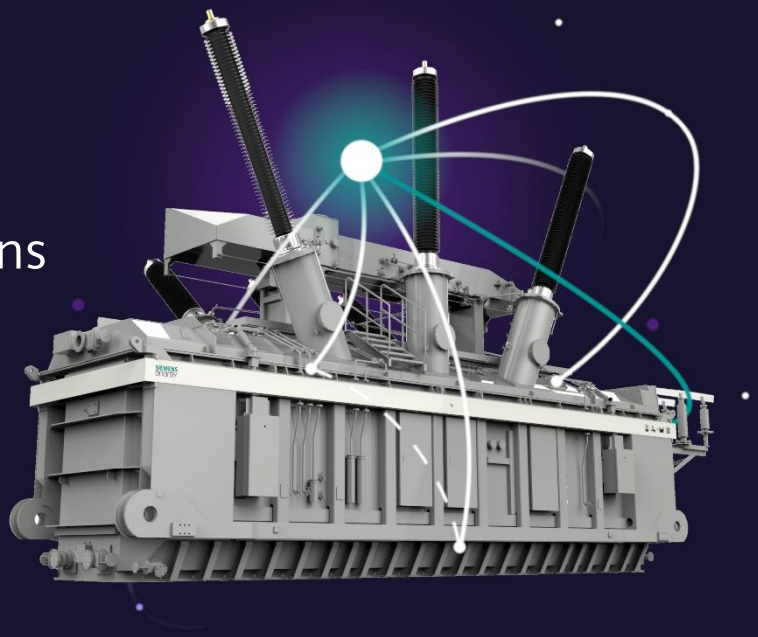
# Siemens Energy design programs for power transformers

## Integrated tools for highly sophisticated solutions



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## 1 Siemens Energy design programs

Unique technique design programs for power transformers are tools for creating tailor-made transformers. These computer programs allow the quick and detailed development of power transformers that meet all stipulated criteria, specifications, and rules. They are powerful implements that are extremely important to use in order to guarantee successful transformer development and a one-of-a-kind transformer product. transformer product.

### Design program accuracy = transformer reliability

The speed, accuracy, and stability of our design programs ensure that defects are prevented. They provide a sophisticated all-in-one transformer solution that's reliable, durable, and trouble-free.

**Areas of use**

All Siemens Energy power transformers are built indi-vidually to order, not on an assembly line. Applications of Siemens Energy design include:

- Engineering department needs
- Complete geometry check
- Detail winding setup
- Calculation of all eventualities
- Transients including limits,test circuit modeling
- Advanced transient modeling –system studies
- Losses turn-wise
- Short-circuit forces and stresses turn-wise
- Low noise (load noise, no-loadnoise, fans, pumps, and sound panels)
- Prevent tank rupture
- Consideration of design limits
- Summaries of all results

### In the beginning was – collaboration

Siemens Energy is a pioneer in transformer development and, for over 30 years, has successfully designed transformers with electromagnetic FEM (finite elements method) programs. Our threedecade- long intensive collaboration with the Graz University of Technology in Austria elevated us to the top of the field long before any of our competitors. This collaboration also advanced the development of program technology thanks to increased processor power.

## 2 Main design programs

### Electrics and transients

- Network generation for transients and circulating currents
- RLC network analysis
- Complete transient analysis
- Frequency response in specific electromagnetic networks
- Simulation of transients in specific electromagnetic networks

### Electromagnetics

- FEM2D electromagnetic field calculation based on turn-wise model
- Load losses, short-circuit forces,and stresses
- FEM3D electromagnetic field calculation in inactive metallic parts
- No-load losses
- Core and yoke losses in shunt reactors (FEM3D)
- DC magnetization issues

### Thermals and aging

- Transformer cooling
- CFD (computational fluid dynamics) to study hydraulic and thermal hydraulic arrangements
- State-of-the-art network models
- Relative losses and transient temperatures, local oil flow,transient moisture distribution

### Noise

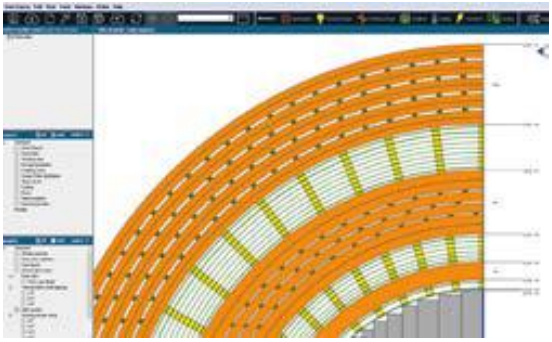
- Load noise (dynamic vibration model)
- No-load noise and core resonances (dynamic vibration model)

### Mechanics

- Seismic models
- Tank rupture

### Module TDS-E (transformer design system – electrical)

- Software for simulating and calculating transformers based on the latest Siemens Energy design rules
- Central support
- Easy data transfer between the Siemens Energy factories
- Same training and comprehension for each designer
- Same structure for costing calculation
- Graphical outputs for quick check of the design



## 3 Siemens Energy power transformer design programs – calculated solutions

### Benchmark flexibility

Each transformer is built to the customer's specifications, and so all of our transformers are different across many parameters. The exceptional flexibility of the Siemens Energy design programs allows us to prepare models for absolutely every need.

### Stay in motion

Due to constant change in the world of transformers, the design rules produced in the R&D department at Siemens Transformers are in constant flux in order to meet all future requirements and tasks.
Ester- filled transformers are completely covered by the Siemens Energy design tools, toname just one example.

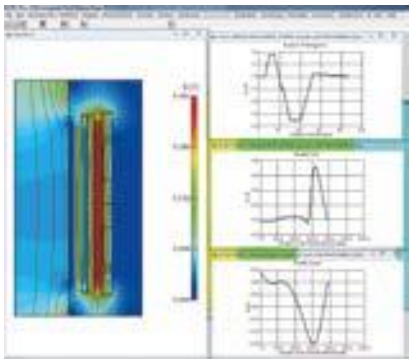
### Stay in contact

As the producers of the design rules, the R&D department maintains a close collaboration with the design and engineering departments.

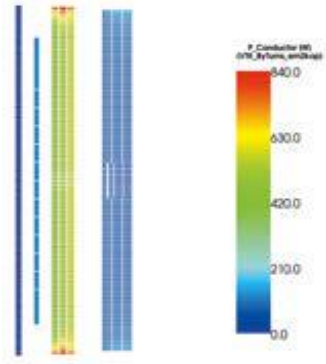
## Stay out in front

As a world leader in power transformer production, Siemens Energy works hard to stay in the lead. Many projects to improve our programs are in progress, along with extensive investments, that will keep us ahead of the competition.



## Be global

Special designs like SVC, PST, and VSHR are fully covered, as are prototype and series designs. Innovation, cutting-edge design concepts, and experience from all the Siemens Energy locations are incorporated in the Siemens designtools. Siemens assures global support for electrical and mechanical design from local Siemens Energy factories.

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