

INTERNATIONAL STANDARD

IEC 61804-2

Second edition
2006-09

Function blocks (FB) for process control – Part 2: Specification of FB concept

© IEC 2006 — Copyright - all rights reserved

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 the publisher.

International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch



Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE

XA

For price, see current catalogue

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	7
3 Terms, definitions and abbreviated terms and acronyms.....	8
3.1 Terms and definitions	8
3.2 Abbreviated terms and acronyms	14
4 General Function Block (FB) definition and EDD model	14
4.1 Device structure (device model)	14
4.2 Block combinations	25
5 Detailed block definition	28
5.1 General	28
5.2 Application FBs	28
5.3 Component FBs	36
5.4 Technology Block	36
5.5 Device (Resource) Block	45
5.6 Algorithms common to all blocks	47
6 FB Environment.....	49
7 Mapping to System Management.....	49
8 Mapping to Communication	49
9 Conformance statement.....	51
Annex A (informative) Parameter description	52
Annex B (normative) IEC 61804 Conformance Declaration	58
Bibliography.....	59
Figure 1 – Position of the IEC 61804 series related to other standards and products	6
Figure 2 – FB structure is derived out of the process (P&ID view)	15
Figure 3 – FB structure may be distributed between devices.....	16
Figure 4 – IEC 61804 FBs can be implemented in different devices	17
Figure 5 – General components of devices	17
Figure 6 – Block types of IEC 61804	18
Figure 7 – IEC 61804 block overview (graphical representation not normative).....	19
Figure 8 – UML class diagram of the device model	22
Figure 9 – Measurement process signal flow.....	26
Figure 10 – Actuation process signal flow	26
Figure 11 – Application process signal flow.....	27
Figure 12 – Analog Input FB	28
Figure 13 – Analog Output FB.....	30
Figure 14 – Discrete input FB	31
Figure 15 – Discrete Output FB.....	32

Figure 16 – Calculation FB.....	34
Figure 17 – Control FB.....	35
Figure 18 – Temperature Technology Block.....	36
Figure 19 – Pressure Technology Block.....	39
Figure 20 – Modulating actuation technology block.....	41
Figure 21 – On/Off Actuation Technology Block.....	43
Figure 22 – Harel state chart.....	46
Figure 23 – Application structure of ISO OSI Reference Model.....	49
Figure 24 – Client/Server relationship in terms of OSI Reference Model.....	50
Figure 25 – Mapping of IEC 61804 FBs to APOs.....	50
Table 1 – References of model elements.....	21
Table 2 – Variables and parameter description template.....	24
Table 3 – Example of temperature sensors of Sensor_Type.....	37
Table 4 – Device status state table.....	45
Table 5 – Device status transition table.....	46
Table A.1 – Parameter description.....	52
Table B.1 – Conformance (sub)clause selection table.....	58
Table B.2 – Contents of (sub)clause selection tables.....	58

INTERNATIONAL ELECTROTECHNICAL COMMISSION

FUNCTION BLOCKS (FB) FOR PROCESS CONTROL –

Part 2: Specification of FB concept

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 provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 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.

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

U.S. Patent No. 5,333,114

U.S. Patent No. 5,485,400

U.S. Patent No. 5,825,664

U.S. Patent No. 5,909,368

U.S. Patent Pending No. 08/916,178

Australian Patent No. 638507

Canadian Patent No. 2,066,743

European Patent No. 0495001

Validated in:

UK – Patent No. 0495001

France – Patent No. 0495001

Germany – Patent No. 69032954.7

Netherlands – Patent No. 0495001

Japan Patent No. 3137643

IEC take no position concerning the evidence, validity and scope of this patent right. The holder of this patent right has assured the IEC that he is willing to negotiate licenses 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:

Fieldbus Foundation,
9390 Research Boulevard, Suite II-250,
Austin, Texas, USA 78759,
Attention: President.

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

This International Standard has been prepared by subcommittee 65C: Digital communications, of IEC technical committee 65: Industrial-process measurement and control.

This second edition, together with the first edition of IEC 61804-3, cancels and replaces the first edition of IEC 61804-2 published in 2004. This edition constitutes a technical revision.

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

- a) transfer of the EDDL-specific clauses to IEC 61804-3;
- b) the FB-specific subclauses 4.1 and 4.2 as well as Clauses 5, 6, 7 and 8 are unchanged.

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

CDV	Report on voting
65C/405/CDV	65C/420/RVC

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 ISO/IEC Directives, Part 2.

The list of all parts of the IEC 61804 series, under the general title *Function Blocks (FB) for process control*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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.

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

This part of IEC 61804 provides conceptual Function Block specifications, which can be mapped to specific communication systems, and their accompanying definitions by industrial groups.

The EDDL fills the gap between the conceptual FB specification of IEC 61804-2 and a product implementation. Figure 1 shows these aspects.

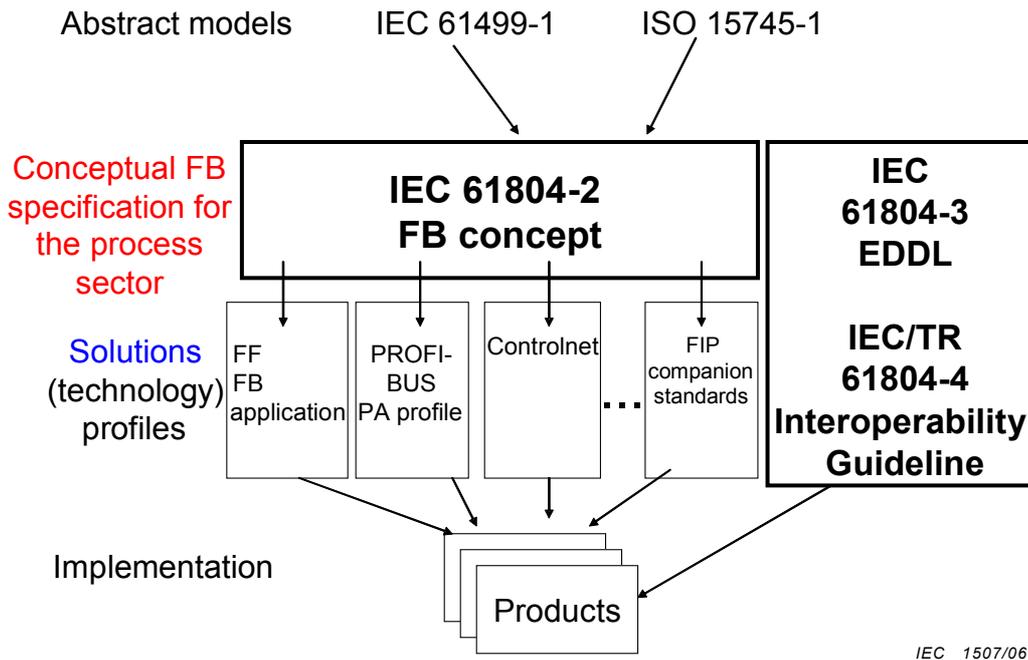


Figure 1 – Position of the IEC 61804 series related to other standards and products

FUNCTION BLOCKS (FB) FOR PROCESS CONTROL –

Part 2: Specification of FB concept

1 Scope

This part of IEC 61804 is applicable to Function Blocks (FB) for process control.

This standard specifies FB by using the result of harmonization work as regards several elements:

- c) the device model which defines the components of an IEC 61804-2 conformant device;
- d) conceptual specifications of FBs for measurement, actuation and processing. This includes general rules for the essential features to support control, whilst avoiding details which stop innovation as well as specialization for different industrial sectors.

This standard defines a subset of the requirements of IEC 61804-1 (hereafter referred to as Part 1) only, while Part 1 describes requirements for a distributed system.

The conformance statement in Annex B, which covers the conformance declaration, is related to this standard only. Requirements of Part 1 are not part of these conformance declarations.

The standardization work for FB was carried out by harmonizing the description of concepts of existing technologies. It results in an abstract level that allowed the definition of the common features in a unique way. This abstract vision is called here the conceptual FB specification and mapped to specific communication systems and their accompanying definitions by the industrial groups. This standard is also based on the abstract definitions of IEC 61499-1.

NOTE This standard can be mapped to ISO 15745-1.

There are solutions on the market today, which fulfil the requirements of this standard and show how the conceptual specification is implemented in a given technology. New technologies will need to find equivalent solutions (see Figure 4).

2 Normative references

The following referenced documents are indispensable for the application 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 60050-351:1998, *International Electrotechnical Vocabulary (IEV) – Part 351: Automatic control*

IEC 60584-1, *Thermocouples – Part 1: Reference tables*

IEC 61131-3:2003, *Programmable controllers – Part 3: Programming languages*

IEC 61158 (all parts), *Digital data communications for measurement and control – Fieldbus for use in industrial control systems*

IEC 61499-1:2005, *Function blocks – Part 1: Architecture*

IEC 61499-2:2005, *Function blocks – Part 2: Software tools requirements*

IEC 61804-1:2003, *Function blocks (FB) for process control – Part 1: Overview of system aspects*

ISO/IEC 7498-1:1994, *Information technology – Open Systems Interconnection – Basic Reference Model: The Basic Model*

ISO/IEC 9899, *Programming languages – C*

ISO/IEC 10646-1, *Information technology – Universal Multiple-Octet Coded Character Set (UCS) – Part 1: Architecture and Basic Multilingual Plane*