

VOLTAGE DIVIDERS

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PURPOSE AND SCOPE

This Specification defines the functional and performance requirements for voltage dividers for quality of supply and precision voltage measurement on the National Grid UK Electricity Transmission System. It supports the more general requirements defined in the companion documents TS 1, TS 2.1 and TS 2.2.

This specification is applicable only to direct connections at National Grid owned installations at 400/275/132 kV substations.

PART 1 – PROCEDURAL

1 GENERAL REQUIREMENTS

Informative: Voltage dividers with analogue voltage outputs referenced in this specification are intended for applications where a precision voltage measurement with a wide bandwidth is required.

As an alternative to the AC voltage output, consideration will be given to dividers offering digital outputs compatible with IEC 61850 bay process bus requirements

- 1.1** Voltage dividers shall comply with TS 1, TS 2.1, TS 2.2 and IEC 60358.
- 1.2** Voltage dividers shall be of the single-phase type.
- 1.3** A single terminal box shall be mounted on each voltage divider to accommodate the low voltage output connection.
- 1.4** All connections and links shall be suitable for their required purpose regarding rating, reliability and environmental conditions.
- 1.5** The nominal output shall be $110 \text{ V} / \sqrt{3}$.

1.6 The rated transformation ratio shall be as shown in table 1.

1.7 Voltage dividers shall be intrinsically safe and shall incorporate failsafe protection to protect personnel from malfunction of the divider e.g. supervised voltage clamps.

1.8 The Voltage Divider supplier shall recommend a suitable supplier of armoured cable type for secondary connections and provide a wiring diagram showing termination and earthing of core screens, overall screens and armouring and spare cores. The cable capacitive burden shall be suited to cabling distances of between 20 and 400 M. In instances where the divider bottom end has to be tuned to the cable capacitance in order to achieve the performance requirements, the tuning range shall accommodate this range of cabling distances

Highest Voltage of Equipment U_m (r.m.s.) kV	Rated transformation ratio
420	3600:1
300	2500:1
145	1200:1

Table 1 - Rated Division Ratio

2 PERFORMANCE REQUIREMENTS

2.1 At nominal frequency and at reference temperature, the phase and magnitude errors shall satisfy the requirements of BS EN 60044-2 class 0.2 but at unity power factor rather than 0.8 lagging.

2.2 The burden shall be $200 \pm 20\%$ M Ω

2.3 The ratio error shall be within $\pm 1\%$ over the frequency range 48 Hz to 3 kHz, for the operating temperature range as given in TS 1 and a $\pm 10\%$ variation of burden and capacitance of cable occurring in combination. The performance requirements

2.4 The phase displacement of the output with respect to the input shall not exceed 40 minutes over the frequency range 48 Hz to 3 kHz, for the operating temperature range as given in TS 1 and a $\pm 10\%$ variation of burden and capacitance of cable occurring in combination.

2.5 The terminal box shall conform to at least classification IP 54 in BS EN 60529, as required by TS 1.

3 TEST REQUIREMENTS

Type Tests

3.1 Voltage dividers shall be tested in accordance with the type test requirements of IEC 60358.

3.2 Voltage dividers shall be tested in accordance with BS EN 60044-2 clauses 12.3 and 13.6.2. The rated burden will be at unity power factor and not at 0.8 lagging.

3.3 The manufacturer shall propose and perform tests to demonstrate that the requirements of clauses 4.3 and 4.4 (accuracy requirements) are met. Proposed tests shall be agreed with National Grid prior to testing.

3.4 The manufacturer shall demonstrate the performance over the frequency range 10 Hz to 48 Hz. Proposed tests shall be agreed with National Grid prior to testing.

3.5 The terminal box shall be tested in accordance with the requirements of BS EN 60529 to at least classification IP 54.