



**IEEE**

**IEC 62529**

Edition 3.0 2024-06

# **INTERNATIONAL STANDARD**    **IEEE Std 1641™**



---

**Standard for Signal and Test Definition**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

---

ICS 25.040.01; 35.060

ISBN 978-2-8322-8703-3

**Warning! Make sure that you obtained this publication from an authorized distributor.**

## Contents

1. Overview .....	12
1.1 Scope .....	12
1.2 Purpose .....	12
1.3 Word Usage .....	12
1.4 Application .....	13
1.5 Annexes .....	13
2. Definitions, abbreviations, and acronyms .....	13
2.1 Definitions .....	13
2.2 Abbreviations and acronyms .....	15
3. Structure of this standard .....	16
3.1 Layers .....	16
3.2 Signal Modeling Language (SML) layer .....	17
3.3 BSC layer .....	17
3.4 TSF layer .....	18
3.5 Test requirement layer .....	18
3.6 Using the layers .....	18
4. Signals and SignalFunctions .....	18
4.1 Introduction .....	18
4.2 Physical signal states .....	19
4.3 Event states .....	20
4.4 Digital stream states .....	21
5. SML layer .....	22
6. BSC layer .....	23
6.1 BSC layer base classes .....	23
6.2 General description of BSCs .....	23
6.3 SignalFunction template .....	24
7. TSF layer .....	25
7.1 TSF classes .....	25
7.2 TSF signals defined by a model .....	26
7.3 TSF signals defined by an external reference .....	28
8. Test procedure language (TPL) .....	28
8.1 Goals of the TPL .....	28
8.2 Elements of the TPL .....	29
8.3 Use of the TPL .....	29
9. Maximizing test platform independence .....	29
Annex A (normative) Signal modeling language (SML) .....	30
A.1 Use of the SML .....	30
A.2 Introduction .....	30
A.3 Physical types .....	31
A.4 Signal definitions .....	34
A.5 Pure signals .....	36
A.6 Pure signal-combining mechanisms .....	38

A.7 Pure function transformations.....	44
A.8 Measure, limiting, and sampling signals.....	44
A.9 Digital signals.....	46
A.10 Basic component SML.....	50
A.11 Fast Fourier analysis support.....	76
Annex B (normative) Basic signal components (BSC) layer.....	78
B.1 BSC layer base classes.....	78
B.2 BSC subclasses.....	78
B.3 Description of a BSC.....	83
B.4 Physical class.....	91
B.5 PulseDefns class.....	103
B.6 SignalFunction class.....	104
Annex C (normative) Dynamic signal descriptions.....	163
C.1 Introduction.....	163
C.2 Basic classes.....	164
C.3 Dynamic signal goals and use cases.....	172
Annex D (normative) Interface definition language (IDL) basic components.....	174
D.1 Introduction.....	174
D.2 IDL BSC library.....	174
Annex E (informative) Test signal framework (TSF) for C/ATLAS.....	175
E.1 Introduction.....	175
E.2 TSF library definition in extensible markup language (XML).....	175
E.3 Interface definition language (IDL) for the TSF for C/ATLAS.....	175
E.4 AC_SIGNAL<type: Current   Power   Voltage>.....	176
E.5 AM_SIGNAL.....	178
E.6 DC_SIGNAL<type: Voltage   Current   Power>.....	180
E.7 DIGITAL_PARALLEL.....	182
E.8 DIGITAL_SERIAL.....	184
E.9 DIGITAL_TEST.....	186
E.10 DME_INTERROGATION.....	189
E.11 DME_RESPONSE.....	192
E.12 FM_SIGNAL<type: Voltage   Power   Current>.....	195
E.13 ILS_GLIDE_SLOPE<type: Voltage   Power>.....	198
E.14 ILS_LOCALIZER<type: Power   Voltage>.....	201
E.15 ILS_MARKER.....	204
E.16 PM_SIGNAL.....	207
E.17 PULSED_AC_SIGNAL<type: Current   Power   Voltage>.....	209
E.18 PULSED_AC_TRAIN<type: Voltage   Current   Power>.....	211
E.19 PULSED_DC_SIGNAL<type: Voltage   Current   Power>.....	213
E.20 PULSED_DC_TRAIN<type: Voltage   Current   Power>.....	216
E.21 RADAR_RX_SIGNAL.....	218
E.22 RADAR_TX_SIGNAL<type: Current   Voltage   Power>.....	220
E.23 RAMP_SIGNAL<type: Voltage   Current   Power>.....	222
E.24 RANDOM_NOISE.....	224
E.25 RESOLVER.....	226
E.26 RS_232.....	229
E.27 SQUARE_WAVE<type: Current   Voltage   Power>.....	230
E.28 SSR_INTERROGATION<type: Voltage   Current   Power>.....	232
E.29 SSR_RESPONSE<type: Voltage   Current   Power>.....	235
E.30 STEP_SIGNAL.....	239
E.31 SUP_CAR_SIGNAL.....	241
E.32 SYNCHRO.....	243

E.33 TACAN .....	247
E.34 TRIANGULAR_WAVE_SIGNAL<type: Voltage   Current   Power> .....	251
E.35 VOR .....	253
Annex F (informative) Test signal framework (TSF) library for digital pulse classes .....	257
F.1 Introduction .....	257
F.2 TSF library definition in extensible markup language (XML) .....	257
F.3 Graphical models of TSFs .....	257
F.4 Pulse class family of TSFs .....	257
F.5 DTIF .....	274
Annex G (normative) Carrier language requirements .....	276
G.1 Carrier language requirements .....	276
G.2 Interface definition language (IDL) .....	276
G.3 Datatypes .....	276
Annex H (normative) Test procedure language (TPL) .....	282
H.1 TPL layer .....	282
H.2 Elements of the TPL .....	282
H.3 Structure of test requirements .....	282
H.4 Carrier language .....	282
H.5 Signal statements .....	282
H.6 Mapping of test statements to carrier language .....	284
H.7 Test statement definitions .....	285
H.8 Elements used in test statement definitions .....	303
H.9 Attributes with multiple properties .....	306
H.10 Transferring data in digital signals .....	310
H.11 Creating test requirements .....	314
H.12 Delimiting TPL statements .....	316
Annex I (normative) Extensible markup language (XML) signal descriptions .....	318
I.1 Introduction .....	318
I.2 XSD for BSCs .....	319
I.3 XSD for TSFs .....	325
Annex J (informative) Support for ATLAS nouns and modifiers .....	333
J.1 Signal and test definition (STD) support for ATLAS signals .....	333
J.2 STD support for ATLAS nouns .....	333
J.3 STD support for C/ATLAS noun modifiers .....	336
J.4 Support for C/ATLAS extensions .....	344
Annex K (informative) Guide for maximizing test platform independence .....	345
K.1 Introduction .....	345
K.2 Guiding principles .....	345
K.3 Best practice rules .....	345
Annex L (informative) IEEE download web-site material associated with this document .....	349
Annex M (informative) Bibliography .....	350
Annex N (informative) Participants .....	352

## Standard for Signal and Test Definition

### 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 document(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.

IEEE Standards documents are developed within IEEE Societies and Standards Coordinating Committees of the IEEE Standards Association (IEEE SA) Standards Board. IEEE develops its standards through a consensus development process, approved by the American National Standards Institute, which brings together volunteers representing varied viewpoints and interests to achieve the final product. Volunteers are not necessarily members of IEEE and serve without compensation. While IEEE administers the process and establishes rules to promote fairness in the consensus development process, IEEE does not independently evaluate, test, or verify the accuracy of any of the information contained in its standards. Use of IEEE Standards documents is wholly voluntary. *IEEE documents are made available for use subject to important notices and legal disclaimers (see <https://standards.ieee.org/ipr/disclaimers.html> for more information).*

IEC collaborates closely with IEEE in accordance with conditions determined by agreement between the two organizations. This Dual Logo International Standard was jointly developed by the IEC and IEEE under the terms of that agreement.

- 2) The formal decisions 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. The formal decisions of IEEE on technical matters, once consensus within IEEE Societies and Standards Coordinating Committees has been reached, is determined by a balanced ballot of materially interested parties who indicate interest in reviewing the proposed standard. Final approval of the IEEE standards document is given by the IEEE Standards Association (IEEE SA) Standards Board.
- 3) IEC/IEEE Publications have the form of recommendations for international use and are accepted by IEC National Committees/IEEE Societies in that sense. While all reasonable efforts are made to ensure that the technical content of IEC/IEEE Publications is accurate, IEC or IEEE 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 (including IEC/IEEE Publications) transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC/IEEE Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC and IEEE do not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC and IEEE are 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 IEEE or their directors, employees, servants or agents including individual experts and members of technical committees and IEC National Committees, or volunteers of IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Association (IEEE SA) Standards Board, 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/IEEE Publication or any other IEC or IEEE 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 implementation of this IEC/IEEE Publication may require use of material covered by patent rights. By publication of this standard, no position is taken with respect to the existence or validity of any patent rights in connection therewith. IEC or IEEE shall not be held responsible for identifying Essential Patent Claims for which a license may be required, for conducting inquiries into the legal validity or scope of Patent Claims or determining whether any licensing terms or conditions provided in connection with submission of a Letter of Assurance, if any, or in any licensing agreements are reasonable or non-discriminatory. Users of this standard are expressly advised that determination of the validity of any patent rights, and the risk of infringement of such rights, is entirely their own responsibility.

IEC 62529/IEEE Std 1641™-2022 was processed through IEC technical committee 91: Electronics assembly technology, under the IEC/IEEE Dual Logo Agreement. It is an International Standard.

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

IEEE Std	FDIS	Report on voting
1641 (2022)	91/1933/FDIS	91/1945/RVD

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 is English.

The IEC Technical Committee and IEEE Technical Committee have decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under [webstore.iec.ch](http://webstore.iec.ch) in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

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



# IEEE Standard for Signal and Test Definition

Developed by the

**Test and Diagnosis for Electronic Systems Standards Committee (SCC20)**

on

**IEEE Standards and Standards Innovations (S&SI)**

**Strategic Management and Delivery Committee (SMDC)**

Approved 21 September 2022

**IEEE SA Standards Board**



**Abstract:** The means to define and describe signals used in testing are provided in this standard. It also provides a set of common basic signals, built upon formal mathematical specifications so that signals can be combined to form complex signals usable across all test platforms.

**Keywords:** ATE, ATLAS, automatic test equipment, IEEE 1641™, signal definitions, test definitions, test requirements, test signals, unit under test, UUT

## **Important Notices and Disclaimers Concerning IEEE Standards Documents**

IEEE Standards documents are made available for use subject to important notices and legal disclaimers. These notices and disclaimers, or a reference to this page (<https://standards.ieee.org/ipr/disclaimers.html>), appear in all standards and may be found under the heading “Important Notices and Disclaimers Concerning IEEE Standards Documents.”

### **Notice and Disclaimer of Liability Concerning the Use of IEEE Standards Documents**

IEEE Standards documents are developed within IEEE Societies and subcommittees of IEEE Standards Association (IEEE SA) Board of Governors. IEEE develops its standards through an accredited consensus development process, which brings together volunteers representing varied viewpoints and interests to achieve the final product. IEEE Standards are documents developed by volunteers with scientific, academic, and industry-based expertise in technical working groups. Volunteers are not necessarily members of IEEE or IEEE SA and participate without compensation from IEEE. While IEEE administers the process and establishes rules to promote fairness in the consensus development process, IEEE does not independently evaluate, test, or verify the accuracy of any of the information or the soundness of any judgments contained in its standards.

IEEE makes no warranties or representations concerning its standards, and expressly disclaims all warranties, express or implied, concerning this standard, including but not limited to the warranties of merchantability, fitness for a particular purpose and non-infringement. In addition, IEEE does not warrant or represent that the use of the material contained in its standards is free from patent infringement. IEEE standards documents are supplied “AS IS” and “WITH ALL FAULTS.”

Use of an IEEE standard is wholly voluntary. The existence of an IEEE Standard does not imply that there are no other ways to produce, test, measure, purchase, market, or provide other goods and services related to the scope of the IEEE standard. Furthermore, the viewpoint expressed at the time a standard is approved and issued is subject to change brought about through developments in the state of the art and comments received from users of the standard.

In publishing and making its standards available, IEEE is not suggesting or rendering professional or other services for, or on behalf of, any person or entity, nor is IEEE undertaking to perform any duty owed by any other person or entity to another. Any person utilizing any IEEE Standards document, should rely upon his or her own independent judgment in the exercise of reasonable care in any given circumstances or, as appropriate, seek the advice of a competent professional in determining the appropriateness of a given IEEE standard.

IN NO EVENT SHALL IEEE BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO: THE NEED TO PROCURE SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE PUBLICATION, USE OF, OR RELIANCE UPON ANY STANDARD, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE AND REGARDLESS OF WHETHER SUCH DAMAGE WAS FORESEEABLE.

## Translations

The IEEE consensus development process involves the review of documents in English only. In the event that an IEEE standard is translated, only the English version published by IEEE is the approved IEEE standard.

## Official statements

A statement, written or oral, that is not processed in accordance with the IEEE SA Standards Board Operations Manual shall not be considered or inferred to be the official position of IEEE or any of its committees and shall not be considered to be, nor be relied upon as, a formal position of IEEE. At lectures, symposia, seminars, or educational courses, an individual presenting information on IEEE standards shall make it clear that the presenter's views should be considered the personal views of that individual rather than the formal position of IEEE, IEEE SA, the Standards Committee, or the Working Group. Statements made by volunteers may not represent the formal position of their employer(s) or affiliation(s).

## Comments on standards

Comments for revision of IEEE Standards documents are welcome from any interested party, regardless of membership affiliation with IEEE or IEEE SA. However, **IEEE does not provide interpretations, consulting information, or advice pertaining to IEEE Standards documents.**

Suggestions for changes in documents should be in the form of a proposed change of text, together with appropriate supporting comments. Since IEEE standards represent a consensus of concerned interests, it is important that any responses to comments and questions also receive the concurrence of a balance of interests. For this reason, IEEE and the members of its Societies and subcommittees of the IEEE SA Board of Governors are not able to provide an instant response to comments, or questions except in those cases where the matter has previously been addressed. For the same reason, IEEE does not respond to interpretation requests. Any person who would like to participate in evaluating comments or in revisions to an IEEE standard is welcome to join the relevant IEEE working group. You can indicate interest in a working group using the Interests tab in the Manage Profile & Interests area of the [IEEE SA myProject system](#).<sup>1</sup> An IEEE Account is needed to access the application.

Comments on standards should be submitted using the [Contact Us](#) form.<sup>2</sup>

## Laws and regulations

Users of IEEE Standards documents should consult all applicable laws and regulations. Compliance with the provisions of any IEEE Standards document does not constitute compliance to any applicable regulatory requirements. Implementers of the standard are responsible for observing or referring to the applicable regulatory requirements. IEEE does not, by the publication of its standards, intend to urge action that is not in compliance with applicable laws, and these documents may not be construed as doing so.

<sup>1</sup> Available at: <https://development.standards.ieee.org/myproject-web/public/view.html#landing>.

<sup>2</sup> Available at: <https://standards.ieee.org/content/ieee-standards/en/about/contact/index.html>.

## Data privacy

Users of IEEE Standards documents should evaluate the standards for considerations of data privacy and data ownership in the context of assessing and using the standards in compliance with applicable laws and regulations.

## Copyrights

IEEE draft and approved standards are copyrighted by IEEE under US and international copyright laws. They are made available by IEEE and are adopted for a wide variety of both public and private uses. These include both use, by reference, in laws and regulations, and use in private self-regulation, standardization, and the promotion of engineering practices and methods. By making these documents available for use and adoption by public authorities and private users, neither IEEE nor its licensors waive any rights in copyright to the documents.

## Photocopies

Subject to payment of the appropriate licensing fees, IEEE will grant users a limited, non-exclusive license to photocopy portions of any individual standard for company or organizational internal use or individual, non-commercial use only. To arrange for payment of licensing fees, please contact Copyright Clearance Center, Customer Service, 222 Rosewood Drive, Danvers, MA 01923 USA; +1 978 750 8400; <https://www.copyright.com/>. Permission to photocopy portions of any individual standard for educational classroom use can also be obtained through the Copyright Clearance Center.

## Updating of IEEE Standards documents

Users of IEEE Standards documents should be aware that these documents may be superseded at any time by the issuance of new editions or may be amended from time to time through the issuance of amendments, corrigenda, or errata. An official IEEE document at any point in time consists of the current edition of the document together with any amendments, corrigenda, or errata then in effect.

Every IEEE standard is subjected to review at least every 10 years. When a document is more than 10 years old and has not undergone a revision process, it is reasonable to conclude that its contents, although still of some value, do not wholly reflect the present state of the art. Users are cautioned to check to determine that they have the latest edition of any IEEE standard.

In order to determine whether a given document is the current edition and whether it has been amended through the issuance of amendments, corrigenda, or errata, visit [IEEE Xplore](#) or [contact IEEE](#).<sup>3</sup> For more information about the IEEE SA or IEEE's standards development process, visit the IEEE SA Website.

## Errata

Errata, if any, for all IEEE standards can be accessed on the [IEEE SA Website](#).<sup>4</sup> Search for standard number and year of approval to access the web page of the published standard. Errata links are located under the Additional Resources Details section. Errata are also available in [IEEE Xplore](#). Users are encouraged to periodically check for errata.

<sup>3</sup> Available at: <https://ieeexplore.ieee.org/browse/standards/collection/ieee>.

<sup>4</sup> Available at: <https://standards.ieee.org/standard/index.html>.

## Patents

IEEE Standards are developed in compliance with the [IEEE SA Patent Policy](#).<sup>5</sup>

Attention is called to the possibility that implementation of this standard may require use of subject matter covered by patent rights. By publication of this standard, no position is taken by the IEEE with respect to the existence or validity of any patent rights in connection therewith. If a patent holder or patent applicant has filed a statement of assurance via an Accepted Letter of Assurance, then the statement is listed on the IEEE SA Website at <https://standards.ieee.org/about/sasb/patcom/patents.html>. Letters of Assurance may indicate whether the Submitter is willing or unwilling to grant licenses under patent rights without compensation or under reasonable rates, with reasonable terms and conditions that are demonstrably free of any unfair discrimination to applicants desiring to obtain such licenses.

Essential Patent Claims may exist for which a Letter of Assurance has not been received. The IEEE is not responsible for identifying Essential Patent Claims for which a license may be required, for conducting inquiries into the legal validity or scope of Patents Claims, or determining whether any licensing terms or conditions provided in connection with submission of a Letter of Assurance, if any, or in any licensing agreements are reasonable or non-discriminatory. Users of this standard are expressly advised that determination of the validity of any patent rights, and the risk of infringement of such rights, is entirely their own responsibility. Further information may be obtained from the IEEE Standards Association.

## IMPORTANT NOTICE

IEEE Standards do not guarantee or ensure safety, security, health, or environmental protection, or ensure against interference with or from other devices or networks. IEEE Standards development activities consider research and information presented to the standards development group in developing any safety recommendations. Other information about safety practices, changes in technology or technology implementation, or impact by peripheral systems also may be pertinent to safety considerations during implementation of the standard. Implementers and users of IEEE Standards documents are responsible for determining and complying with all appropriate safety, security, environmental, health, and interference protection practices and all applicable laws and regulations.

<sup>5</sup> Available at: <https://standards.ieee.org/about/sasb/patcom/materials.html>.

## IEEE Introduction

This introduction is not part of IEEE Std 1641™-2022, IEEE Standard for Signal and Test Definition.

This signal and test definition (STD) standard provides the ability to unambiguously define test signals. It includes a rigorous mathematical and definitive foundation for all of its signal components. Any signal defined using this standard shall be the same regardless of the equipment that is used to create it. The standard supports the implementation of new technologies by providing users with the ability to describe their own signals by combining existing signals. Thus, any desired signal may be described, and there is no limit on the extensibility of signals supported by this standard.

Signals defined using this standard can be used in a programming environment of the user's choice provided that that environment fulfills the minimum requirements defined in this standard. This universality enables the user to take full advantage of modern program structures and development environments, including graphical programming environments.

This standard was developed by the P1641 Working Group (of the IEEE Standards Coordinating Committee 20 (SCC20) on Test and Diagnosis for Electronic Systems), which has prepared a companion guide, IEEE Std 1641.1™, to explain how to implement signal definitions and test requirements in conformance with STD.



# IEEE Standard for Signal and Test Definition

## 1. Overview

### 1.1 Scope

This standard provides the means to define and describe signals used in testing. It provides a set of common basic signal definitions, built upon formal mathematical specifications, so that signals can be combined to form complex signals usable across all test platforms. The standard provides support for structural textual languages and programming language interfaces for interoperability.

### 1.2 Purpose

This standard provides a common reference for signal definitions, which may be used throughout the life cycle of a unit under test (UUT) or test system. Such a reference shall in turn facilitate information transfer, test reuse, and broader application of test information—accessible through commercially available development tools.

### 1.3 Word Usage

The word *shall* indicates mandatory requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted (*shall equals is required to*).

The word *should* indicates that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required (*should equals is recommended that*).<sup>6, 7</sup>

The word *may* is used to indicate a course of action permissible within the limits of the standard (*may equals is permitted to*).

The word *can* is used for statements of possibility and capability, whether material, physical, or causal (*can equals is able to*).

<sup>6</sup> The use of the word *must* is deprecated and cannot be used when stating mandatory requirements, *must* is used only to describe unavoidable situations

<sup>7</sup> The use of *will* is deprecated and cannot be used when stating mandatory requirements, *will* is only used in statements of fact.



## 1.4 Application

This signal and test definition (STD) standard provides the capability to model, describe and control signals, while permitting a choice of operating environment, including the choice of carrier language. STD permits signal operations to be embedded in any object-oriented environment and thus to be used by the architecture standards of various automatic test systems (ATSS). STD may be used to create truly portable test requirements. It facilitates test information to pass freely between the design, test, evaluation and maintenance phases of a project and enables the same models and information to be used directly across project phases. This more efficient re-use of models and information directly leads to reduced life-cycle costs.

## 1.5 Annexes

This standard also contains annexes that describe various elements of the standard in detail. The normative annexes include definitions of the basic signals (in words and with reference to an extensible markup language (XML) format), supporting mathematical definitions for these signals, dynamic model information, interface definition descriptions, and a definition of the requirements of a supporting computer language.

Informative annexes are provided to present examples of signal libraries together with their associated XML definition.