

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

**Function blocks (FB) for process control and electronic device description language (EDDL) –  
Part 4: EDD interpretation**

**Blocs fonctionnels (FB) pour les procédés industriels et le langage de description électronique de produit (EDDL) –  
Partie 4: Interprétation EDD**



**THIS PUBLICATION IS COPYRIGHT PROTECTED**  
**Copyright © 2015 IEC, Geneva, Switzerland**

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
Fax: +41 22 919 03 00  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

#### About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

#### About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

#### IEC Catalogue - [webstore.iec.ch/catalogue](http://webstore.iec.ch/catalogue)

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

#### IEC publications search - [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

#### IEC Glossary - [std.iec.ch/glossary](http://std.iec.ch/glossary)

More than 60 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

#### IEC Customer Service Centre - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: [csc@iec.ch](mailto:csc@iec.ch).

#### A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

#### A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

#### Catalogue IEC - [webstore.iec.ch/catalogue](http://webstore.iec.ch/catalogue)

Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

#### Recherche de publications IEC - [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 15 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

#### Glossaire IEC - [std.iec.ch/glossary](http://std.iec.ch/glossary)

Plus de 60 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

#### Service Clients - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: [csc@iec.ch](mailto:csc@iec.ch).

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



**Function blocks (FB) for process control and electronic device description language (EDDL) –  
Part 4: EDD interpretation**

**Blocs fonctionnels (FB) pour les procédés industriels et le langage de description électronique de produit (EDDL) –  
Partie 4: Interprétation EDD**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

ICS 25.040.40; 35.240.50

ISBN 978-2-8322-2937-8

**Warning! Make sure that you obtained this publication from an authorized distributor.  
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

## CONTENTS

FOREWORD.....	8
INTRODUCTION.....	10
1 Scope.....	11
2 Normative references .....	11
3 Terms, definitions, abbreviated terms, acronyms and conventions.....	11
3.1 General terms and definitions .....	12
3.2 Terms and definitions related to modular devices.....	12
3.3 Abbreviated terms and acronyms .....	13
3.4 Conventions.....	13
4 EDDL user interface description .....	13
4.1 Overview.....	13
4.2 Menu conventions for handheld applications.....	14
4.3 Menu conventions for PC-based applications.....	14
4.3.1 Overview .....	14
4.3.2 Online Root Menus .....	14
4.3.3 Offline Root Menu.....	15
4.3.4 Example of EDD menu structure.....	15
4.3.5 User interface.....	20
4.4 Containers and contained items.....	23
4.4.1 Overview .....	23
4.4.2 Containers.....	23
4.4.3 Contained items.....	26
4.5 Layout rules.....	30
4.5.1 Overview .....	30
4.5.2 Layout rules for WIDTH and HEIGHT.....	30
4.5.3 Layout rules for COLUMNBREAK and ROWBREAK.....	31
4.5.4 Layout examples .....	37
4.5.5 Conditional user interface.....	45
4.6 Graphical elements.....	46
4.6.1 Overview .....	46
4.6.2 Graph and chart.....	47
4.6.3 Common attributes .....	47
4.6.4 CHART .....	48
4.6.5 GRAPH.....	56
4.6.6 AXIS.....	65
4.6.7 IMAGE.....	66
4.6.8 GRID .....	67
5 EDDL data description.....	69
5.1 Variables .....	69
5.1.1 VARIABLE TYPEs .....	69
5.1.2 VARIABLE CLASS.....	70
5.1.3 VARIABLE ACTIONS.....	70
5.2 EDDL application stored device data.....	70
5.2.1 Overview .....	70
5.2.2 FILE .....	71
5.2.3 LIST .....	73

5.3	Exposing data items outside the EDD application.....	80
5.4	Initialization of EDD instances.....	80
5.4.1	Overview .....	80
5.4.2	Initialization support .....	80
5.4.3	TEMPLATE.....	80
5.5	Device model mapping.....	81
5.5.1	BLOCK_A.....	81
5.5.2	BLOCK_B.....	82
6	EDDL METHOD programming and usage of Builtins .....	82
6.1	Builtin MenuDisplay .....	82
6.2	Division by zero and undetermined floating values .....	85
6.2.1	Integer and unsigned integer values .....	85
6.2.2	Floating-point values .....	85
7	Modular devices .....	85
7.1	Overview.....	85
7.2	EDD identification .....	86
7.3	Instance object model.....	86
7.4	Offline configuration.....	87
7.5	Online configuration.....	87
7.6	Simple modular device example.....	87
7.6.1	General .....	87
7.6.2	Separate EDD file example with direct EDD referencing .....	88
7.6.3	Separate EDD file example with classification EDD referencing and interfaces .....	89
7.6.4	One EDD file example .....	92
7.6.5	Combination of single and separate modular device example .....	93
7.7	COMPONENT_RELATION.....	93
7.7.1	General .....	93
7.7.2	NEXT_COMPONENT usage .....	93
7.7.3	REQUIRED_RANGES and ADDRESSING usage.....	93
7.8	Upload and download for modular devices .....	93
7.9	Diagnostic.....	94
7.10	Reading modular device topology .....	95
7.10.1	SCAN .....	95
7.10.2	Detect module type.....	96
7.11	Configuration check .....	97
8	Edit session.....	98
8.1	Data management.....	98
8.1.1	Overview .....	98
8.1.2	General rules.....	99
8.1.3	Data caching for dialogs and windows .....	99
8.1.4	Data caching for METHODS.....	100
8.2	UI aspects of editing sessions.....	102
8.3	User roles .....	103
9	Offline and online configuration .....	103
9.1	Overview.....	103
9.2	Offline dataset .....	104
9.3	Offline configuration.....	104
9.4	Online dataset .....	104

9.5	Online configuration .....	104
9.6	Upload and download .....	105
9.6.1	Overview .....	105
9.6.2	Error recovery.....	106
9.6.3	Upload procedure .....	106
9.6.4	Download procedure.....	107
10	EDDL communication description .....	109
10.1	COMMAND .....	109
10.1.1	General .....	109
10.1.2	OPERATION.....	109
10.1.3	TRANSACTION .....	110
10.1.4	Command addressing .....	113
10.2	Parsing data received from the device .....	114
10.2.1	General .....	114
10.2.2	Parsing complex data items.....	114
10.2.3	FOUNDATION Fieldbus .....	114
10.2.4	HART .....	115
10.2.5	PROFIBUS and PROFINET .....	115
10.3	FOUNDATION Fieldbus communication model.....	115
11	EDD development.....	119
11.1	Dictionaries.....	119
11.2	Reserved .....	119
Annex A	(normative) Device simulation.....	120
Annex B	(informative) Predefined identifiers .....	121
Figure 1	– EDD example of root menus.....	20
Figure 2	– Example of an EDD application for diagnostics .....	20
Figure 3	– Example of an EDD application for process variables.....	21
Figure 4	– Example of an EDD application for primary variables .....	21
Figure 5	– Example of an EDD application for process-related device features .....	22
Figure 6	– Example of an EDD application for device features .....	22
Figure 7	– Example of an EDD application for maintenance features .....	23
Figure 8	– Usage of COLLECTION MEMBERS in MENUs of STYLE GROUP.....	26
Figure 9	– Displaying single bits of BIT_ENUMERATED .....	27
Figure 10	– Displaying multiple bits of BIT_ENUMERATED.....	28
Figure 11	– Example of an EDD application for a variable of type BIT_ENUMERATED .....	28
Figure 12	– EDD source code for layout for protruding elements example.....	32
Figure 13	– Layout for protruding elements .....	32
Figure 14	– EDD source code for layout for partially filled rows example.....	33
Figure 15	– Layout for partially filled rows .....	33
Figure 16	– EDD source code for layout for partially filled rows example.....	34
Figure 17	– Layout for partially filled rows .....	34
Figure 18	– EDD source code for layout for oversized elements example.....	35
Figure 19	– Layout for oversized elements.....	35
Figure 20	– EDD source code example for a layout for columns in stacked group .....	36
Figure 21	– Layout for columns in stacked group .....	36

Figure 22 – EDD source code for layout for columns with GRAPHS in stacked group example.....	37
Figure 23 – Layout for columns with GRAPHS in stacked group .....	37
Figure 24 – Example of an EDD for an overview menu.....	37
Figure 25 – Example of an EDD application for an overview window .....	38
Figure 26 – Example of an EDD using COLUMNBREAK .....	38
Figure 27 – Example of an EDD application for an overview window .....	39
Figure 28 – EDD example for an overview window .....	39
Figure 29 – Example of an EDD application for an overview window .....	40
Figure 30 – Example of an EDD for in-line graphs and charts .....	40
Figure 31 – Example of an EDD application for an in-line graph.....	41
Figure 32 – Example of an EDD for full-width graphs and charts .....	41
Figure 33 – Example of an EDD application for a full-width graph .....	42
Figure 34 – Example of an EDD for nested containers .....	43
Figure 35 – Example of an EDD application for nested containers.....	43
Figure 36 – Example of an EDD for EDIT_DISPLAYS .....	44
Figure 37 – Example of an EDD application for EDIT_DISPLAYS.....	44
Figure 38 – Example of an EDD for images.....	45
Figure 39 – Example of an EDD application for images.....	45
Figure 40 – HEIGHT and WIDTH attributes for CHART and GRAPH .....	47
Figure 41 – EMPHASIS attribute to differentiate one or more SOURCES or WAVEFORMs .....	48
Figure 42 – Example of a chart with one curve in a dialog.....	50
Figure 43 – Example of a chart with two SOURCES .....	51
Figure 44 – Displaying example of a chart with two SOURCES.....	52
Figure 45 – Example of a chart with three horizontal bars .....	53
Figure 46 – Displaying example of a chart with three horizontal bars .....	54
Figure 47 – Example of a chart in a dialog .....	56
Figure 48 – A graph and the visual elements .....	57
Figure 49 – Example of a graph .....	60
Figure 50 – Multiple used axes .....	61
Figure 51 – EDD with device-supported zooming and scrolling .....	65
Figure 52 – EDD example of an IMAGE .....	66
Figure 53 – EDD example of an IMAGE with the LINK attribute.....	66
Figure 54 – EDD example of a GRID.....	68
Figure 55 – Result of the EDD example .....	68
Figure 56 – Wrong usage of a BIT_ENUMERATED variable.....	69
Figure 57 – Usage of ENUMERATED instead of BIT_ENUMERATED .....	69
Figure 58 – Example of a file declaration .....	72
Figure 59 – Example of comparing valve signatures.....	73
Figure 60 – Example of more complex file declaration .....	74
Figure 61 – Example of reviewing the stored radar signals.....	75
Figure 62 – Example of an EDD that inserts, replaces, or compares radar signals .....	80
Figure 63 – Example of TEMPLATE usage .....	81

Figure 64 – Example of a BLOCK\_A ..... 82

Figure 65 – Example of a wizard ..... 84

Figure 66 – The different relations of a module ..... 87

Figure 67 – Components and possible configuration of the modular devices ..... 87

Figure 68 – Separate EDD file example with direct EDD referencing ..... 88

Figure 69 – EDD example for module1 ..... 89

Figure 70 – EDD example for module2 ..... 89

Figure 71 – EDD example for modular device ..... 90

Figure 72 – EDD example for module1 ..... 91

Figure 73 – EDD example for module2 ..... 91

Figure 74 – EDD example for module2 ..... 93

Figure 75 – NEXT\_COMPONENT usage ..... 93

Figure 76 – REQUIRED\_RANGES usage ..... 93

Figure 77 – Upload/download order of a modular device ..... 94

Figure 78 – Example of a SCAN METHOD ..... 96

Figure 79 – Example of a DETECT METHOD ..... 97

Figure 80 – Example of a CHECK\_CONFIGURATION METHOD ..... 98

Figure 81 – Data caching for an offline session ..... 98

Figure 82 – Data caching for an online session ..... 99

Figure 83 – Sub dialogs or windows using a shared edit cache ..... 100

Figure 84 – Sub dialogs or windows using separate edit caches ..... 100

Figure 85 – Data caching for nested METHODS ..... 101

Figure 86 – Data caching for a METHOD invoked within a dialog ..... 101

Figure 87 – Data caching for a METHOD invoking a dialog using an edit cache ..... 101

Figure 88 – Data caching for a METHOD invoking a dialog ..... 102

Figure 89 – Data flow for download to the device ..... 105

Figure 90 – Data flow for upload from the device ..... 105

Figure 91 – Example of a single item mask ..... 111

Figure 92 – Mapping example with a single item mask ..... 111

Figure 93 – Multiple item masks ..... 111

Figure 94 – Mapping example with a multiple item mask ..... 112

Figure 95 – INFO qualifier ..... 112

Figure 96 – INDEX qualifier ..... 113

Figure 97 – INFO and INDEX qualifier ..... 113

Figure 98 – Example device with 2 unique BLOCK\_A definitions ..... 116

Figure 99 – Example EDD for a device with 2 unique BLOCK\_A definitions ..... 117

Figure 100 – BLOCK\_A example with PARAMETER\_LISTS ..... 118

Figure 101 – Example EDD for a BLOCK\_A with PARAMETER\_LISTS ..... 119

  

Table 1 – List of defined root menu identifiers for handhelds ..... 14

Table 2 – List of defined root menu identifiers for PC-based devices ..... 14

Table 3 – Fall back alternatives for online root menus ..... 15

Table 4 – Fall back alternatives for offline root menus ..... 15

Table 5 – Permitted contained items and default STYLES ..... 24

Table 6 – WIDTH and HEIGHT span and applicability .....	31
Table 7 – Image formats .....	67
Table 8 – String handling .....	69
Table 9 – Examples of floating-point results .....	85
Table 10 – Usages of COMPONENT_PATH .....	86
Table 11 – Diagnostic classifications .....	95
Table 12 – Builtins for method cache controlling .....	102
Table 13 – List of defined upload menu identifiers .....	106
Table 14 – List of defined download menu identifiers .....	107
Table 15 – PROFIBUS and PROFINET communication mapping .....	110
Table B.1 – Predefined identifiers .....	121

Withdrawn

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**FUNCTION BLOCKS (FB) FOR PROCESS CONTROL AND  
ELECTRONIC DEVICE DESCRIPTION LANGUAGE (EDDL) –****Part 4: EDD interpretation**

## 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 61804-4 has been prepared by subcommittee 65E: Devices and integration in enterprise systems, of IEC technical committee 65: Industrial-process measurement, control and automation.

This first edition cancels and replaces IEC TR 61804-4 published in 2006. This edition constitutes a technical revision.

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

- New paragraph:
  - EDDL data description
  - EDDL METHOD programming and usage of builtins
  - Edit session
  - Offline and online configuration

- EDDL communication description
- Enhancements in paragraph EDDL user interface descriptions

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

FDIS	Report on voting
65E/465/FDIS	65E/481/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.

A list of all parts in the IEC 61804 series, published under the general title *Function blocks (FB) for process control and electronic device description language (EDDL)*, can be found on the IEC website.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on 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.

**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 document using a colour printer.**

## INTRODUCTION

This part of IEC 61804 was developed using material from FDI Cooperation LLC (Foundation™ Fieldbus<sup>1</sup>, HART®<sup>2</sup> Communication Foundation (HCF), PROFIBUS™<sup>3</sup> Nutzerorganisation e.V. (PNO)), OPC Foundation (OPCF) and FDT Group. IEC 61804 has the general title "Function blocks (FB) for process control and Electronic Device Description Language (EDDL)".

This edition does not reflect many of the various rules defined by the different communication foundations, however it is not a complete representation of those rules defined by each of the communication foundations today. Therefore, an EDD application and EDD developer will need to rely on both IEC 61804-4 and the respective communication foundation documents (e.g. specifications, test requirements, test cases) to develop a conformant application that will meet foundation registration requirements.

Conformity assessment of an EDD application is the responsibility of the respective communication foundations. In cases of any ambiguity, the rules of the respective communication foundations apply.

This part of IEC 61804

- contains an overview of the use of EDDL;
- provides examples demonstrating the use of the EDDL constructs;
- shows how the use cases are fulfilled; and
- shows the proper EDD application interpretation for each example.

This part of IEC 61804 is not an EDDL tutorial and is not intended to replace the EDDL specification.

Instructions are provided for the EDD application, which describe what will be performed without prescribing the technology used in the host implementation. For example, the FILE construct describes data that is stored by the EDD application on behalf of the EDD. The FILE construct does not specify how the data is stored. The EDD application can use a database, a flat file, or any other implementation it chooses.

---

1 FOUNDATION™ Fieldbus is the trademark of the Fieldbus Foundation. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.

2 HART® is the registered trademark of the HART Communication Foundation. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.

3 PROFIBUS and PROFINET are the trademarks of the PROFIBUS Nutzerorganisation e.V. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.