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IEEE Recommended Practice for the Analysis of Fluctuating Installations on Power Systems

IEEE Power and Energy Society

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IEEE Std 1453™-2015
(Revision of
IEEE Std 1453-2011)

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Abstract: Background on light flicker caused by fluctuations in power demands of variable loads is presented in this recommended practice. A flicker measurement method is presented using a meter that is completely described in IEC 61000-4-15. The short-term (P_{st}) and long-term (P_{lt}) flicker indices used for the analysis of flicker data are defined. Flicker limits for various voltage levels are presented. An assessment procedure for evaluating flicker compliance against emission limits is described. Methodologies to analyze background flicker to identify the flicker contribution of single loads are also presented.
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Introduction

This introduction is not part of IEEE Std 1453-2015, IEEE Recommended Practice for the Analysis of Fluctuating Installations on Power Systems.

Voltage fluctuations on electric power systems sometimes give rise to noticeable illumination changes from lighting equipment. The frequency of these voltage fluctuations is much less than the 50 Hz or 60 Hz supply frequency. However, they may occur with enough frequency and magnitude to cause irritation for people observing the illumination changes. This phenomenon is often referred to as flicker, lamp flicker, and sometimes voltage flicker. Often times, the terms have been used interchangeably. IEEE Std 141™-1993 [B14] and IEEE Std 519™-1992 [B15] contain charts showing allowable voltage fluctuations. The advent of high-power electronic utilization equipment and mitigation equipment has given rise to some very complex voltage fluctuations that are not easily handled by IEEE Std 141-1993 [B14] and IEEE Std 519-1992 [B15]. For this reason, the IEEE has worked in close cooperation with the International Union for Electroheat (UIE) and the International Electrotechnical Commission (IEC) to enhance existing standards to include a broader part of the world community. In 2004, IEEE Std 1453-2004 was published, adopting the IEC flickermeter standard and providing recommended levels. IEEE Std 1453-2011 adopted the 2010 edition of the IEC 61000-4-15, moving the recommended acceptable flicker levels to its annex, facilitating the adoption of the IEC/TR 61000-3-7 in IEEE Std 1453.1™-2012. This present version of IEEE Std 1453 replaces both IEEE Std 1453-2011 and IEEE Std 1453.1-2012. This edition uses the IEC flicker methodology while providing additional information.

Contents

IEEE Recommended Practice for the Analysis of Fluctuating Installations on Power Systems

1. Overview

1.1 Scope

This recommended practice provides background on light flicker caused by fluctuations in power demands of variable loads. A flicker measurement method is presented using a meter that is completely described in IEC 61000-4-15. The short-term (P_{st}) and long-term (P_{lt}) flicker indices used for the analysis of flicker data are defined. Flicker limits for various voltage levels are presented. An assessment procedure for evaluating flicker compliance against emission limits is described. Methodologies to analyze background flicker to identify the flicker contribution of single loads are also presented.

The document provides ways to estimate flicker levels at the Point of Common Coupling (PCC) depending on the type of the load. This document includes example terms and language that can be the basis for defining relative responsibilities and assessment methods for customer installations that may cause flicker.

1.2 Purpose

The purpose of this document is to provide guidance to system operators, owners, and engineers who are responsible for providing electrical service to installations that cause voltage fluctuations. It provides guidance on the principles and methodology that can be used to determine requirements for connecting fluctuating loads to both radial and network systems. Methods for determining appropriate flicker planning