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.

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.

In addition, the auto-transformer supplied shall comply with the latest editions and amendments of the relevant International Electrotechnical Commission (IEC) Standards.

2. PERFORMANCE PARAMETERS

2.1 Technical Particulars

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

(a)	Type:	Indoor three 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: ± 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 40, 80, 160, 315 or 630A. The direct-on-line motor starting current shall be 6 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 3-phase induction motors shall be as follows:

Output	Motors			3.3 kV Motors	
kW	3.3 kV	6.6 kV	11 kV	p.f.	Eff.
1000	221.9	111.5	66.9	0.83	0.96
1500	332.8	167.3	100.4	0.83	0.96
2000	443.8	223.1	133.8	0.83	0.96
2500	554.7	278.8	167.3	0.83	0.96

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 -