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INTERNATIONAL STANDARD

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Industrial communication networks – High availability automation networks – Part 1: General concepts and calculation methods

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INDUSTRIAL COMMUNICATION NETWORKS – HIGH AVAILABILITY AUTOMATION NETWORKS –

Part 1: General concepts and calculation methods

FOREWORD

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International Standard 62439-1 has been prepared by subcommittee 65C: Industrial Networks, of IEC technical committee 65: Industrial-process measurement, control and automation.

This standard cancels and replaces IEC 62439 published in 2008. This first edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to IEC 62439 (2008):

- adding a calculation method for RSTP (rapid spanning tree protocol, IEEE 802.1Q),
- adding two new redundancy protocols: HSR (High-availability Seamless Redundancy) and DRP (Distributed Redundancy Protocol),
- moving former Clauses 1 to 4 (introduction, definitions, general aspects) and the Annexes (taxonomy, availability calculation) to IEC 62439-1, which serves now as a base for the other documents,
- moving Clause 5 (MRP) to IEC 62439-2 with minor editorial changes,

– moving Clause 6 (PRP) was to IEC 62439-3 with minor editorial changes,
– moving Clause 7 (CRP) was to IEC 62439-4 with minor editorial changes, and
– moving Clause 8 (BRP) was to IEC 62439-5 with minor editorial changes,
– adding a method to calculate the maximum recovery time of RSTP in a restricted configuration (ring) to IEC 62439-1 as Clause 8,
– adding specifications of the HSR (High-availability Seamless Redundancy) protocol, which shares the principles of PRP to IEC 62439-3 as Clause 5, and
– introducing the DRP protocol as IEC 62439-6.

The text of this standard is based on the following documents:

FDIS	Report on voting
65C/583/FDIS	65C/589/RVD

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

A list of the IEC 62439 series can be found, under the general title *Industrial communication networks – High availability automation networks*, on the IEC website.

This publication has been drafted in accordance with ISO/IEC Directives, Part 2.

The committee has decided that the contents of this amendment and the base publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this standard may be issued at a later date.

IMPORTANT – The "colour inside" logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this publication using a colour printer.

INTRODUCTION

The IEC 62439 series specifies relevant principles for high availability networks that meet the requirements for industrial automation networks.

In the fault-free state of the network, the protocols of the IEC 62439 series provide ISO/IEC 8802-3 (IEEE 802.3) compatible, reliable data communication, and preserve determinism of real-time data communication. In cases of fault, removal, and insertion of a component, they provide deterministic recovery times.

These protocols retain fully the typical Ethernet communication capabilities as used in the office world, so that the software involved remains applicable.

The market is in need of several network solutions, each with different performance characteristics and functional capabilities, matching diverse application requirements. These solutions support different redundancy topologies and mechanisms which are introduced in IEC 62439-1 and specified in the other Parts of the IEC 62439 series. IEC 62439-1 also distinguishes between the different solutions, giving guidance to the user.

The IEC 62439 series follows the general structure and terms of IEC 61158 series.

INDUSTRIAL COMMUNICATION NETWORKS – HIGH AVAILABILITY AUTOMATION NETWORKS –

Part 1: General concepts and calculation methods

1 Scope

The IEC 62439 series is applicable to high-availability automation networks based on the ISO/IEC 8802-3 (IEEE 802.3) (Ethernet) technology.

This part of the IEC 62439 series specifies

- the common elements and definitions for other parts of the IEC 62439 series;
- the conformance test specification (normative);
- a classification scheme for network characteristics (informative);
- a methodology for estimating network availability (informative);
- the configuration rules, calculation and measurement method for a deterministic recovery time in RSTP.

2 Normative references

The following referenced documents 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.

IEC 60050-191:1990, *International Electrotechnical Vocabulary – Chapter 191: Dependability and quality of service*

IEC 61158 (all parts), *Industrial communication networks – Fieldbus specifications*

IEC 61158-6-10, *Industrial communication networks – Fieldbus specifications – Part 6-10: Application layer protocol specification – Type 10 elements*

ISO/IEC 8802-3:2000, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications*

IEEE 802.1Q, *IEEE standards for local and metropolitan area network. Virtual bridged local area networks*

IEEE 802.1D:2004, *IEEE standard for local Local and metropolitan area networks Media Access Control (MAC) Bridges*

IETF RFC 791, *Internet Protocol*; available at <http://www.ietf.org>