



# Engineering Recommendation G101

Issue 1 2017

## Voltage Measurements for Assessment of Compliance with Statutory Voltage Limits

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**Amendments since publication**

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## **Foreword**

This Engineering Recommendation (EREC) is published by the Energy Networks Association (ENA) and comes into effect from August, 2017. 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 “EREC G101”.

## Introduction

The Electricity Safety, Quality and Continuity Regulations 2002 (ESQC Regulations 2002 [1]) and Electricity Safety, Quality and Continuity Regulations (Northern Ireland) 2012 [2] specify nominal values of frequency and voltage that shall be declared to consumers, together with permitted tolerances. For voltage, these permitted tolerance limits are referred to as 'Statutory Voltage Limits' and they shall be met save in exceptional circumstances. These limits apply unless otherwise agreed in writing.

This Engineering Recommendation has been prepared to ensure consistency in application of Statutory Voltage Limits at consumers' Supply Terminals. It defines how the voltage is measured and what conditions are considered exceptional. It is not intended to have an impact on design standards or the way in which DNOs operate their networks.

## 1 Scope

This Engineering Recommendation applies to voltage measurements by distributors for the purposes of assessment of compliance with the Statutory Voltage Limits defined in the ESQC Regulations for GB and those for Northern Ireland[1],[2] at Supply Terminals.

This document does not apply to other types of voltage measurement, including measurement of:

- Voltage dips/swells caused by faults or switching.
- Interruptions or outages.
- Voltage (waveform) distortion (e.g. harmonics).
- Flicker (e.g. associated with motor starting, welding, poor connections etc).
- High-frequency events (e.g. transient overvoltage for example associated with switching of capacitance/inductance).
- Superimposed signalling.
- Radiated interference (e.g. radio frequency noise).
- Frequency variation.

## 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.

- [1] *For GB - S.I. 2002 No.2665 – Electricity, Safety, Quality and Continuity Regulations, 2002 (as amended).*
- [2] *For NI – S.I 2012 No 381 - Electricity Safety, Quality and Continuity Regulations (Northern Ireland) 2012 (as amended)*

## 3 Standards publications

- [3] *BS EN 61000-4-30:2015 Electromagnetic compatibility (EMC) – Part 4-30: Testing and measurement techniques. Power quality measurement methods.*

## **4 Terms and definitions**

For the purposes of this document, the following terms and definitions apply.

### **4.1 Consumer**

Any person supplied or entitled to be supplied by a supplier, but in the ESQC Regulations for GB [1], Regulations 24, 25 and 26 shall not include, in respect of any supply to meet haulage or traction requirements, any person who is an operator of a network within the meaning of Part I of the Railways Act 1993.

### **4.2 Consumer's Installation**

The electric lines situated upon the consumer's side of the supply terminals together with any equipment permanently connected or intended to be permanently connected thereto on that side.

### **4.3 Declared Voltage**

At High Voltage, the Declared Voltage at the Supply Terminals shall be defined by the Distributor.

At Low Voltage, the Declared Voltage at the Supply Terminals shall be 230V between phase and neutral unless otherwise agreed in accordance with the ESQC Regulations [1], [2].

### **4.4 Distributor**

A person who operates a network, except in GB for a network where that person is an operator of a network within the meaning of Part I of the Railways Act 1993.

### **4.5 High Voltage**

Any voltage exceeding Low Voltage.

### **4.6 Low Voltage**

In relation to alternating current, a voltage exceeding 50V measured between phase conductors (or between phase conductors and earth), but not exceeding 1,000V measured between phase conductors (or 600V if measured between phase conductors and earth), calculated by taking the square root of the mean of the squares of the instantaneous values of a voltage during a complete cycle.

### **4.7 Measured Voltage**

Is the output of the whole measurement chain as described in this document.

### **4.8 Normal Operating Conditions**

The normal operating condition for an electricity network is where the load and generation demands are met, system switching operations are made and faults are cleared by automatic protection systems, in the absence of exceptional circumstances, including:

- a) temporary supply arrangement;
- b) in the case of non-compliance of a consumer's installation or equipment with the relevant standards or with the technical requirements for connection;
- c) exceptional situations, such as:
  - 1) exceptional weather conditions and other natural disasters;