-rolled strip steel with a reinforced bottom trough. All of the heat loss is released from the tank surface into the ambient air. The cover is bent on the longitudinal sides for additional reinforcement and screwed to the tank. Two lifting eyes are welded to the unit to lift the transformer or the active part.



### Corrosion protection

The corrosion protection is particularly important. The tank and cover are sand-blasted and painted or power-coated with several layers in the standard color RAL 7033. Low-solvent paint is preferred in order to protect the environment.

# Designs

## Your Specification – Your Transformer

We have been manufacturing transformers with state-of-the-art equipment according to customer requirements for nearly 100 years.

### Free-breathing transformers

Open transformers have been adopted as the standard in Switzerland. The cover has two pressure-relief valve openings through which the air is exchanged with the air cushion under the cover inside the transformer. This air cushion makes contact with the cooling liquid and any absorbed moisture over the entire surface can escape during higher coolant temperatures. The free-breathing design is characterized by low oil volume and extremely small dimensions. During operation, the transformer operates without any pressure. In addition, the tank is not subjected to additional mechanical loads. The free-breathing design has proven itself a thousand times over and is cost-effective.

### Hermetically sealed transformers

Transformers with hermetically sealed tanks are standard in international markets. The unit is fully hermetically sealed, thus preventing direct contact of the cooling liquid with the air and further reducing maintenance costs thanks to the higher oil quality. The oil expansion is absorbed by the cooling shafts and therefore subjects the tank to an additional mechanical load. In order to limit the pressure, hermetically sealed transformers require lower shafts, which results in a higher oil volume. As a result, the dimensions and weights increase accordingly.



Free-breathing design

### Industrial transformers

We recommend only operating specially designed transformers in industrial grids in which high transient interference voltages are to be expected, for example due to power converters or frequency-controlled drives.

Frequent or constant transient interference voltages result in the premature ageing of the paper insulation and wire coating, both on the transformer's low-voltage and high-voltage side.

In order to prevent this, additional measures must be taken; the layer insulation must be reinforced and a grounded shield must be installed between the high-voltage and low-voltage winding.

### Cast resin transformers

Rauscher & Stoecklin offers cast resin transformers from Tesar, a company of the R&S Group, as an alternative to liquid-filled distribution transformers. The cast resin transformers comply with the applicable international standards and are used wherever liquid-filled transformers are undesirable or wherever environmental or fire prevention regulations exist. The power range extends from 160 kVA to 25 MVA with a maximum rated voltage of 52 kV.

High-quality materials coupled with solid workmanship ensure maximum reliability. The low-voltage winding is insulated with resin. The high-voltage winding is cast without any cavities in a compression mold under vacuum and hardened with no cracking. Fiberglass insulation and epoxy resin are used to ensure high mechanical strength.

Due to the low fire risk, cast resin transformers can be installed in the load's center of gravity. They easily withstand short-term peak loads, which occur when starting motors or during welding operations. A fan can be installed to allow for a permanent overload of up to 40%. The fans are fastened to the transformer clamping structure and can be retrofitted at any time.

Cast resin transformers can also be installed in housings on request. Protection classes IP21, IP23 and IP31 are available.



Cast resin transformer

# Special Applications

## New Challenges – New Solutions

Our customized solutions and special options satisfy all customer requirements

### Customized solutions

If standard solutions cannot meet all application requirements, we also produce customized solutions on request. The customer is involved in every development step to develop the perfect solution. Rauscher & Stoecklin has profound expertise and a series of reference projects in this area.

### Dry-type transformers

Rauscher & Stoecklin air-cooled transformers are used wherever low voltage must be transformed into low voltage. The units are manufactured according to customer specifications as an autotransformer or isolating transformer and are also based on individual customer requests.

The power range for single-phase transformers extends from 5 kVA to 100 kVA and for three-phase transformers from 10 kVA to 400 kVA with a maximum rated voltage of 1.1 kV.

The transformers are designed with insulation class B or F depending on the size or customer requirements. Insulation that is characterized by high mechanical and electric strength and good thermal properties is used depending on the required thermal class. The active part is impregnated using a vacuum-pressure or immersion technique to protect it against moisture. It is then painted in the color RAL 7032.

Dry-type transformers can also be installed in housings on request. Protection classes from IP20 to IP22 are available.

### Special-purpose transformers

Loads in the distribution grid are controlled remotely using audio frequency ripple control.

We supply audio-frequency transformers for the simultaneous supply of ripple control systems for a frequency range from 200 Hz to 2000 Hz and for a maximum rated voltage of approximately 36 kV.

For railway companies, Rauscher & Stoecklin produces single-phase overhead line transformers up to 1000 kVA for supplying loads in railway grids with 15 kV and 16 2/3 Hz or 25kV and 50Hz.



Single-phase transformer

### Amorphous transformers

To meet the constantly increasing demands in terms of losses, Rauscher & Stoecklin also offers distribution transformers with amorphous cores.

Amorphous transformers with particularly low no-load losses are ideal wherever such losses play a major role and the associated costs are to be absorbed over the long term. Most amorphous transformers now already satisfy the limit value requirements that will come into force in 2021.

The lower no-load losses compared to a conventional transformer are the result of the core material. The core in amorphous transformers is produced out of very thin foils made of amorphous materials.

The crystalline structure of the amorphous core is significantly easier to magnetize and demagnetize than with a conventional core. This produces considerably fewer no-load losses.

The amorphous transformers are available in the output range from 400 kVA to 1,000 kVA. Other sizes are available on request. They offer the same equipment options as the standard transformers.

### Distribution Transformer with on-load tap changer

When planning and operating grids, there is an increasing number of obvious advantages achieved by dynamically adjusting the voltage in the distribution grid and thus also in medium and low voltage. As already mentioned in the higher voltage levels, vacuum on-load tap-changers are the tool of choice here – replacing the static transformers that have been used to date – to expand the voltage adjustment function during operation in the distribution grid.

Controllable transformers that can dynamically change the transformer ratio and thus the voltages are the worldwide standard in high-voltage and extra-high-voltage grid systems. In the past, however, most transformers connected to medium voltage contained a tap changer, via which the voltage could only be adjusted when the transformer was switched off.

This is why Rauscher & Stoecklin offers distribution transformers with on-load tap changer. With vacuum on-load tap changers, we rely on the experience and proven technology of Maschinenfabrik Reinhausen. We will be happy to advise you about your customized solution.



Low-radiation transformer

# Test Methods

## Our test facility

### Testing

All transformers undergo standardized routine testing and a test report is drawn up at our test facility. It contains the following points:

- Measurement of the winding resistances
- Measurement of transformer ratio and determination of the vector group
- Test with applied voltage (external voltage test)
- Test with induced voltage (internal voltage test)
- Measurement of no-load currents and no-load losses
- Measurement of winding losses and short-circuit voltage

### Type and special testing

Type tests and special testing are also performed in our test facility or an external test facility on customer request:

- Noise measurement
- Temperature rise measurement
- Short-circuit resistance
- Surge voltage test
- Oil analyses



Our transformer test facility



Winding of a distribution transformer



Transformers shortly before delivery

# Our Accessories

## Customized solutions



### Integrated oil retention vat

This transformer design is equipped with an integrated oil retention vat made of steel. It is securely connected to the transformer between the tank and the chassis frame. Integrated oil retention vats must be included in the project from the start, since the wider transformer dimensions may no longer allow installation through existing door openings.



### Stand-alone oil retention vat

Stand-alone oil retention vats are made of lightweight aluminum and are supplied separately. The stand-alone design offers various advantages. They can be subsequently placed under every transformer and installed separately in the station. Narrow doors no longer present a problem. All stand-alone oil troughs can be connected on the longitudinal or narrow side or completely sealed. With the EASY design, the transformer must only be lifted a few millimeters and can thus be rolled into the trough.



### Contact dial thermometer

- In stainless steel
- Protection class IP 54
- Measuring range 0 – 120°C
- Accuracy class 1.5
- Screw connection G1
- With trailing pointer (standard from 400 kVA)
- With trailing pointer and switching output (2 microswitches)





### Connecting plates

- According to DIN 42530
- DT630 hole 1x Ø 14 mm
- DT1000 hole 2x Ø 14 mm
- DT2000 hole 3x Ø 14 mm
- DT3150 hole 4x Ø 14 mm



### Castors

- According to EN 50216-4 with frame, switchable for longitudinal and transverse travel
- Sizes up to 400 kVA: Ø125 x 40 mm, nylon, bracket M16
- Sizes up to 630 kVA: Ø125 x 40 mm, cast iron, bracket M16
- Sizes up to 1600 kVA: Ø125 x 40 mm, cast iron, bracket M24, color RAL 7033
- Wheel lock can be fixed with M12 screws
- Wheel lock for nylon or cast iron castors, Ø 125x40 mm



### Vibrastop & wheel locks

Vibrastop:

- For transformers from 500 up to 2,500 kg
- For transformers from 2,500 up to 12,000 kg



### Additional accessories and options

Rauscher & Stoecklin offers the following customized solutions:

- Special dimensions
- Special altitude requirements
- Measures for seismic safety
- Additional monitoring devices (PT100, RIS, etc.)

Please do not hesitate to tell us about your individual requirements.

# Certified Quality

We insist on the highest quality standards both for our company as well as our products.

At Rauscher & Stoecklin, we are proud of our test facility, as well as the regular routine testing and wide variety of additional measurements that we offer in accordance with IEC standards (see also our test methods).

We can also perform all the standard oil inspections for our customers in our laboratory.

Of course, Rauscher & Stoecklin continuously monitors, regularly calibrates and certifies the test equipment. Certificates can be provided on request. Rauscher & Stoecklin is certified in accordance with ISO 9001, ISO 14001 and OHSAS 18001 standards.



Certified in accordance with the latest standards

# Services

## Maintenance

Our services also include oil analyses, overhauls, repairs, retrofilling, and disposal.

### Maintenance

In addition to manufacturing high-quality products, we also offer our customers product-related services, either at our company or on-site. Among other things, this includes:

- Consultation and technical support
- Optimum availability and short delivery times
- Special designs based on customer requests
- Transport to the place of use, installation, and commissioning
- Insulation oil analysis with oil sampling
- Maintenance, repairs, overhauls, and conversions
- Consignment warehouse
- Crane transport & integration
- Disposal



Transformers from Rauscher & Stoecklin are the right choice.

# Product overview of Rauscher & Stoecklin



## Distribution Transformers

Oil-immersed distribution transformers with up to 36 kV and 2.5 MVA (max. 3.15 MVA).

- Hermetically sealed or free-breathing design
- Optionally available with step switch



## Railway switches

Overhead line switches from 15 kV to 25 kV AC and up to 2,000 A. Our product portfolio includes:

- Load break switches
- Disconnectors
- Grounding switches
- Motor drives and rod linkages



## Power transformers

Power transformers with up to 170 kV and 125 MVA. Tested in accordance with IEC and GOST

- Step up/Step down
- Converter transformers
- Furnace transformers



## High-current connectors

Plug-in connectors and junction boxes from 200 A - 400 A and up to 1,000 V

- Tunnel construction/mining
- Marine applications
- Infrastructure/transport
- Military applications
- Building sites



## Cast resin transformers

Cast resin transformers with up to 52 kV and 25 MVA for various applications such as:

- Energy distribution
- Industrial applications
- Railway applications



## Building connection systems

Up to 400 A, suitable for T + T and TV.

- Building connection systems, surface-mounted
- Building connection systems, flush-mounted
- Building connection columns



## 3-phase outdoor switches

- Outdoor pole-mounted load break switches with arcing chamber
- Outdoor pole-mounted load break switches with arcing horns



## Switchgear systems

Low-voltage switch and control systems, tested in accordance with EN 61439 and EN 60204.

- Distribution systems
- Testing systems
- Control systems
- Inverter systems

# A company of R&S

## An international oriented Group

The companies of R&S are united by their long-standing experience in the production of power products and their hunger for progress.

Founded in 2012, R&S is an international group headquartered in Sissach, Switzerland with branches all over the world.

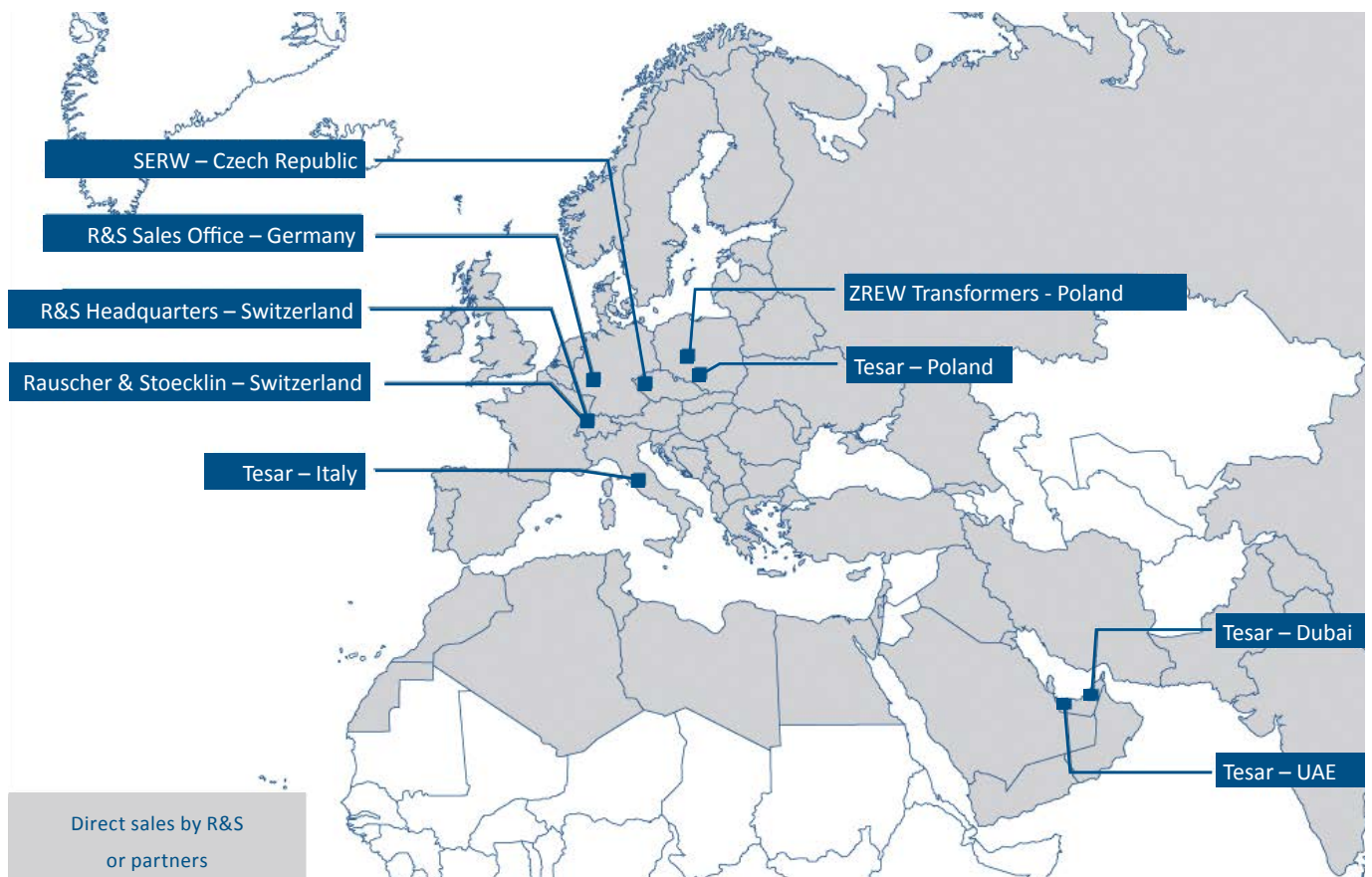
This results in premium-quality products and the highest possible degree of reliability for our customers.

### The success of R&S is built on:

- long-standing experience of the associated companies in their respective product sectors
- a highly motivated and excellently trained workforce
- products based on proven technologies that go hand in hand with innovative and efficient manufacturing processes

### Companies of R&S

- Rauscher & Stoecklin: Distribution transformers, overhead line switches, high-current connectors
- SERW: High-voltage and medium-voltage switchgear
- ZREW: Power transformers
- Tesar: Cast-resin transformers, instrument transformers



Our branches worldwide





# Companies of the R&S Group

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