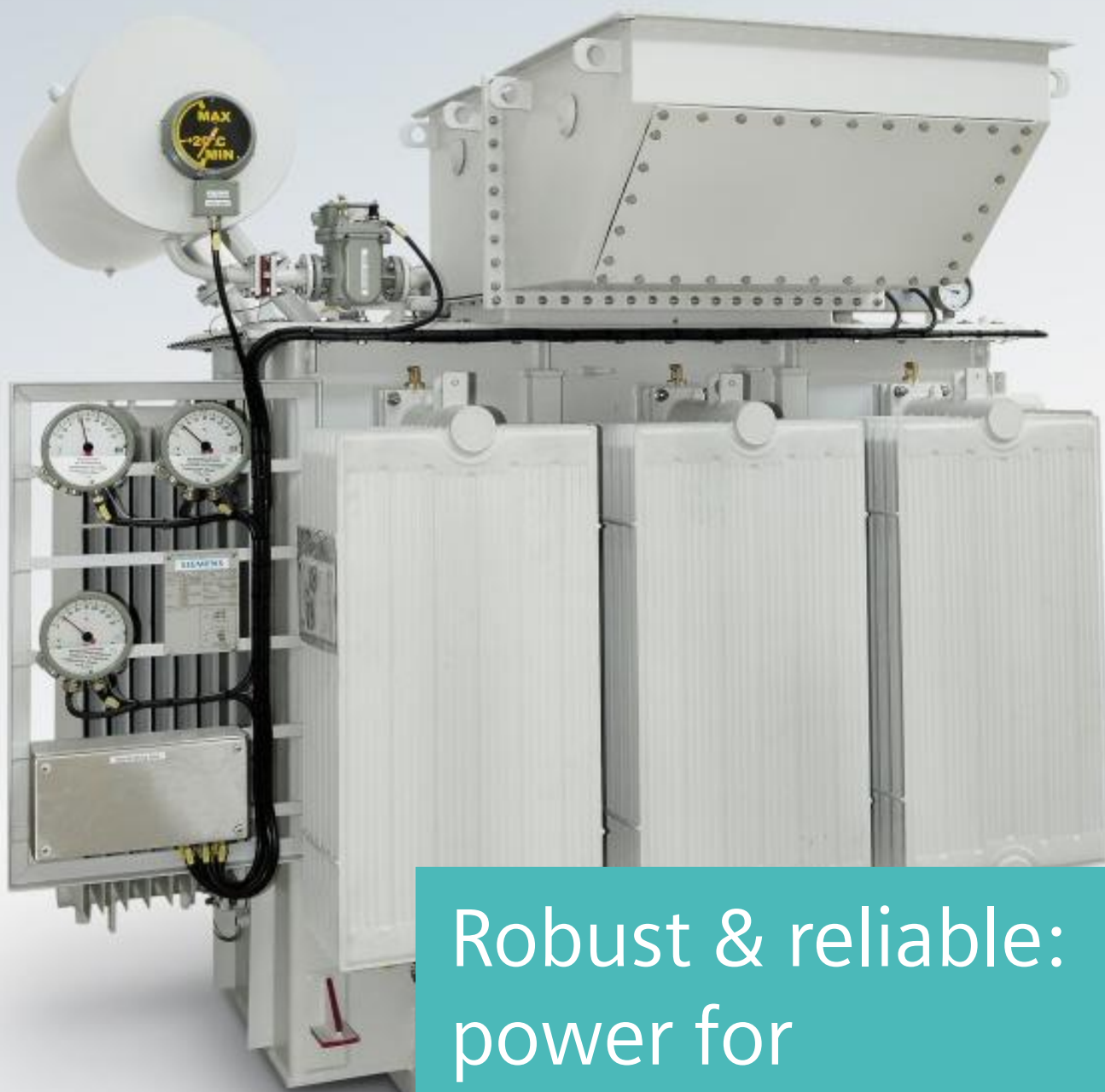


**SIEMENS**

*Ingenuity for life*



# Robust & reliable: power for electric drives

Distribution transformers for  
industrial applications



There are specific industries that require more than just classic distribution transformers for electric power supply. Oil and gas companies, chemical and cement industry, as well as mining and tunnel construction enterprises depend on electric drives and excitation systems driven by static converter transformers.

Static converter facilities with appropriate valves are required to transform and control electric energy for those applications. Static converter transformers provide the link to the supply network.

These special transformers are particularly suitable for applications such as heavy-duty drives for steel mills, oil rigs, offshore installations, and conveyance facilities, and for the complete variety of uses for drives in industry.

The circuit of the static converter transformer is adapted to that of the static converter. Its windings are designed to cope with the stress and the current curves generated during the operation of the static converter. The static converter transformer is subject in particular to the following influences specific to the drive and the static converter.

#### Heavier dynamic and thermal stress due to rapid changes in the load

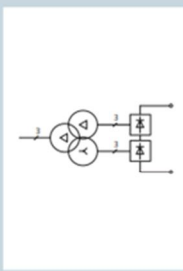
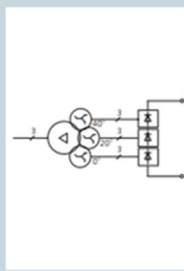
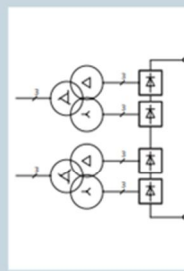
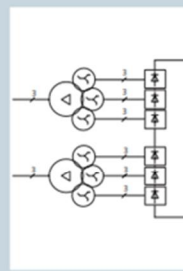
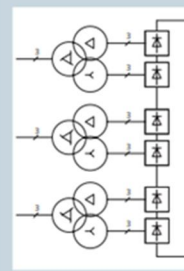
Unlike the design of standard distribution transformers, the design of static converter transformers must allow for frequent start-uploads.

#### The advantages of Siemens technology.

The winding design ensures reliable absorption of radial, axial and contraction forces. This is how we achieve a high short-circuit withstand capability, which makes the transformer insusceptible to the stress caused by frequent drive peak loads. Another positive factor is the great heat capacity and thus the high overload capability of this type of transformer.

According to the future application and location where the transformer is needed, products can receive ATEX certification.

Our high quality standards are internationally recognized. All Siemens transformer manufacturing plants work with consistently certified quality management systems such as DIN ISO 9001:2000 and ISO 14001, among others. We manufacture all units in accordance with IEC or IEEE (ANSI) or other local standards. Upon customer request we also take care of ATEX-certifications for our units. Above all, our high standard of quality is based on more than a century of experience in transformers, as well as continual research and development work.

Infeed	12-pulse	18-pulse	24-pulse	36-pulse	
Circuit version					
Infeed transformers	one three-winding transformer	one four-winding transformer	two three-winding transformers	two four-winding transformers	three three-winding transformers
Required electrical phase angles between all secondary windings	30°	20°	15°	10°	10°
Example of vector group	Dd0 Dy11 or Dd0 Dy5	Dy11+20° Dy11 Dy11-20°	1 x (Dy5 Dd0) +7.5° 1 x (Dy5 Dd0) -7.5°	1 x (Dy11-10° Dy11 Dy11-10°) +15° 1 x (Dy11-10° Dy11 Dy11-10°) -15°	1 x (Dy5 Dd0) +10° 1 x (Dy5 Dd0) -10° 1 x (Dy5 Dd0)

Examples of vector groups

Capital letters = primary side; small letters = secondary side; D/d = Delta; Y/y = Star

### Technical characteristics and benefits

The broad and long-term experience of Siemens Transformers leads to products with characteristics that fit to the special challenges of industrial applications.

#### Number of secondary winding systems per transformer

If the drive transformer supplies more than one lineside rectifier, the phase angles between each secondary winding are set to eliminate the lower-order harmonics. These can be supplied by a multi-winding system transformer in order to save cost and volume. The number of secondary windings per transformer can be defined by the customer.

#### Flux density

The magnetic flux density of the core depends on the applied voltage and frequency. For proper operation of the transformer, the core of the transformer should not be magnetically saturated at specified operating conditions. Hence a margin to the saturation induction is considered in the design to achieve transformers with maximum reliability.

#### Transformer tapping

According to customer requirements, transformers will be equipped with tap changers to adjust the turns ratio of the transformer when needed. This is done to take into account voltage variations.

### DC current

If any DC current is present in either the supply or load side of the transformer windings, overheating of core and other parts due to the DC fields can occur. It can also result in noise and vibration. This is why Siemens Transformers is able to optimize its products in regards to DC current to deliver units with minimal noise and heat if required.

### Harmonics

The current harmonics determine the harmonic losses in the drive transformers. These result in additional heating. Siemens Transformers focuses on designing converters that withstand thermal stress. Siemens Transformers are designed under consideration of the converter characteristics to withstand the thermal stress which may occur.

### Siemens transformers: suitable for your drive

Utilities and distribution grid operators have trusted Siemens Transformers as their supplier for more than a hundred years. Our target is also to be the partner of choice of industrial companies when it comes to transformers. As an experienced manufacturer of transformers of all ratings, special requests are in good hands with us.

Within Siemens Distribution Transformer Segment we offer static converter transformers up to 30 MVA / 72.5 kV. Maybe the next of those units will be energizing your drive?

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The required technical options should therefore  
be specified in the contract.