



DPC: 25/30510355 DC

BSI Group Headquarters

389 Chiswick High Road London W4 4AL

Tel: +44 (0)20 8996 9000

Fax: +44 (0)20 8996 7400

www.bsigroup.com

Date: 14 October 2025

Origin: International

Latest date for receipt of comments: 05 November 2025

Project No. 2025/00541

Responsible committee: GEL/65/5 Devices and integration in enterprise systems

Interested committees:

Title: Draft BS EN 63270-2 Ed.1.0 BS EN 63270-2 Industrial automation equipment and systems. Part 2: Algorithm Verification Methods.

Please notify admin.start@bsigroup.com if you are aware of any keywords that might assist in clarifying or identifying the standard or of the content of this standard:

- i) has any issues related to 3rd party IPR, patent or copyright
- ii) affects other national standard(s)
- iii) requires additional national guidance or information

WARNING: THIS IS A DRAFT AND MUST NOT BE REGARDED OR USED AS A BRITISH STANDARD. THIS DRAFT IS NOT CURRENT BEYOND 05 November 2025

This draft is issued to allow comments from interested parties; all comments will be given consideration prior to publication. No acknowledgement will normally be sent. **See overleaf for information on the submission of comments.**

No copying is allowed, in any form, without prior written permission from BSI except as permitted under the Copyright, Designs and Patent Act 1988 or for circulation within a nominating organization for briefing purposes. Electronic circulation is limited to dissemination by e-mail within such an organization by committee members.

Further copies of this draft may be purchased from BSI Shop <http://shop.bsigroup.com> or from BSI Customer Services, Tel: +44(0) 20 8996 9001 or email cservices@bsigroup.com. British, International and foreign standards are also available from BSI Customer Services.

Information on the co-operating organizations represented on the committees referenced above may be obtained from <https://standardsdevelopment.bsigroup.com/>.

E-mail: admin.start@bsigroup.com

Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
------------------	------------------------

1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



65E/1195/CD

COMMITTEE DRAFT (CD)

PROJECT NUMBER: IEC 63270-2 ED1	
DATE OF CIRCULATION: 2025-10-10	CLOSING DATE FOR COMMENTS: 2025-12-05
SUPERSEDES DOCUMENTS: 65E/1077/NP, 65E/1090/RVN	

IEC SC 65E : DEVICES AND INTEGRATION IN ENTERPRISE SYSTEMS	
SECRETARIAT: United States of America	SECRETARY: Mr David Richmond
OF INTEREST TO THE FOLLOWING COMMITTEES:	HORIZONTAL FUNCTION(S):
ASPECTS CONCERNED:	

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Recipients of this document are invited to submit, with their comments, notification of any local regulations or technical reasons that may exist and should be considered should this proposal proceed, recognizing that failure to address such requirements could result in the need for new or existing "In Some Countries" clauses. (SEE [AC/22/2007](#) OR [NEW GUIDANCE DOC](#)).

TITLE:

Industrial automation equipment and systems – Part 2: Algorithm Verification Methods

NOTE FROM TC/SC OFFICERS:

Copyright © 2025 International Electrotechnical Commission, IEC. All rights reserved. It is permitted to download this electronic file, to make a copy and to print out the content for the sole purpose of preparing National Committee positions. You may not copy or "mirror" the file or printed version of the document, or any part of it, for any other purpose without permission in writing from IEC.

1

Full document details: 25/30510355 DC

48	9.2.1 Condition Monitoring Algorithms	17
49	9.2.2 Fault Diagnosis Algorithm	18
50	9.2.3 Life Prediction Algorithm	18
51	9.2.4 Verification Description	18
52	10 Verification Data Requirements	18
53	10.1 Overview.....	18
54	10.2 Data Entry Requirements	18
55	10.2.1 Format and Content Requirements	18
56	10.2.2 Calibration Requirements	18
57	10.2.3 Data Conversion.....	18
58	10.2.4 Data Entry	19
59	10.2.5 Post-entry Checks	19
60	Annex A (informative) Signal Processing Algorithm Test Indicators.....	20
61	A.1 Waveform Quality Verification Indicator	20
62	A.2 Spectrum Quality Verification Indicator	20
63	A.3 Quality Verification Indicator for Time-frequency Distribution	21
64	A.4 Computational Complexity Verification Indicator.....	21
65	Annex B (informative) Format of the Verification Report.....	22
66	B.1 Algorithm Verification Report	22
67	Annex C (informative) Verification of the Prediction Algorithm.....	23
68	C.1 Verification of the Prediction Algorithm	23
69	Annex D (informative) Database Construction and System Requirements	25
70	D.1 Overview.....	25
71	D.2 Data Quality Requirements	26
72	D.3 Database System Functions.....	26
73	Annex E (Normative) Supplementary Indicators of Prediction Algorithm Test	28
74	E.1 Mean Squared Error.....	28
75	E.2 Precision.....	28
76	E.3 Uncertainty Quantification Indicator	28
77		

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**PREDICTIVE MAINTENANCE OF INDUSTRIAL AUTOMATION EQUIPMENT
AND SYSTEMS – PART 2: ALGORITHM VERIFICATION METHODS****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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC XXXXX has been prepared by IEC technical committee 65: Industrial process measurement, control and automation.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
XX/XX/FDIS	XX/XX/RVD

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

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

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

- reconfirmed,

- 128 • withdrawn,
- 129 • replaced by a revised edition, or
- 130 • amended.

131

132 The National Committees are requested to note that for this document the stability date
133 is 20XX..

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

136

137

138

INTRODUCTION

139 The use of predictive maintenance has increased in many industries as it has evolved into the
140 predominant method of operation and maintenance services. Algorithms are at the core of
141 effective implementation of predictive maintenance. Moreover, there is an urgent need for a
142 standardized measurement system to evaluate the accuracy, effectiveness, and applicability of
143 the predictive maintenance algorithm in a scientific and reasonable manner.

144 Predictive maintenance is a new equipment operation and maintenance model for equipment
145 or components in various industries. It uses new-generation information technology in
146 conjunction with vibration, image, current, vocal print, and other signal analysis for condition
147 monitoring, fault diagnosis, remaining life prediction, developing operation and maintenance
148 decision plans, and arranging reasonable maintenance activities. By using the standard test
149 verification indications and procedures used in industry, a general algorithm verification system
150 is developed in this document with condition monitoring, fault diagnosis, life prediction, and
151 other predictive maintenance algorithms as objects. This standard can provide support for its
152 application in different industries after issuance and implementation.

153 Generally, the practitioners of predictive maintenance are divided into equipment users,
154 equipment manufacturers, and solution suppliers. This document can be used by the
155 aforementioned practitioners as a reference manual and verification basis, as well as an
156 important supporting material for the procurement and acceptance of equipment. It can also be
157 used as a basis for equipment manufacturers and solution suppliers to explain the advantages
158 of the technical solutions for predictive maintenance that they provide.
159

PREDICTIVE MAINTENANCE OF INDUSTRIAL AUTOMATION EQUIPMENT AND SYSTEMS – PART 2: ALGORITHM VERIFICATION METHODS

1. Scope

This document specifies the algorithm verification categorization, the verification process, test indicators, test methods, the verification index system, and the verification data requirements for predictive maintenance.

This document applies to the test verification of condition monitoring, fault diagnosis, life prediction, and other algorithms in predictive maintenance.

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 63270-1:2025: Predictive maintenance of industrial automation equipment and systems — Part 1: General requirements

3. Terms and definitions

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

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

1 IEC Electropedia: available at <http://www.electropedia.org/>

2 ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1 Terms, definitions, and abbreviated terms

3.1.1 condition monitoring

Recording and verification of technical entity status for maintenance purposes.

[SOURCE: IEC 63270-1, 3.1.3]

3.1.2 Fault Diagnosis

Examine the symptoms and symptom complexes in order to determine the nature (type, condition, and degree) of the fault or failure.

3.1.3 Predictive Maintenance

It is a form of preventive maintenance that is carried out continuously or at predetermined intervals governed by observed conditions in order to monitor, diagnose, or trend the condition indicators of a structure, system, or component. Results indicate functional capacity for the present and the future, or the nature and timing of planned maintenance.

[SOURCE: IEC 62342:2007, 3.14, modified – notes have been deleted]

3.1.4 Confidence Level

Quality criteria represent the accuracy degree of the diagnosis or prediction.

Note 1: It is expressed as a percentage.

Note 2: A computational or weighted verification system may compute this value, which is basically a number that represents the cumulative impact of the error source on the ultimate reliability or confidence in the accuracy of the output result. Abbreviated terms.

202 [SOURCE: ISO 13381-1-2015, 3.3]

203 3.2 Abbreviated Terms

RUL	Remaining Use Life
MAE	Mean Absolute Error
RMSE	Root Mean Squared Error
SPE	Score of Prediction Error
MSE	Mean Squared Error
UQ	Uncertainty Quantification

204 4. General

205 Based on IEC 63270-1:2025, predictive maintenance can realize condition monitoring, fault
 206 diagnosis, and life prediction. In this document, condition monitoring, fault diagnosis, life
 207 prediction, and other algorithms are evaluated, of which the life prediction algorithm is
 208 abbreviated as the prediction algorithm.

209 The verification method presented in this document is made up of two parts: testing and
 210 verification. The test is primarily based on the algorithm test indicators in Chapter 7 and the
 211 algorithm test methods in Chapter 8. However, the verification is primarily based on the
 212 algorithm verification index system in Chapter 9. These three elements together constitute the
 213 algorithm verification requirements.

214 5. Classification

215 In this document, condition monitoring, fault diagnosis, life prediction, and other algorithms are
 216 evaluated. Moreover, one or several can be selected to be tested in the actual test. Signal
 217 processing is a significant part of monitoring, diagnosis, and prediction algorithms. In addition,
 218 signal test indicators include signal processing quality verification and algorithm complexity
 219 verification. It is feasible to decide whether to perform the test of signal processing algorithms
 220 during the testing of monitoring, diagnosis, and prediction algorithms based on specific
 221 application scenarios and requirements. Check Annex A for the test indicators of signal
 222 processing algorithms such as atlas analysis.

223 Condition monitoring algorithm verification includes:

224 - Threshold-based monitoring algorithm: Condition monitoring algorithms can be divided into
 225 two categories, which are fixed threshold-based discrimination methods and relative threshold-
 226 based discrimination methods. Clause 7.1 describes the test indicator system, while Clause 8.1
 227 describes the test methods.

228 - Algorithms that do not fall into these categories may be evaluated by referring to the indicators
 229 in Clause 7.1.

230 Fault diagnosis algorithm verification consists of:

231 - Expert system verification: Based on the knowledge and experience of experts in the field,
 232 expert systems can conduct reasoning and judgement by applying artificial intelligence
 233 technology and computer technology in order to obtain the results of fault diagnosis according
 234 to the characteristic data matching degree of expert systems. Clause 7.2.1 describes the test
 235 indicator system of the expert system, while Clause 8.2 describes the test methods.

236 - Verification of Artificial Intelligence based methods such as artificial based algorithm: Artificial
 237 Intelligence based methods such as Machine learning algorithms can obtain the structure of
 238 fault diagnosis through the classification of condition characteristics.