

WATER SUPPLIES DEPARTMENT
STANDARD SPECIFICATION E-60-06
AUTO-TRANSFORMERS FOR
HIGH-VOLTAGE MOTOR STARTERS

1. GENERAL

1.1 Scope

This specification covers the design, manufacture, inspection and testing of auto-transformers suitable for Korndorfer-connected no break high-voltage motor starters. In general, these motor starters may apply to starting of high-voltage 3-phase induction motors of rated power output equal to or greater than 1,000 kW.

1.2 Standards

The auto-transformer supplied shall be of either bulk oil or epoxy-resin encapsulated type.

For bulk oil auto-transformers, they shall be designed, manufactured, inspected and tested in compliance with the Water Supplies Department (WSD) Standard Specification E-60-05 (Bulk Oil Power Transformer) unless otherwise specified.

For epoxy-resin encapsulated auto-transformers, they shall be designed, manufactured, inspected and tested in compliance with WSD Standard Specification E-60-04 (Power Transformers with Epoxy-encapsulated Windings for a Rating of 50 to 1000 kVA) unless otherwise specified in the Particular Specification.

2. PERFORMANCE PARAMETERS

2.1 Technical Particulars

The auto-transformer supplied shall comply with the following specific requirements:

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|-----|----------------------|---|
| (a) | Type: | Indoor 3-phase, floor mounted auto-transformer for Korndorfer-connected no-break starting of high-voltage squirrel cage 3-phase induction motor |
| (b) | Tapping range: | 40%, 60% and 75% of the rated voltage |
| (c) | Ambient temperature: | 40°C maximum continuous for 4 hours
35°C average over any 24 hours
30°C average over one year
0°C minimum |

- (d) Relative humidity: Up to 98%
- (e) Altitude: not greater than 1000 metres
- (f) Electricity supply: 11kV, 6.6kV or 3.3kV as specified in the Particular Specification, 3-phase, 50 Hz, 3-wire solidly earthed neutral system
- (g) Normal limits of voltage fluctuation: +10%, -2.5%
- (h) Normal limits of frequency variation: $\pm 2\%$

2.2 Rating

The rating of the auto-transformer shall be designed for intermittent duty of 15 starts per hour and 6 consecutive starts in any 15 minutes with 15 minutes cooling after 6 consecutive starts. The motor starting time shall be taken as 10 seconds at 75% or higher taps and 15 seconds at 60% or lower taps except where specified in the Particular Specification. The Contractor shall submit detailed calculations showing that the auto-transformer is designed for operation under this duty for approval before manufacturing.

The rated current of the auto-transformer shall be 80, 160, 315 or 630A. The direct-on-line motor starting current shall be 5 times full load current at rated voltage except where specified otherwise in the Particular Specification.

Unless otherwise specified in the Particular Specification, the full load current for a 3-phase induction motor with rated power output equal to or greater than 1,000 kW shall be estimated based on 0.83 power factor and 96% efficiency.

2.3 Service Life

The auto-transformer shall be designed for a minimum life of 25 years of service at a load factor 0.75 (viz. 18 hours per day) and 18000 starts based on the conditions detailed in this specification.

- End of this specification -