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Microgrids -
Part 3-5: Technical requirements - Testing for microgrid monitoring, control, and energy management systems

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CONTENTS

FOREWORD 3
INTRODUCTION 5
1 Scope 6
2 Normative references 6
3 Terms and definitions 6
4 General technical requirements 9
4.1 Test environment 9
4.2 Equipment information 9
5 Laboratory testing 9
5.1 General requirements of laboratory testing 9
5.1.1 General 9
5.1.2 Test object 9
5.1.3 Testbed 10
5.1.4 Equipment 11
5.1.5 Comparison between HIL and P-HIL 12
5.1.6 Communication protocols 13
5.1.7 Architecture 13
5.1.8 Simulation model 15
5.2 HIL test for MEMS 16
5.2.1 HIL test for dispatch optimization 16
5.2.2 HIL test for forecast 17
5.2.3 HIL test for demand side integration 19
5.2.4 HIL test for flexible resource management 20
5.3 HIL test for MMCS 22
5.3.1 HIL test for anti-maloperation locking and alarm 22
5.3.2 HIL test for frequency/voltage regulation during steady-state operation of isolated microgrid 23
5.3.3 HIL test for control of device switching 24
5.3.4 HIL test for operation mode transition 25
5.3.5 HIL test for active/reactive power control 27
5.3.6 HIL test for islanding detection 27
5.3.7 HIL test for black start 29
5.3.8 End-to-end HIL test before commissioning 30
6 Commissioning testing 30
6.1 General requirements of commissioning testing 30
6.2 Calibration and inspection 31
6.3 Commissioning test for MEMS 31
6.3.1 Test for dispatch optimization 31
6.3.2 Test for forecast 31
6.3.3 Test for demand-side integration 31
6.3.4 Test for flexible resource management 31
6.4 Commissioning test for MMCS 31
6.4.1 Test for anti-maloperation locking and alarm 31
6.4.2 Test for frequency/voltage regulation during steady-state operation of isolated microgrid 31
6.4.3 Test for control of device switching 31

6.4.4 Test for operation mode transition 31
6.4.5 Test for active/reactive power control 32
6.4.6 Test for islanding detection 32
6.4.7 Test for black start 32
6.5 Periodic testing 32
Bibliography 33

Figure 1 – HIL and P-HIL enable to test and validate MEMS and MCMS beyond lab limitations 10
Figure 2 – HIL applied for microgrids 11
Figure 3 – P-HIL applied for microgrids 11
Figure 4 – Typical three-layer architecture of MEMS and MMCS 14
Figure 5 – Simplified architecture with MEMS alone 14
Figure 6 – Simplified architecture with MMCS alone 15
Figure 7 – Example of a EES model used for HIL 16
Figure 8 – HIL testing flowchart for dispatch and scheduling module 17
Figure 9 – HIL testing flowchart for forecast 19
Figure 10 – HIL testing flowchart for demand side integration 20
Figure 11 – HIL test for flexible resource management 21
Figure 12 – HIL testing flowchart for anti-maloperation locking and alarm 22
Figure 13 – HIL testing flowchart for frequency/voltage regulation during steady-state operation of isolated microgrid 24
Figure 14 – HIL testing flowchart for device switching control 25
Figure 15 – HIL testing flowchart for operation mode transition 26
Figure 16 – HIL testing flowchart for active/reactive power control 27
Figure 17 – HIL testing flowchart for islanding detection 28
Figure 18 – HIL testing flowchart for black start 29

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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Microgrids - Part 3-5: Technical requirements - Testing for microgrid monitoring, control, and energy management systems

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IEC TS 62898-3-5, which is a technical specification, has been prepared by subcommittee 8B: Decentralized electrical energy systems, of IEC technical committee 8: System aspects of electrical energy supply. It is a Technical Specification.

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

Draft	Report on voting
8B/277/DTS	8B/292/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 [change language if necessary].

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 62898 series, published under the general title *Microgrids*, 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

Microgrid monitoring, control, and energy management systems (MMCS and MEMS) are essential components of microgrid infrastructure designed to monitor, control, and optimize the operation of a microgrid. These systems play a central role in managing distributed energy resources (DERs), ensuring grid stability, and improving the efficiency and reliability of energy supply within a microgrid.

The major functions of MMCS and MEMS include the control of device switching, islanding detection, operation modes switching, active/reactive power control, black-start, anti-maloperation locking, local power quality control, frequency/voltage regulation, tertiary control, etc.

Microgrid systems are often deployed in critical applications, such as hospitals, data centres, and remote communities. Providing a comprehensive testing for the MMCS and MEMS system is critical to ensure the microgrid system's stability, even during unexpected events or disturbances. A standardized set of testing procedures could facilitate the wide adoption of standard MMCS and MEMS functional and performance requirements by vendors and utilities while reducing the cost of design and construction.

The IEC 62898 series is intended to provide comprehensive guidelines and technical requirements for microgrid projects, however, there are some standardization gaps left in this series.

IEC TS 62898-3-1 mainly covers the requirements for microgrid protection, protection systems for microgrids and dynamic control for transient and dynamic disturbances in microgrids.

IEC TS 62898-3-2 covers the technical requirements for microgrid energy management systems (MEMS), but this document does not specify any testing procedures required for MEMS.

IEC TS 62898-3-3 covers the self-regulation of dispatchable loads of microgrids.

IEC TS 62898-3-4 covers the technical requirements for the monitoring and control of microgrids, however, it does not specify any testing items or procedures for MMCS.

The IEC TS 62898-3-5 aims to provide a standardized testing procedure for MMCS and MEMS' major functions.

This document covers the technical requirements for the hardware in the loop testing (HIL), commissioning testing, and periodic testing that allows the verification, and quantification of the performance of microgrid monitoring, control, and energy management systems.

The HIL test aims to verify the performance of MMCS and MEMS major functions and provide a set of metrics to quantify the minimum requirements of different functions. This test requires the interaction between both systems and the real-time simulation environment. HIL testing is recommended for MW level or larger microgrids.

The commissioning test provides the performance evaluation of both systems' major functions on-site. This test will be conducted after MMCS and MEMS are installed and ready for operation. Certain testing items will show actual performances of the MMCS and MEMS such as voltage deviation, harmonics, step power response, voltage/current evolution, power management efficiency, etc.

The periodic function test is set to verify certain functions' performance after a certain time of operation. The test interval is specified by the manufacturer, system integrator, or microgrid owner.

1 Scope

This part of IEC 62898, which is a Technical Specification, provides technical requirements for the hardware in the loop testing (HIL), commissioning testing, and periodic testing that allows the verification, and quantification of the performance of microgrid monitoring, control, and energy management systems (MMCS and MEMS). This document applies to MMCS and MEMS developed for grid-connected or isolated microgrids, or both.

This document includes the following aspects:

– general technical requirements;
– hardware in the loop testing;
– commissioning testing;
– periodic testing.

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 TS 62898-3-2, *Microgrids - Part 3-2: Technical requirements - Energy management systems*

IEC TS 62898-3-4, *Microgrids - Part 3-4: Technical requirements - Microgrid monitoring and control systems*

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

– IEC Electropedia: available at https://www.electropedia.org/
– ISO Online browsing platform: available at https://www.iso.org/obp

3.1
microgrid
<in an electric power system> group of interconnected loads and distributed energy resources with defined electrical boundaries forming a local electric power system at distribution voltage levels, that acts as a single controllable entity and is able to operate in island mode, no matter if it is standalone or grid-connected

Note 1 to entry: This definition covers both (utility) distribution microgrids and (customer owned) facility microgrids.

[SOURCE: IEC 60050-617:2017 [30], 617-04-22, modified – "either grid-connected or island mode" has been changed to " in island mode, no matter if it is standalone or grid-connected"]

3.2
microgrid monitoring and control system
MMCS
computer or PLC based system performing real time monitoring and control of microgrid

Note 1 to entry: In a large grid or large microgrid, such a system is also designated by PMS (power monitoring system).