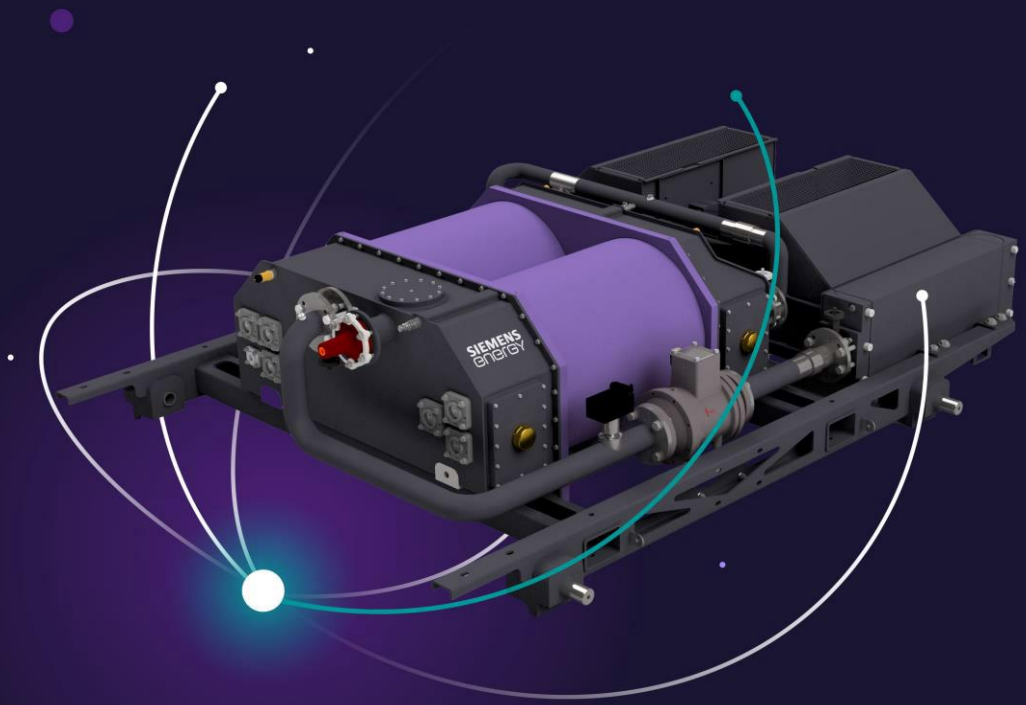
SIEMENS energy

Tractronic®

Turning energy into speed with traction transformers from Siemens Energy



siemens-energy.com

We are Siemens Energy – a global leader in energy technology



Welcome to Siemens Energy

Energy transition is the greatest challenge our generation faces. How do we reduce emissions while also increase energy supply? It is an uphill battle. And there is no silver bullet. But finding solutions has always been in our DNA. For more than 150 years our engineers have been spearheading the electrification of the world. Today we are a team of 98.000[1] sharing the same passion, vision and values. Our diversity makes us strong and helps us to find answers together with our partners.

Located in 90 countries, Siemens Energy operates across the whole energy landscape. From conventional to renewable power, from grid technology to storage to electrifying complex industrial processes. We deliver cutting-edge solutions and services to customers in the utility, industry, and infrastructure sectors across the entire value chain.

Our mission is to support companies and countries with what they need to reduce greenhouse gas emissions and make energy reliable, affordable, and more sustainable.

Let's energize society.

Transparency is honored by ESG[2] ratings:

ISS ESG

SUSTAINALYTICS
a Morningstar company

MSCI
ESG Research

CDP
DISCLOSURE INSIGHT ACTION

ecovadis

Sustainability is at the heart of our strategy

Step-by-step, we are making our contribution to a successful energy transition. We are proud of the progress we have made across all areas of sustainability within Siemens Energy. Through performance reporting and storytelling, our sustainability report provides a comprehensive overview of our sustainability activities.

Decarbonization through technology

To speed up the energy transition, we put all our energy into working with customers and partners to build sustainable energy systems along the value chain. We focus on three pillars to meet net zero: generate power with low-or zero-emissions; transport and store energy efficiently; reduce emissions in industrial processes.

People with responsibility

With a common goal to master the challenges of the energy transition, we leverage the drive, power and expertise of every employee and differentiate on the how with our customers. We aim to be employer of choice in the energy industry and strive for excellence in the areas of EHS (environment, health and safety), inclusion and diversity, as well as integrity.

Partnerships for innovation

We innovate today by forming new partnerships, we create innovations for tomorrow and shape future innovation by co-creating emerging technologies in our global Innovation Centers together with our partners.

Profitability as a foundation

To create resilient energy systems for society, we need to be a stable and profitable business. We focus on improving our profitability, strong cash conversion and sustainable growth.

Learn more about our sustainability activities:

1 Number of employees as of June 30, 2024
2 ESG - Environmental, Social and Corporate Governance

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Tractronic® on-board traction transformer sets the bar for quality and versatility

In a class of their own

Siemens Energy offers Tractronic® traction transformers of all capacity ranges for rail-based vehicles. The long product lifecycle means that the focus is on maximum reliability, economic efficiency, and safety - perfectly aligned with customers' requirements. This is reflected in a variety of designs based on the following parameters:

- Power ratings -frequency, capacity, and voltage
- Dimensions, weight, and place of installation
- Dissipation and short-circuit voltages
- Driving patterns and medium-frequency performance
- Losses and impedance voltage characteristics
- Materials and technologies to meet environmental requirements (e.g. ester coolant)

Comprehensive portfolio

From a technical perspective, Siemens Energy Tractronic® traction transformers cover every need. In all capacity ranges up to 15 MVA and - on request - even above, Siemens Energy offers single-phase and multi-phase transformers for machine rooms, under-floor and low-floor applications, and for on-roof installation - which provides maximum flexibility for the train's design.

Siemens Energy can design and customize the cooling unit to suit customer preferences, either integrated in the transformer in the full frame or as a separate component, entirely in accordance with the specific space requirements. Flexibility is also the order of the day when it comes to selecting cooling fluids. We have solutions for all capacity ranges that use oil, silicon, or an ester-based fluid (e.g. MIDEL 7131) that is very kind on the environment.





Technical performance

- Frequencies from 16 2/3 to 60 Hz
- Operating voltages: 1.5 kV DC, 3 kV DC, 11.5 kV AC, 15 kV AC, 25 kV AC and other special voltage levels
- Single- or multi-system versions
- Integrated smoothing and filter reactors, auxiliary transformers, tap changers
- Auxiliary and heating windings where required
- Traction windings as network filter reactors

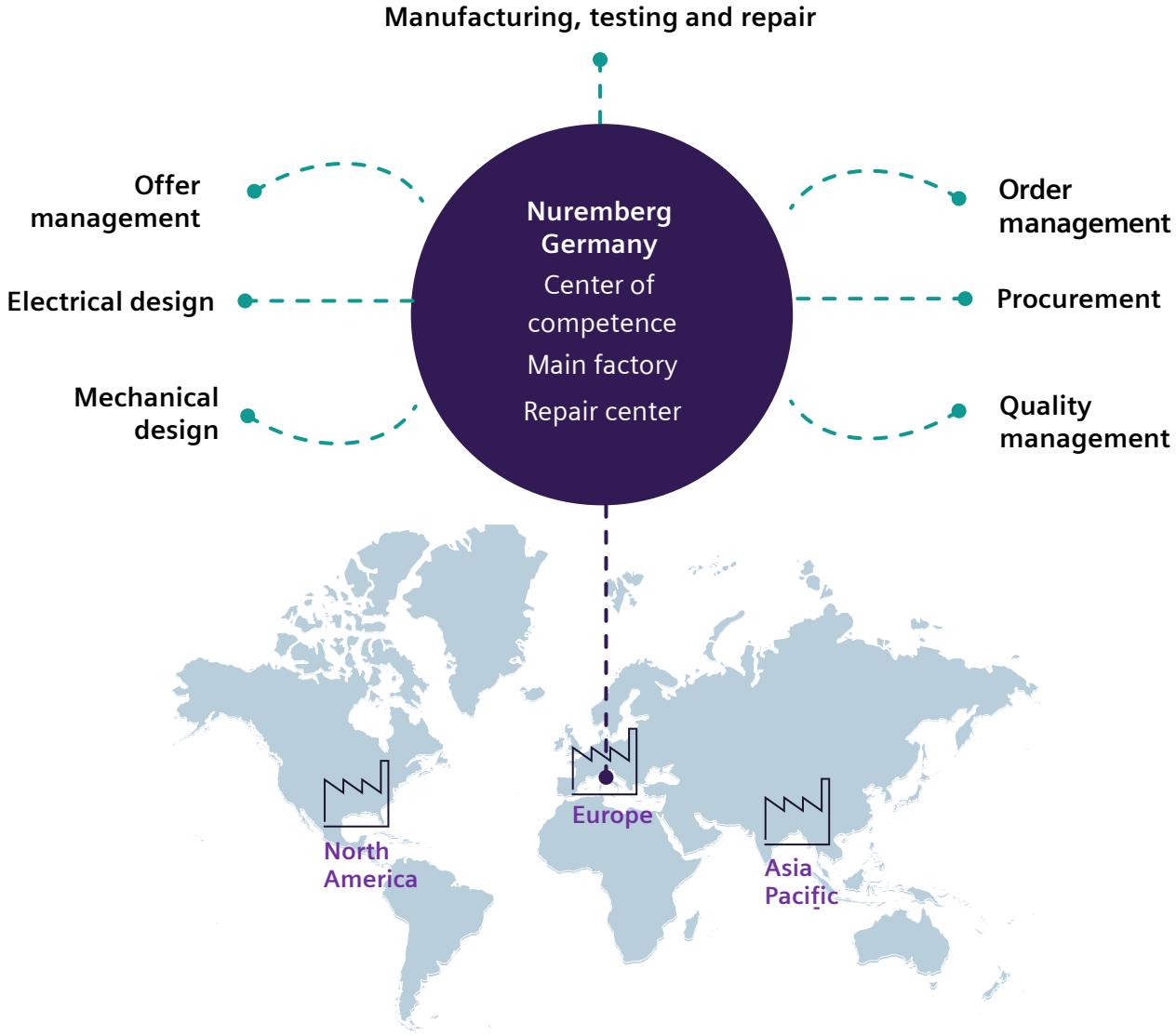
Certified and awarded

Siemens Energy Tractronic® traction transformers are setting standards of quality and versatility around the world. Close cooperations with international standards committees ensure compliance with the specific requirements and standards. Besides being awarded Q-1 supplier status for the German Railway Company Deutsche Bahn AG, Siemens Energy also holds the following certifications:

- ISO 9001
- ISO 14001
- ISO 45001
- ISO 50001
- ISO 22163 (IRIS)
- Welding qualification EN 15085-2

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Manufacturing excellence - Center of competence and global factory network



Tractronic® - born in Germany

Tractronic® traction transformers are typically designed in the Center of Competence in Nuremberg, Germany to ensure close collaboration between engineering and production in the prototype stage. Afterwards Tractronic® traction transformers are perfectly prepared for serial production at our main factory in Nuremberg, Germany and at other Siemens Energy factories where required.



Manufactured over the world

Siemens Energy operates a worldwide manufacturing and service network to serve customers all over the world. All factories implement the same high-quality standards and enables us to meet the local content requirements.

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Tractronic® traction transformers in details

Siemens Energy designs and manufactures Tractronic® traction transformers for rail operators and train manufacturers worldwide, that increase train efficiency and performance.

Tractronic® traction transformers can handle maximum ratings in a minimum of space, serve local content demands for worldwide applications, and ensure maximum reliability and flexibility.

Tractronic® AC transformers for electric and hybrid locomotives





Tractronic® DC reactors for electric and hybrid locomotives





AUX[1] and HEP[2] transformers for hybrid and diesel locomotives





Tractronic® transformers for high-speed trains





Tractronic® transformers for EMUs[3] and BEMUs[4]





1 AUX - auxiliary transformer
2 HEP - Head-End-Power transformer
3 EMU - Electric Multiple Unit
4 BEMU – Battery Electric Multiple Unit

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Selected references

Electric locomotive



Transformer data

- Customer: Siemens Mobility
- Operating region: Europe & Asia
- Rated power: up to 6.3 MVA
- Voltage primary: AC 25kV 50Hz / AC 15 kV 16.67 Hz / DC 3 kV / DC 1.5 kV
- Traction: up to 4 x 1.957 kVA
- Weight: appx. 12 500 kg (example)

Hybrid locomotive



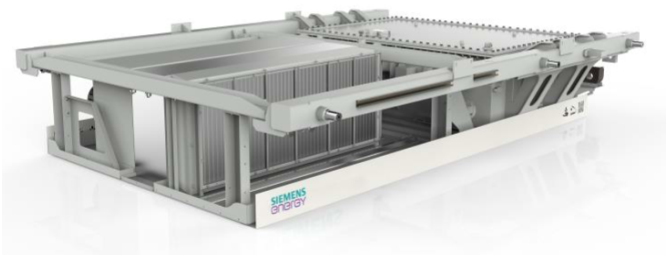
Transformer data

- Customer: Siemens Mobility
- Operating region: USA
- Rated power: up to 4.3 MVA
- Voltage primary: AC 25kV 60 Hz / AC 12.5kV 60Hz / AC 12kV 25 Hz
- Traction: up to 4 x 1.08 kVA
- Weight: appx. 7 300 kg (example)

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Selected references

High speed



Transformer data

- Customer: Siemens Mobility
- Operating region: World
- Rated power: up to 4.8 MVA
- Voltage primary: AC 25kV 50 Hz / AC 15 kV 16.67 Hz
- Traction: up to 4 x 1.848 kVA
- Weight: appx. 6 600 kg (example)

High speed



Transformer data

- Customer: Alstom
- Operating region: Europe
- Rated power: up to 2,4 MVA
- Voltage primary: AC 25kV 50 Hz / AC 15 kV 16.67 Hz
- Traction: up to 4 x 0.9 kVA
- Weight: appx. 4 900 kg (example)

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Selected references

Electric multiple units



Transformer data

- Customer: Siemens Mobility
- Operating region: Europe / Middle East
- Rated power: up to 2,2 MVA
- Voltage primary: AC 25kV 50 Hz / AC 15 kV 16.67 Hz
- Traction: up to 2 x 0.950 kVA / 4 x 0.980 kVA / 6 x 0.449 kVA
- Weight: appx. 3 300 kg (example)

Electric multiple units



Transformer data

- Customer: ŠKODA Transportation
- Operating region: Europe
- Rated power: up to 2,2 MVA
- Voltage primary: AC 25kV 50 Hz
- Traction up to 2 x 0.640 kVA / 4 x 0.550 kVA
- Weight: appx. 3 650 kg (example)

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Tractronic® services - designed to provide ideal solution tailored to your needs

Meeting your needs and ensuring long-term satisfaction

- Review the service needs
- Identify demand and requirements
- Find the ideal service solution
- On demand: long-term service contract agreement

Repair

Overhaul of Tractronic® traction transformers after damage or for corrective maintenance:

- Gas-in-oil analysis acc. IEC 61181
- Electrical and mechanical inspection
- Function control of main components
- Visual inspection of the active part
- Repair and overhaul where required

Maintenance

Services on-demand for Tractronic® traction transformers:

- Spare parts
- Gas-in-oil analysis acc. IEC 61181
- Preventive maintenance, if not fulfilled by the customer
- Corrective maintenance with recommendation for part overhaul





Revision

Project related services to increase reliability and lifetime of Tractronic® traction transformers:

- Optimization of Tractronic® traction transformers design based on operational experience
- Revision service for lifetime improvement
- Investigation of alternative solutions for failure prevention
- Retrofit solutions

For all service requests please contact

support.traction@siemens-energy.com

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Germany

For the U.S. published by
Siemens Energy, Inc
Grid Technologies
8841 Wadford Drive
Raleigh, NC 27616
USA

Customer Support Center
Tel.: +49 911 6505 6505

E-Mail: support@siemens-energy.com

For more information, please visit our website:
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