

# SLOVENSKI STANDARD

## SIST EN IEC 62439-5:2018

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SIST EN 62439-5:2010

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**Industrijska komunikacijska omrežja - Omrežja za avtomatizacijo z visoko razpoložljivostjo - 5. del: Redundančni protokol radijskega odzivnika (BRP) (IEC 62439-5:2016)**

Industrial communication networks - High availability automation networks - Part 5: Beacon Redundancy Protocol (BRP) (IEC 62439-5:2016)

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Industrielle Kommunikationsnetze - Hochverfügbare Automatisierungsnetze - Teil 5: Funkbaken-Redundanz-Protokoll (BRP) (IEC 62439-5:2016)

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Réseaux de communication industrielle - Réseaux d'automatisme à haute disponibilité - Partie 5: Protocole de redondance à balise (BRP) (IEC 62439-5:2016)

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**ICS:**

25.040.01	Sistemi za avtomatizacijo v industriji na splošno	Industrial automation systems in general
35.110	Omreževanje	Networking

**SIST EN IEC 62439-5:2018**

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EUROPEAN STANDARD

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## Industrial communication networks - High availability automation networks - Part 5: Beacon Redundancy Protocol (BRP) (IEC 62439-5:2016)

Réseaux de communication industrielle - Réseaux d'automatisme à haute disponibilité - Partie 5: Protocole de redondance à balise (BRP) (IEC 62439-5:2016)

Industrielle Kommunikationsnetze - Hochverfügbare Automatisierungsnetze - Teil 5: Funkbaken-Redundanz-Protokoll (BRP) (IEC 62439-5:2016)

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**EN IEC 62439-5:2018 (E)****European foreword**

The text of document 65C/834/FDIS, future edition 2 of IEC 62439-5:2016, prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62439-5:2017.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2018-08-02
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2021-02-02

This document supersedes EN 62439-5:2010.

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SYSTEN following 62439-5:2018  
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IEC 61158 (all parts)	NOTE	Harmonized as EN 61158 (all parts).
IEC 62439-2	NOTE	Harmonized as EN 62439-4 (not modified).
IEC 62439-3	NOTE	Harmonized as EN 62439-6 (not modified).
IEC 62439-4	NOTE	Harmonized as EN 62439-4 (not modified).
IEC 62439-6	NOTE	Harmonized as EN 62439-4 (not modified).

## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: [www.cenelec.eu](http://www.cenelec.eu).

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60050-191	-	International Electrotechnical Vocabulary - - Chapter 191: Dependability and quality of service	-	-
IEC 62439-1	-	Industrial communication networks - High availability automation networks -- Part 1: General concepts and calculation methods	EN 62439-1	-
ISO/IEC 10164-1	-	Information technology, Open Systems Interconnection; systems management: object management function	-	-
ISO/IEC/TR 8802-1	-	Information technology -- Telecommunications and information exchange between systems -- Local and metropolitan area networks -- Specific requirements -- Part 1: Overview of Local Area Network Standards	-	-
ISO/IEC/IEEE 8802-3	2014	Standard for Ethernet	-	-
IEEE 802.1D	-	IEEE Standard for local and metropolitan area networks - Media Access Control (MAC) Bridges	-	-
IEEE 802.1Q	-	IEEE Standard for Local and metropolitan area networks - Media Access Control (MAC) Bridges and Virtual Bridges	-	-

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IEC 62439-5

Edition 2.0 2016-03

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



Industrial communication networks – High availability automation networks –  
Part 5: Beacon Redundancy Protocol (BRP)

Réseaux de communication industriels – Réseaux d'automatisme à haute  
disponibilité –  
Partie 5: Protocole de redondance à balise (BRP)

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**INDUSTRIAL COMMUNICATION NETWORKS –  
HIGH AVAILABILITY AUTOMATION NETWORKS –****Part 5: Beacon Redundancy Protocol (BRP)**

## FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 62439-5 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation.

This second edition cancels and replaces the first edition published in 2010. This edition constitutes a technical revision.

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

- a) The protocol is now independent of application (Path\_Check\_Request is sent periodically);
- b) Failure\_Notify message has been removed;
- c) Frame format had been changed;
- d) New MAC address had been added.

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

FDIS	Report on voting
65C/834/FDIS	65C/841/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.

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

This International Standard is to be read in conjunction with IEC 62439-1.

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

The committee has decided that the contents of this 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.

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## 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/IEEE 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 the IEC 61158 series.

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of patents concerning fault-tolerant Ethernet provided through the use of special interfaces providing duplicate ports that may be alternatively enabled with the same network address. Switching between the ports corrects single faults in a two-way redundant system. This is given in Clauses 5 and 6.

These patents are listed in the table below, where the [xx] notation indicates the holder of the patent rights:

			<a href="https://standards.iteh.ai/catalog/standards/sist/1fb64248-9d1d-4a89-9168-22322b592d3a/sist-en-iec-62439-5-2018">https://standards.iteh.ai/catalog/standards/sist/1fb64248-9d1d-4a89-9168-22322b592d3a/sist-en-iec-62439-5-2018</a>
US 7,817,538 B2	[RA]	Fault-tolerant Ethernet network	
US 8,493,840	[RA]	Fault-tolerant Ethernet network	

IEC takes no position concerning the evidence, validity and scope of these patent rights.

The holder of this patent right has assured the IEC that he/she is willing to negotiate licences either free of charge or under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with IEC. Information may be obtained from:

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ISO ([www.iso.org/patents](http://www.iso.org/patents)) and IEC (<http://patents.iec.ch>) maintain on-line data bases of patents relevant to their standards. Users are encouraged to consult the data bases for the most up to date information concerning patents.

# INDUSTRIAL COMMUNICATION NETWORKS – HIGH AVAILABILITY AUTOMATION NETWORKS –

## Part 5: Beacon Redundancy Protocol (BRP)

### 1 Scope

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

This part of the IEC 62439 series specifies a redundancy protocol that is based on the duplication of the network, the redundancy protocol being executed within the end nodes, as opposed to a redundancy protocol built in the switches. Fast error detection is provided by two beacon nodes, the switchover decision is taken in every node individually. The cross-network connection capability enables singly attached end nodes to be connected on either of the two networks.

### 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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, *International Electrotechnical Vocabulary – Chapter 191: Dependability and quality of service*

IEC 62439-1, *Industrial communication networks – High availability automation networks – Part 1: General concepts and calculation methods*

ISO/IEC TR 8802-1, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 1: Overview of Local Area Network Standards*

ISO/IEC/IEEE 8802-3:2014, *Standard for Ethernet*

ISO/IEC 10164-1, *Information technology – Open Systems Interconnection – Systems Management: Object Management Function*

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

IEEE 802.1Q, *IEEE Standard for Local and metropolitan area networks: Media Access Control (MAC) Bridges and Virtual Bridged Local Area Networks*

### 3 Terms, definitions, abbreviations, acronyms, and conventions

#### 3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-191, as well as in IEC 62439-1, apply.

### 3.2 Abbreviations and acronyms

For the purposes of this document, the abbreviations and acronyms given in IEC 62439-1, as well as the following apply:

BRP Beacon Redundancy Protocol  
DANB doubly attached node implementing BRP

### 3.3 Conventions

This part of the IEC 62439 series follows the conventions defined in IEC 62439-1.

## 4 BRP overview

This part of the IEC 62439 series specifies a protocol for an Ethernet network tolerant to all single point failures. This protocol is called Beacon Redundancy Protocol or BRP. A network based on the BRP is called a BRP network. The BRP network is based on switched ISO/IEC/IEEE 8802-3 (IEEE 802.3) (Ethernet) and ISO/IEC/TR 8802-1 (IEEE 802.1) technologies and redundant infrastructure. In this network, the decision to switch between infrastructures is made individually in each end node.

## 5 BRP principle of operation

### 5.1 General

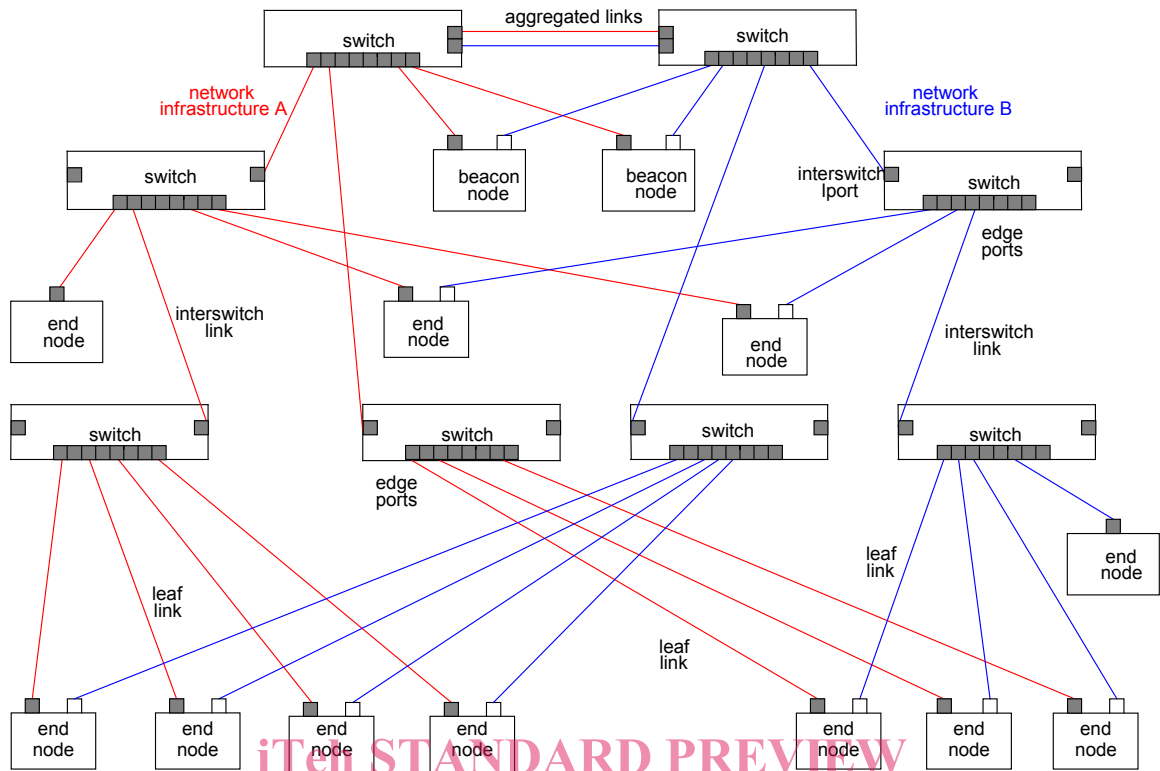
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Subclauses 5.2 to 5.4 are an explanation of overall actions performed by the BRP state machine. If a difference in the interpretation occurs between these subclauses and the state machines in Clause 7, then the state machines take precedence.

### 5.2 Network topology

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The BRP network topology can be described as two interconnected top switches, each heading an underlying topology of star, line, or ring. Beacon end nodes shall be connected to the top switches. Examples of star, linear and ring BRP networks are shown in Figure 1, Figure 2 and Figure 3 respectively.



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**Figure 1 – BRP star network example**  
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