



SLOVENSKI STANDARD
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Industrijska komunikacijska omrežja - Avtomatizacija omrežja z visoko razpoložljivostjo - 2. del: Protokol z redundanco medijev (MRP)

Industrial communication networks - High availability automation networks - Part 2: Media Redundancy Protocol (MRP)

Industrielle Kommunikationsnetze: Hochverfügbare Automatisierungsnetze - Teil 2: Medienredundanz-Protokoll (MRP)

Réseaux industriels de communication - Réseaux d'automatisme à haute disponibilité - Partie 2: Media Redundancy Protocol (MRP)

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35.110	Omreževanje	Networking

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COMMITTEE DRAFT FOR VOTE (CDV)

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IEC SC 65C : INDUSTRIAL NETWORKS	
SECRETARIAT: France	SECRETARY: Ms Valérie DEMASSIEUX
OF INTEREST TO THE FOLLOWING COMMITTEES: SC 22G, TC 57	PROPOSED HORIZONTAL STANDARD: <input type="checkbox"/> Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.
FUNCTIONS CONCERNED: <input type="checkbox"/> EMC <input type="checkbox"/> ENVIRONMENT <input type="checkbox"/> QUALITY ASSURANCE <input type="checkbox"/> SAFETY	
<input checked="" type="checkbox"/> SUBMITTED FOR CENELEC PARALLEL VOTING <input type="checkbox"/> NOT SUBMITTED FOR CENELEC PARALLEL VOTING	
<p>Attention IEC-CENELEC parallel voting</p> <p>The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting.</p> <p>The CENELEC members are invited to vote through the CENELEC online voting system.</p>	

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TITLE:

Industrial communication networks - High availability automation networks - Part 2: Media Redundancy Protocol (MRP)

PROPOSED STABILITY DATE: 2025

NOTE FROM TC/SC OFFICERS:

NC comments will be addressed during the SC65C/WG15 meeting scheduled on June 8th-10h, 2020 in Baden (Switzerland). Corresponding meeting notice will be provided in due time by the convenor.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**INDUSTRIAL COMMUNICATION NETWORKS –
HIGH AVAILABILITY AUTOMATION NETWORKS –**

Part 2: Media Redundancy Protocol (MRP)

FOREWORD

243 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising
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270 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is
271 indispensable for the correct application of this publication.

272 International Standard IEC 62439-2 has been prepared by subcommittee 65C: Industrial
273 networks, of IEC technical committee 65: Industrial-process measurement, control and
274 automation.

275 This third edition cancels and replaces the second edition published in 2016. This edition
276 constitutes a technical revision.

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

- 279 – improvements for the Continuity Check Protocol,
- 280 – introduction of further specifiers for the rings, the interconnection links, and the device roles,
- 281 – extensions and informations on the use of baudrates smaller than 100 Mbit/s,
- 282 – informations on using MRP together with scheduling and shaping mechanisms,
- 283 – introduction of an MRP Interconnection profile for 30 ms reconfiguration time.

284

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

FDIS	Report on voting
65C/XXX/FDIS	65C/XXX/RVD

286
287 Full information on the voting for the approval of this standard can be found in the report on
288 voting indicated in the above table.

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

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

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

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

- 297 • reconfirmed,
- 298 • withdrawn,
- 299 • replaced by a revised edition, or
- 300 • amended.

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302 The National Committees are requested to note that for this document the stability date
303 is 2025.

304 THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED
305 AT THE PUBLICATION STAGE.

306

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INTRODUCTION

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

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

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

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

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

324 The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed
325 that compliance with this document may involve the use of a patent concerning ring protocol
326 given in Clause 5. Table 1 gives an overview of the relevant patents.

327

Table 1 – Patent information

No.	Status	Country	Granted Patent Number or Application Number (if pending)	Title
1	granted	US	US 6430151	Local networking with redundancy properties having a redundancy manager
	granted	CA	CA 2323429	
	granted	CN	CN 117195	
	granted	NO	NO 330908	
	granted	EP (AT, BE, CH, DE, DK, ES, FR, GB, IT, NL, SE)	EP 1062787	

328

329 IEC takes no position concerning the evidence, validity and scope of this patent right.

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

334 Siemens Aktiengesellschaft

335 Otto-Hahn-Ring 6

336 Munich 81739

337 Germany

338 and

339 Hirschmann Automation and Control GmbH

340 Stuttgarter Strasse 45-51

341 Neckartenzlingen 72654

342 Germany

343 Attention is drawn to the possibility that some of the elements of this document may be the
344 subject of patent rights other than those identified above. IEC shall not be held responsible for
345 identifying any or all such patent rights.

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

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INDUSTRIAL COMMUNICATION NETWORKS – HIGH AVAILABILITY AUTOMATION NETWORKS –

Part 2: Media Redundancy Protocol (MRP)

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358 **1 Scope**

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

361 This part of the IEC 62439 series specifies a recovery protocol based on a ring topology,
362 designed to react deterministically on a single failure of an inter-switch link or switch in the
363 network, under the control of a dedicated media redundancy manager node.

364 **2 Normative references**

365 The following documents are referred to in the text in such a way that some or all of their content
366 constitutes requirements of this document. For dated references, only the edition cited applies.
367 For undated references, the latest edition of the referenced document (including any
368 amendments) applies.

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

371 IEC 61158-6-10:2019, *Industrial communication networks – Fieldbus specifications –*
372 *Part 6-10: Application layer protocol specification – Type 10 elements*

373 IEC 61784-1, *Industrial communication networks – Profiles – Part 1: Fieldbus profiles*

374 IEC 61784-2, *Industrial communication networks – Profiles – Part 2: Additional fieldbus profiles*
375 *for real-time networks based on ISO/IEC 8802-3*

376 IEC 62439-1:2010, *Industrial communication networks – High availability automation networks*
377 *– Part 1: General concepts and calculation methods*

378 IEC 62439-1:2010/AMD1:2012

379 IEC 62439-1:2010/AMD2:2016¹

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

382 ISO/IEC/IEEE 8802-3 *Standard for Ethernet*

383 IEEE 802.1D:2004, *IEEE Standard for Local and metropolitan area networks – Media Access*
384 *Control (MAC) Bridges*

385 IEEE 802.1Q:2018, *IEEE Standard for Local and metropolitan area networks – Media Access*
386 *Control (MAC) Bridges and Virtual Bridge Local Area Network*

¹ A consolidated version of this publication exists, comprising IEC 62439-1:2010, IEC 62439-1:2010/AMD1:2012 and IEC 62439-1:2010/AMD2:2016.

387 IEEE 802.3:2018, *IEEE Standard for Ethernet*.

388 **3 Terms, definitions, abbreviations, acronyms, and conventions**

389 **3.1 Terms and definitions**

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

392 ISO and IEC maintain terminological databases for use in standardization at the following
393 addresses:

- 394 • IEC Electropedia: available at <http://www.electropedia.org/>
- 395 • ISO Online browsing platform: available at <http://www.iso.org/obp>

396 **3.1.1**

397 **interconnection port**

398 port of a switch that is used to interconnect two ring topologies

399 **3.1.2**

400 **interconnection topology**

401 topology in which two ring topologies are connected

402 **3.2 Abbreviations and acronyms**

403 For the purposes of this document, the abbreviations and acronyms given in IEC 62439-1 apply,
404 in addition to the following.

405	ASE	Application Service Element
406	CCM	Continuity Check Messages
407	CFM	Connectivity Fault Management
408	CFM-MRP	Connectivity Fault Management for MRP
409	CPU	Central Processing Unit
410	FDB	Filtering Database
411	LC-mode	Link Check mode
412	LSB	Least Significant Bit
413	MAID	Maintenance Association ID
414	MD	Maintenance Domain
415	MD Level	Maintenance Domain Level
416	MEP	Maintenance End Point
417	MEPID	Maintenance Association End Point ID
418	MIB	Management Information Base
419	MRA	Media Redundancy Automanager
420	MRC	Media Redundancy Client
421	MRM	Media Redundancy Manager
422	MRP	Media Redundancy Protocol
423	MIC	Media Redundancy Interconnection Client
424	MIM	Media Redundancy Interconnection Manager
425	RC-mode	Ring Check mode