SLOVENSKI STANDARD
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Information processing systems - Computer graphics - Programmer's Hierarchical Interactive Graphics Systems (PHIGS) - Part 1: Functional description (ISO/IEC 9592-1:1989)

Information processing systems - Computer graphics - Programmer's Hierarchical Interactive Graphics Systems (PHIGS) - Part 1: Functional description (ISO/IEC 9592-1:1989)

Graphische Systeme der Informationsverarbeitung - Hierarchisches Interaktives Graphisches System für Programmierer - Teil 1: Funktionsbeschreibung (ISO/IEC 9592-1:1989, Ausg. 1)

Systemes de traitement de l'information - Infographie - Interface de programmation du systeme graphique hiérarchisé (PHIGS) - Partie 1: Description fonctionnelle (ISO/IEC 9592-1:1989, éd. 1)

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Information processing systems -- Computer graphics -- Programmer's Hierarchical Interactive Graphics System (PHIGS) -- Part 1: Functional description (ISO/IEC 9592-1: 1989 - edition 1)

Systèmes de traitement de l'information -- Infographie -- Interface de programmation du système graphique hiérarchisé (PHIGS) -- Partie 1: Description fonctionnelle (ISO/IEC 9592-1: 1989 - édition 1)

Graphische Systeme der Informationsverarbeitung -- Hierarchisches Interaktives Graphisches Systems für Programmierer -- Teil 1: Funktionsbeschreibung (ISO/IEC 9592-1: 1989 Ausgabe 1)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in two official versions (English and French). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

FOREWORD

The Technical Board has decided to submit the International Standard

Information processing systems -- Computer graphics -- Programmer's Hierarchical Interactive Graphics System (PHIGS) -- Part 1: Functional description

to Formal Vote, and the result was positive

For the time being, this document exists only in the English and French versions.

According to the CEN/CENELEC Common Rules, the following countries are bound to implement this standard:

Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxemburg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom.

ENDORSEMENT NOTICE

The text of the International Standard ISO/IEC 9592-1, edition 1, 1989, was approved by CEN as a European Standard without any modification.

INTERNATIONAL STANDARD

ISO/IEC 9592-1

First edition
1989-04-01

Information processing systems — Computer graphics — Programmer's Hierarchical Interactive Graphics System (PHIGS) —

Part 1 : Functional description

Systèmes de traitement de l'information — Infographie — Interface de programmation du système graphique hiérarchisé (PHIGS) —

Partie 1 : Description fonctionnelle

Reference number
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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) together form a system for worldwide standardization as a whole. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for approval before their acceptance as International Standards. They are approved in accordance with procedures requiring at least 75 % approval by the national bodies voting.

International Standard ISO/IEC 9592-1 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

ISO/IEC 9592 consists of the following parts, under the general title *Information processing systems — Computer graphics — Programmer's Hierarchical Interactive Graphics System (PHIGS)*:

— *Part 1: Functional description*

— *Part 2: Archive file format*

— *Part 3: Clear-text encoding of archive file*

Annex D forms an integral part of this part of ISO/IEC 9592. Annexes A, B, C, E, F, G, H, I are for information only.

Information processing systems — Computer graphics — Programmer's Hierarchical Interactive Graphics System (PHIGS) —

Part 1 : Functional description

0 Introduction

The Programmer's Hierarchical Interactive Graphics System (PHIGS) provides a set of functions for

- definition, display and modification of 2D or 3D graphical data,
- definition, display and manipulation of geometrically related objects,
- modification of graphics data and the relationships between the graphical data.

This International Standard draws extensively on GKS (Graphical Kernel System ISO 7942) and GKS-3D (Graphical Kernel System for Three Dimensions ISO 8805) for its model and functionality. In addition this International Standard enables graphical (and application) data to be stored in a hierarchical data store. Information in the data store can be inserted, modified and deleted with the provided functions. The relationship of this part of ISO/IEC 9592 to GKS and GKS-3D is further described in 4.3.2.

The choice of which graphics standard to use will depend on a number of factors: application profile, overall system architecture, equipment available, existing application database interaction, system performance considerations, user interface requirements, management policy and other external factors. The aim of producing a compatible set of graphics standards in GKS, GKS-3D and PHIGS is to allow that choice to be made in the most flexible way.

The main reasons for introducing a standard in this area of computer graphics are

a) to allow application programs using dynamic hierarchical graphics to be easily portable between installations,

b) to aid the understanding and use of dynamic hierarchical graphics methods by application programmers;

c) to reduce program development costs and time; many of the functions currently performed by the application program will now be performed by PHIGS;

d) to serve manufacturers of graphics equipment as a guideline in providing useful combinations of graphics capabilities in a device.

To meet these objectives, a number of design principles were adopted:

e) Consistency: the mandatory requirements of PHIGS should not be mutually contradictive.

f) Compatibility: this Standard will be compatible with GKS and GKS-3D except when technical reasons justify differences.

g) Orthogonality: the functions should be independent of each other.

h) Completeness: all the functions necessary for application programs to use a dynamic hierarchical graphics system should be included.

i) Minimality: redundant functions are only supported where their availability enables application programs to improve performance or where some collection of capabilities is frequently used.

j) Programmer Experience: those using PHIGS should have a working knowledge of computer graphics.

k) Error Handling: error conditions should be minimized, and their impact well defined.

l) Device Independence: PHIGS should allow an application program to address facilities of different graphics input and output devices with minimal changes to the application program.

m) Device Dependence: PHIGS should allow an application program to address specific graphics input and output devices in a direct manner.

n) Implementability: it should be possible to support PHIGS functions using most languages on most operating systems.

o) Efficiency: PHIGS should be capable of being implemented and executed without consuming undue amounts of computer resources.

p) Interaction: Some application programs will require realtime or near-realtime response from PHIGS. PHIGS will not exclude such application programs though specific graphics devices and dedicated computer resources may be necessary.

Annexes A to C and E to I are given for information; they do not form part of this part of ISO/IEC 9592.

1 Scope and field of application

This part of ISO/IEC 9592 specifies a set of functions for computer graphics programming, the Programmer's Hierarchical Interactive Graphics System (PHIGS). PHIGS is a graphics system for application programs that produce computer generated pictures on line graphics or raster graphics output devices. It supports operator input and interactions by supplying basic functions for graphical input and hierarchical picture definition. Picture definitions are retained in a *centralized structure store* where they may be edited by an application.

Pictures are displayed on *workstations* consisting of a single output device and a number of input devices. Several workstations can be used simultaneously. The application program is allowed to adapt its behaviour at a workstation to make best use of workstation capabilities.

Functions are specified for archiving picture definitions to file. In addition an interface to the Computer Graphics Metafile (ISO 8632) is described.

NOTE - For certain parameters of the functions, PHIGS defines value ranges as being reserved for registration (see 4.1.2). The meanings of these values will be defined using the established procedures.

This part of ISO/IEC 9592 defines a language independent nucleus of a graphics system for integration into a programming language. PHIGS is embedded in a language layer obeying the particular conventions of the language. Such language bindings are specified for ISO or ISO/IEC languages in ISO/IEC 9593.

2 References

ISO 646, *Information processing - ISO 7-bit coded character set for information interchange.*

ISO 2022, *Information processing - ISO 7-bit and 8-bit coded character sets - Code extension techniques.*

ISO 2382-13, *Data processing - Vocabulary - Part 13: Computer graphics.*

ISO 6093, *Information processing - Representation of numeric values in character strings for information interchange.*

ISO 7942, *Information processing systems - Computer graphics - Graphical Kernel System (GKS) functional description.*

ISO 8632, *Information processing systems - Computer graphics - Metafile for the storage and transfer of picture description information*

- *Part 1 : Functional description*
- *Part 2 : Character encoding*
- *Part 3 : Binary encoding*
- *Part 4 : Clear text encoding*

ISO 8805, *Information processing systems - Computer graphics - Graphical Kernel System for Three Dimensions (GKS-3D) functional description.*

ISO/IEC 9593, *Information processing systems - Computer graphics - Programmer's Hierarchical Interactive Graphics System (PHIGS) language bindings.*

CIE Recommendations on colour space, supplement to CIE publication 15.

CIE 1976 Supplementary standard colour metric of server and coordinate systems.

3 Definitions

For the purpose of this part of ISO/IEC 9592 the following definitions apply.

NOTE - As far as possible, graphics terminology which is commonly accepted and consistent with other graphics Standards is used.

3.1 acknowledgement: Output to the *operator* of a *logical input* device indicating that a *trigger* has fired.

3.2 addressable point: Any point of a device that can be addressed.

3.3 ancestor structure: A *parent structure* or the ancestor of a *parent structure*.

3.4 annotation: A class of *output primitives* that are defined in *normalized projection coordinates* but are placed with respect to a reference point which may be anywhere in *modelling coordinate space*. The plane on which the annotation appears is always parallel to the x-y plane of the *display space* and is unaffected by modelling and viewing transformations, but the reference point is transformed in the normal manner.

3.5 annotation style: An aspect of *annotation* indicating how relationships between an annotation primitive and a reference point are displayed.

3.6 annotation text relative: An *output primitive* consisting of a character string which is always drawn parallel to the x-y plane of the *display space*. Its position is determined by a reference point defined in *modelling coordinate space* and an offset in *normalized projection coordinates*.

3.7 application data: Data used by an application program, the nature of which is not specified in this standard. Application data is inserted into a *structure* as an "application data" *structure element*.

3.8 archive file: A mechanism for the storage and transportation of graphical data, represented by *PHIGS structures* and their contents.

3.9 aspects of output primitives: The appearance of *output primitives* is controlled by the values of a set of characteristics called "aspects" examples of which are the height of a character or the *linetype* of a *polyline*. Geometric aspects are *workstation* independent and are controlled by the corresponding *attributes*. For non-geometric aspects, the mapping between a particular aspect and its controlling *attribute* is defined by an associated *aspect source flag* (ASF). If the ASF is set to BUNDLED this aspect of the *output primitive* is controlled by the *bundle index attribute*. If the ASF is set to INDIVIDUAL then the aspect is controlled by the corresponding attribute.

3.10 aspect ratio: The ratio of lengths along the principal axes of an object.

3.11 aspect source flag (ASF): A flag indicating whether a particular *workstation* dependent *aspect of an output primitive* is selected from an *attribute* bundle, or as an individual *attribute* selection.

3.12 attribute: Attributes control the properties of *output primitives*. There are four types of attributes: geometric, non-geometric, viewing and identification. The geometric and non-geometric attributes control the values of *aspects of output primitives*.

3.13 back plane: A plane parallel to the *view plane* whose location is specified as an N coordinate value in the *view reference coordinate system*. *Output primitives* behind the back plane lie outside the *view volume*.

3.14 break action: An implementation dependent and *workstation* dependent mechanism enabling the *operator* to interrupt an input operation.

3.15 bundle index: An *attribute* of an *output primitive* which is an index into a *bundle table*; which defines the *workstation* dependent *aspects of the output primitive*.

3.16 bundle table: A *workstation* dependent table specifying aspects of one or more *output primitives*. *PHIGS* has *polyline*, *polymarker*, *text*, *interior*, and *edge* bundle tables.