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Technical Specification 41-38

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Power installations exceeding 1 kV a.c. – Design of high-voltage open-terminal stations

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PUBLISHING AND COPYRIGHT INFORMATION

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Amendments since publication

Issue	Date	Amendment
Issue 1 + A1	2016	Table 1 phase-to-phase and phase-to-earth clearances amended, to account for further alignment with BS EN 61936-1:2010. New clearances inserted in Table 1 for a rated voltage of 123 kV (110 kV systems). Previous Table 2 has been deleted and two new tables created: Table 2, *Horizontal clearances*. A note has been included at the bottom of this table to explain how values are derived. Table 3, *Minimum height over access areas*. A note has been included at the bottom of this table to explain how values are derived. A new Figure 1 to assist user in the application of boundary clearances requirements. A new Annex D has been added to provide an explanation of the reason for the difference between ‘safety distance’ and design phase-to-earth clearance.

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Foreword

This Technical Specification (TS) is published by the Energy Networks Association (ENA) and comes into effect from the date of publication. It has been prepared under the authority of the ENA Engineering Policy and Standards Manager and has been approved for publication by the ENA Electricity Networks and Futures Group (ENFG). The approved abbreviated title of this engineering document is "ENA TS 41-38".

This is the first issue of this Technical Specification.

This Technical Specification has been prepared by the Energy Networks Association with direction from the Switchgear Assessment Panel.

BS 7354:1990 has been withdrawn and replaced by BS EN 50522:2010 (Earthing of power installations exceeding 1 kV a.c.) and BS EN 61936-1:2010 (Power installations exceeding 1 kV a.c.). This Technical Specification is intended to capture additional information and requirements from BS 7354 that are not elaborated on in BS EN 61936-1. Annex B [of this Technical Specification] relating to nomenclature and Annex C [of this Technical Specification] relating to interlocking replicate associated parts of BS 7354 for information.

Stations covered by this Technical Specification conform to the International and National Standards listed. This Technical Specification amplifies and/or clarifies the requirements of BS EN 61936-1 where alternative arrangements are permitted or where additional information is required. The Technical Specification should, therefore, be read in conjunction with BS EN 61936-1.

Vertical clearances within this document have been harmonised with those in ENA Technical Specifications for switchgear, i.e. TS 41-36 and TS 41-37, given this switchgear is likely to be used within open-terminal stations conforming to this Technical Specification.

BS 7354 assumed a value of 2 400 mm for the vertical reach of a person. The clearance to exposed live conductors was the vertical reach plus the basic electrical clearance to earth. Insulation height was specified as 2 100 mm.

ENA Technical Specification 41-36 – *Switchgear for service up to 36 kV (Cable and overhead conductor connected)* and ENA Technical Specification 41-37 – *Switchgear for use on 66 kV to 132 kV distribution systems* both specify the insulation height as personal reach plus 300 mm and the clearance to exposed live conductors as personal reach plus 300 mm plus basic electrical clearance. Personal reach in these documents has been specified as 2 250 mm. By including the additional 300 mm, clearances have been increased compared to BS 7354.

It should be noted that these design clearances ensure that personnel moving around within an open-terminal station do not inadvertently infringe safety distances. Safety distances to exposed live conductors will be specified in the appropriate safety rules applicable to a specific station. The safety distance within the ENA Model Distribution Safety Rules SHE Standard 07 (MDSRs) [4] are calculated using the basic electrical clearance from BS 7354 plus 300 mm.

Amendment 1 of this Technical Specification includes revised minimum phase-to-earth and phase-to-phase clearances. In particular, the clearances for 132 kV systems are now based on a lighting impulse withstand voltage (LIWV) of 650 kV. Annex D has been added to provide the context and explanation for this amendment.

The clause numbering of this Technical Specification follows that of BS EN 61936-1. Where appropriate, the relevant clause of BS EN 61936-1 is given.

All references relate to BS EN 61936-1:2010.

The requirements in this Technical Specification do not override those in other ENA Technical Specifications for main plant and equipment.

The term ‘user’ relates to any user of this document.

Where the term “shall” or “must” is used in this document it means the requirement is mandatory. The term “may” is used to express permission.

NOTE: Commentary, explanation and general informative material is presented in smaller type and does not constitute a requirement.

1 Scope

This Technical Specification covers the design of high-voltage open-terminal stations operating up to and including nominal voltages of 132 kV. Installations in outdoor and indoor environments are covered.

NOTE: Although predominantly found in an outdoor environment, some high-voltage open-terminal stations are located indoors.

This Technical Specification excludes design of the main earthing systems of high-voltage open-terminal stations as these aspects are adequately covered by BS EN 50522 and ENA TS 41-24 [1].

2 Normative references

The following referenced documents, in whole or part, are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Standards publications

BS EN 61936-1:2010, *Power installations exceeding 1 kV a.c. Part 1: Common rules*

Other publications

[N1] The Electricity Safety, Quality and Continuity Regulations 2002

[N2] ENA TS 43-8:2015, Issue 4 + A1:2016, *Overhead line clearances*

3 Terms and definitions

For the purposes of this document, Clause 3 and all sub-clauses of BS EN 61936-1 shall apply.

4 Fundamental requirements

4.1 General

The requirements of Clause 4.1 and all sub-clauses of BS EN 61936-1 shall apply.

4.2 Electrical requirements

The requirements of Clause 4.2 and all sub-clauses of BS EN 61936-1 shall apply with the following amendments.

a) For Clause 4.2.1 of BS EN 61936-1, the user shall specify the method of neutral earthing to be adopted for each nominal voltage level at a particular site.

b) For Clause 4.2.2 of BS EN 61936-1, the user, based on the nominal voltage(s) and maximum operating voltage(s) for a particular site, shall specify the highest voltage(s) for installation (U_m) for that site.

c) For Clause 4.2.3 of BS EN 61936-1, the user shall specify the normal operation currents required. The rating of conductors connecting separate items of switchgear shall be equal to or greater than the rating of the associated switchgear unless otherwise agreed by the user.

d) For Clause 4.3.4 of BS EN 61936-1, the value of rated duration of the short circuit shall be 3.0 s.

e) For Clause 4.3.5 of BS EN 61936-1, the frequency shall be 50 Hz.