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Power quality management -
Part 1: General guidelines

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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Power quality management - Part 1: General guidelines

FOREWORD

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC TS 63222-1:2022. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC TS 63222-1 has been prepared by IEC technical committee 8: System aspects of electrical energy supply. It is a Technical Specification.

This second edition cancels and replaces the first edition published in 2022. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) this document completes the use cases planned in IEC 63222-1:2022: four business use cases and three system use cases are added;
b) this document makes adjustments to the wording of certain phrases and technical details in IEC 63222-1:2022.

The text of this Technical Specification is based on the following documents:

Draft	Report on voting
8/1793/DTS	8/1803/RVDTS

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Specification is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 63222 series, published under the general title *Power quality management*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

– reconfirmed,
– withdrawn, or
– revised.

INTRODUCTION

With the development of smart grid and massive deployment of renewable energy, power quality issues have received attention not only from system operators and customers (especially with sensitive power quality loads) but also from market regulators with the demands to provide information on the actual power quality level. Power quality management of the grid is a systematic project which includes the whole process of planning, operation, assessment and mitigation. The characteristics of power supplier, load characteristics of power consumer and external environment will affect the power quality of the grid. This document focuses on the whole process management and is the general guideline for the IEC 63222 series.

Traditional electrified railways, steel mills and other non-linear loads are the main pollution sources of the power quality. In recent years, the new loads such as new energy and electric vehicles have brought new challenges to power quality management. The rapid popularization and application of high-tech precision technology has also put forward new requirements for high-quality power supply and consumption system.

Power quality is an important issue for electricity supply network operators; it is also important to handle it at planning and operation stages. In order to achieve power quality target, reduce power quality impacts/losses and improve the economic efficiency of the system, power quality regulation and supervision of the operating power system is ~~necessary~~ crucial, as well as a well-considered power quality planning before project implementation ~~is also needed~~, such as system expansion, construction and grid connection of the distributed generation. Besides, the users at the end of power system should also be taken into consideration. Power quality problems can cause system instability, equipment abnormal operation and supply interruption. Power quality management is a method to avoid further power quality problems after project implementation.

The standard system in power quality management provides a technical basis for improving power management level and standardizing power quality industry and market. As the general guideline of the IEC 63222 series, this document summarizes the power quality indicators and assessment methods, and analyses the overall power quality level by monitoring assessment and predicted assessment. Monitoring system and field test are used to assess the power quality level at different nodes of the grid and solve users' power quality complaints and other practical problems. Connection and monitoring points are reasonably selected to assess the power quality levels of the grid in operation stage, and it also contributes to the power quality mitigation. In addition, the economical assessment of power quality is regulated in the document. Power quality management use cases in different typical scenarios are shown in Annex A.

1 Scope

This part of IEC 63222, which is a Technical Specification, is intended to provide provisions associated to the main use cases regarding recognized engineering practices applicable to power quality management in public electric power supply networks. It summarizes the operation in power quality management and investigates the current standards, for requirement of power quality assessment work, as well as to promote the development of power quality management best practices.

The power quality management domain groups use cases and associated power quality requirement common to network management, including customer support network operation, network and extension planning.

This document captures possible "common and repeated usage" of power quality management under the format of "use case". Use case implementations are given for information purpose only. This document derives the common requirement as provisions by further standardization activities, in terms of actors interacting with the given system. The interface requirement is considered for later standardization activities. The relationship of the stakeholders in power quality management, such as network operator, network user, etc, are discussed in the document. Table 1 highlights the domains and business use cases described.

Table 1 – Content of IEC TS 63222-1

Domain	Content	Scope
Power quality monitoring assessment	Described with 5 business use cases 1) Manage power quality over the grid. 2) Manage power quality through distribution or transmission grid interfaces with other network. 3) Take into account power quality constraints in network operation. 4) Provide reports on network power quality. 5) Manage complaints on power quality over the network. 6) Manage power quality through distribution or transmission grid interfaces with other network. Described with 4 system use cases 1) Measure power quality on a specific point of the network. 2) Monitor power quality on the network. 3) Engineer a power quality ~~provision~~ solution. 4) Assess power quality on the network. ~~5) Assess the emission limit related to power quality technical parameters in power system.~~	Continuous monitoring operation for public power grid

Domain	Content	Scope
Power quality predicted assessment	Described with 7 business use cases 1) Manage power quality over the grid. 2) Connect new user to the grid. 3) Plan network development. 4) Take into account power quality constraints in connecting a user to the grid. 5) Take into account power quality constraints in network development. 6) Provide reports on network power quality. Described with 6 system use cases 1) Predict power quality impact of a construction work or maintenance. 2) Predict power quality impact of a new connection or network development. 3) Measure power quality on a specific point of the network. 4) Monitor power quality on the network. 5) Engineer a power quality ~~provision~~ solution. 6) Assess power quality on the network ~~7) Assess the emission limit related to power quality technical parameters in power system.~~	Power quality assessment of new construction, reconstruction or expansion projects in the grid

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

IEC 61000-3 (all parts), *Electromagnetic compatibility (EMC) - Part 3: Limits*

IEC 61000-3-2, *Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)*

IEC 61000-3-3, *Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply system, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection*

IEC TS 61000-3-4, *Electromagnetic compatibility (EMC) - Part 3-4: Limits - Limitation of emission of harmonic currents in low-voltage power supply systems for equipment with rated current greater than 16 A*

IEC TS 61000-3-5, *Electromagnetic compatibility (EMC) - Part 3-5: Limits - Limitation of voltage fluctuations and flicker in low-voltage power supply systems for equipment with rated current greater than 75 A*

IEC TR 61000-3-6, *Electromagnetic compatibility (EMC) - Part 3-6: Limits - Assessment of emission limits for the connection of distorting installations to MV, HV and EHV power systems*

IEC TR 61000-3-7, *Electromagnetic compatibility (EMC) - Part 3-7: Limits - Assessment of emission limits for the connection of fluctuating load installations to MV, HV and EHV power systems*

IEC 61000-3-8, *Electromagnetic compatibility (EMC) - Part 3: Limits - Section 8: Signalling on low-voltage electrical installations - Emission levels, frequency bands and electromagnetic disturbance levels*

IEC 61000-3-11, *Electromagnetic compatibility (EMC) - Part 3-11: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems - Equipment with rated current ≤ 75 A and subject to conditional connection*

IEC 61000-3-12, *Electromagnetic compatibility (EMC) - Part 3-12: Limits - Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current >16 A and ≤ 75 A per phase*

IEC TR 61000-3-13, *Electromagnetic compatibility (EMC) - Part 3-13: Limits - Assessment of emission limits for the connection of unbalanced installations to MV, HV and EHV power systems*

IEC TR 61000-3-14, *Electromagnetic compatibility (EMC) - Assessment of emission limits for harmonics, interharmonics, voltage fluctuations and unbalance for the connection of disturbing installations to LV power systems*

IEC 61000-4 (all parts), *Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques*

IEC 61000-4-15, *Electromagnetic compatibility (EMC) - Part 4-15: Testing and measurement techniques - Flickermeter - Functional and design specifications*

IEC 61000-4-30:2015, *Electromagnetic compatibility (EMC) - Part 4-30: Testing and measurement techniques - Power quality measurement methods*

~~IEC 61850 (all parts), *Communication networks and systems for power utility automation*~~

IEC TR 61850-90-17:2017, *Communication networks and systems for power utility automation - Part 90-17: Using IEC 61850 to transmit power quality data*

~~IEC 61968-9:2013, *Application integration at electric utilities – System interfaces for distribution management – Part 9: Interfaces for meter reading and control*~~

IEC 61968-9:2024, *Enterprise business function interfaces for utility operations - Part 9: Interfaces for meter reading and control*

IEC TS 62749:2020, *Assessment of power quality - Characteristics of electricity supplied by public networks*

IEC TS 63222-2:2023, *Power quality management - Part 2: Power quality monitoring system*

ISO 10002:2018, *Quality management - Customer satisfaction - Guidelines for complaints handling in organizations*

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IEC 60038:2009/AMD1:2021

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IEC 60050-551, *International Electrotechnical Vocabulary (IEV) - Part 551: Power electronics,* available at <http://www.electropedia.org/

IEC 60050-617, *International Electrotechnical Vocabulary (IEV) - Part 617: Organization/Market of electricity,* available at <http://www.electropedia.org/

IEC 60050-714, *International Electrotechnical Vocabulary (IEV) - Part 714: Switching and signalling in telecommunications,* available at <http://www.electropedia.org/

IEC 60050-721, *International Electrotechnical Vocabulary (IEV) - Part 721: Telegraphy, facsimile and data communication,* available at <http://www.electropedia.org/

IEC 60050-732, *International Electrotechnical Vocabulary (IEV) - Part 732: Computer network technology,* available at <http://www.electropedia.org/

~~IEC 60050-845, *International Electrotechnical Vocabulary (IEV) – Part 845: Lighting* (available at <http://www.electropedia.org/)~~

IEC 60050-901, *International Electrotechnical Vocabulary (IEV) - Part 901: Standardization,* available at <http://www.electropedia.org/

IEC 60050-904, *International Electrotechnical Vocabulary (IEV) - Part 904: Environmental standardization for electrical and electronic products and systems,* available at <http://www.electropedia.org/

~~IEC 61000-2-2, *Electromagnetic compatibility (EMC) – Part 2-2: Environment – Compatibility levels for low-frequency conducted disturbances and signalling in public low-voltage power supply systems*~~

~~IEC 61000-2-4, *Electromagnetic compatibility (EMC) – Part 2-4: Environment – Compatibility levels in industrial plants for low-frequency conducted disturbances*~~

~~IEC 61000-2-8, *Electromagnetic compatibility (EMC) – Part 2-8: Environment – Voltage dips and short interruptions on public electric power supply systems with statistical measurement results*~~

~~IEC 61000-2-12, *Electromagnetic compatibility (EMC) – Part 2-12: Environment – Compatibility levels for low-frequency conducted disturbances and signalling in public medium-voltage power supply systems*~~

~~IEC 61000-4-7, *Electromagnetic compatibility (EMC) – Part 4-7: Testing and measurement techniques – General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto*~~

~~IEC 61000-4-34, *Electromagnetic compatibility (EMC) – Part 4-34: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current more than 16 A per phase*~~

~~IEC TR 62559-1:2019, *Use case methodology – Part 1: Concept and processes in standardization*~~

~~IEC 62559-2, *Use case methodology – Part 2: Definition of the templates for use cases, actor list and requirements list*~~

~~IEC SRD 62913-1, *Generic smart grid requirements – Part 1: Specific application of the Use Case methodology for defining generic smart grid requirements according to the IEC system approach*~~

~~IEC SRD 62913-2-1, *Generic smart grid requirements – Part 2-1: Grid related domains*~~

IEC 61000-4 (all parts), *Electromagnetic compatibility (EMC)*

IEC 61850 (all parts), *Communication networks and systems for power utility automation*

IEC 63222 (all parts), *Power quality management*

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J. M. R. GORDON, C. NOCE, *Enel global solution for power quality monitoring and analysis.* CIRED, Volume 2017, issue 1, no. 645.