



# Transforming Energy into Speed. Siemens **Transformers.**

Traction Transformers

Power Transmission and Distribution

**SIEMENS**

# Traction Transformers from Siemens

## In Either Case the **Right Solution**



Siemens transformers are setting benchmarks in quality and versatility. Experience for more than 100 years is a solid base for tailored solutions for traction transformers according to the latest and most modern design rules.

Siemens develops and produces traction transformers for rolling stock applications of all relevant ratings and voltage levels. Our mission towards our customers is the provision of valuable equipment with maximum reliability, efficiency, and operational safety.

All products are optimized with regard to individual customer requirements, such as

- Frequency, rating, voltage
- Required dimensions and weights
- Losses and impedance voltage characteristics
- Operational cycles and frequency response behavior
- Environmental requirements.

Latest developments of traction transformers have been realized, for example, for locomotives in Austria (ÖBB 1016, 1116, and 1216 series), in Slovenia (ES64U4 series), and in Germany (BR 189 series). Tailored products have been realized for the Velaro in Spain, China, and Russia. The Desiro Mainline with Siemens traction transformers is the latest EMU platform solution.

Siemens produces traction transformers in Nuremberg as well as in manufacturing lines in Jinan, China and Mumbai, India.

Most modern manufacturing facilities, a consistent certified quality management according to DIN EN ISO 9001 and DIN EN 14001, as well as qualified and motivated employees are a solid base for highest quality standards characterizing Siemens traction transformers. Furthermore, we are qualified according to the welding norm DIN 6700 and are Q1 supplier of DB AG. The result: Every produced transformer comprises highest reliability.



Traction Transformer Plants:  
Nuremberg, Germany  
(Center of Competence)



Jinan, China



Mumbai, India

# Our Product Scope

Locomotives  
Rating > 5.5 MVA



High speed trains  
Rating: 3–5.5 MVA



EMUs  
Rating 1–3 MVA



System trams  
Rating < 1 MVA



0

2

4

6

8

10

MVA

Pfisterer  
connectors



Suspension  
according  
to customer  
requirements



Low voltage  
bushings for  
multiple system  
applications



Efficient pumps  
with low noise



## Technical capabilities:

- Single phase transformers for machine room, underfloor construction, low-floor vehicles, as well as for roof assembly
- Ratings up to 10 MVA and above
- In case of customer request with cooling plant – integrated in one frame together with the transformer or stand-alone solution
- Various cooling media for all ratings: mineral oil, silicone, or Ester fluid for highest environmental compatibility
- Operating frequencies from 16 $\frac{2}{3}$  to 60 Hz
- Voltages: 1.5 kV DC, 3 kV DC, 15 kV, 25 kV, 11.5 kV, or other specific solutions
- Single or multiple system operation
- Integrated absorption circuit reactors
- Auxiliary windings and / or heater windings according to customer specification
- Traction windings to be used as line filters
- Refurbishment



## System Trams

Example: SNCF Tramline T4, Paris

- Continuous operation every day
- Total length: 37 m, weight: 60 t
- Number of seats: 86
- Operating voltage: 750 V DC or 25 kV/50 Hz
- Rating: 4x200 kW
- Maximum speed: 100 km/h

### Transformer Data:

- Rated power: 690 kVA
- Voltage levels: 25/2x0.420 kV
- Frequency: 50 Hz
- Weight: 2.15 t (weight optimized)
- Very close tolerances for assembly
- Roof assembly



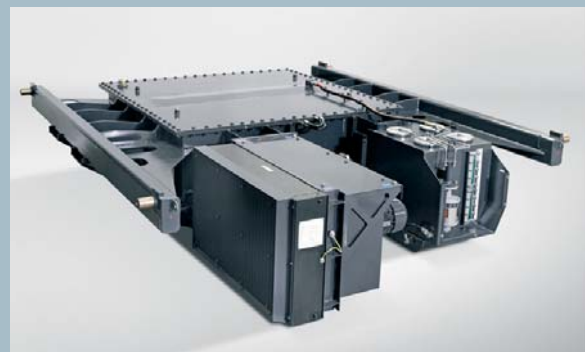
Transformer platform for system trams and EMUs:

Rating HV winding (kVA)	Rating traction winding (kVA)	Frequency (Hz)	Voltage (kV)	Impedance Voltage (%)	References
882	2x372	16 2/3	15/2x0.920	23.5	Desiro Mainline
1142	2x497	16 2/3	15/2x0.920	31.0	Desiro Mainline
690	2x345	50	25/2x0.420	33.0	Avanto
1360	4x270	50	25/4x0.953	29.0	Desiro Bulgaria

## Electric Multiple Units

Example: Desiro Bulgaria

- Three or four cars per trainset
- Operating voltage: 25 kV/50 Hz AC
- Rating: 1300 kW
- Maximum speed: 140 km/h
- Number of seats: 190/254



### Transformer Data:

- Rated power: 1.36 MVA
- Voltage levels: 25/4x0.953 kV
- Frequency: 50 Hz
- Heater winding: 120 kW
- Auxiliary winding: 2x80 kW
- Integrated cooling unit
- Integrated conservator



## High Speed Trains

Example: RENFE Series S103 for Spain

- Eight cars per trainset
- Travel time between Madrid and Barcelona (635 km): 2h 30min
- Number of seats: 404
- Maximum power at wheel: 8800 kW
- Maximum speed: 350 km/h

### Transformer Data:

- Rated power: 5.66 MVA
- Traction windings: 4x1.265 kV
- Nomex insulation for highest energy density
- Ester cooling fluid for highest environmental compatibility
- Integrated design of transformer and cooling unit
- Pfisterer connectors on the transformers



## Locomotives

Example: ÖBB Austria Series 1016/1116/1216

- Approx. 350 locomotives with 350 Siemens transformers
- Four-system operation:
  - AC 15 kV, 16 2/3 Hz
  - AC 25 kV, 50 Hz
  - DC 3 kV
  - DC 1.5 kV
- Speed: 200–230 km/h
- Weight: 87 t



### Transformer Data:

- Four-system operation:
  - AC 15 kV, 16 2/3 Hz (6x1.26 kV windings)
  - AC 25 kV, 50 Hz (6x1.26 kV windings)
  - DC 3 kV
  - DC 1.5 kV
- Rated power: 7.5 MVA
- Transformer dimensions: 1300x2500x3000 mm
- Mineral oil cooling fluid
- Two additional auxiliary windings and one heater winding
- Two reactors for absorption and impedance increase

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The information in this document contains general descriptions of the technical options available, which do not always have to be present in individual cases. The required features should therefore be specified in each individual case at the time of closing the contract.