SLOVENSKI STANDARD
SIST EN 60848:2013

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Specifikacijski jezik GRAFCET za sekvenčne funkcijske sheme (IEC 60848:2013)

GRAFCET specification language for sequential function charts (IEC 60848:2013)

Entwurfssprache GRAFCET für Ablauf-Funktionspläne (IEC 60848:2013)

Langage de spécification GRAFCET pour diagrammes fonctionnels en séquence (CEI 60848:2013)

Ta slovenski standard je istoveten z: EN 60848:2013

ICS:

01.100.25	Risbe s področja elektrotehnike in elektronike	Electrical and electronics engineering drawings
35.060	Jeziki, ki se uporabljajo v informacijski tehniki in tehnologiji	Languages used in information technology

SIST EN 60848:2013 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

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English version

GRAFCET specification language for sequential function charts
(IEC 60848:2013)

Langage de spécification GRAFCET pour diagrammes fonctionnels en séquence
(CEI 60848:2013)

GRAFCET, Spezifikationssprache für Funktionspläne der Ablaufsteuerung
(IEC 60848:2013)

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CENELEC

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

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Ref. No. EN 60848:2013 E

Foreword

The text of document 3/1135/FDIS, future edition 3 of IEC 60848, prepared by SC 3B “Documentation” of IEC/TC 3 “Information structures, documentation and graphical symbols" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60848:2013.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2014-01-03
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2016-04-03

This document supersedes EN 60848:2002.

EN 60848:2013 includes the following significant technical changes with respect to EN 60848:2002:

This edition constitutes a global technical revision with the extended definition of the concept of variables introducing: internal variable, input variable and output variable.

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Endorsement notice

The text of the International Standard IEC 60848:2013 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 61131-3:2003	NOTE	Harmonised as EN 61131-3:2003 (not modified).

IEC 60848

Edition 3.0 2013-02

INTERNATIONAL STANDARD

NORME INTERNATIONALE

GRAFCET specification language for sequential function charts

Langage de spécification GRAFCET pour diagrammes fonctionnels en séquence

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GRAFCET SPECIFICATION LANGUAGE FOR SEQUENTIAL FUNCTION CHARTS

FOREWORD

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International Standard IEC 60848 has been prepared by the former subcommittee 3B: Documentation, of IEC technical committee 3: Information structures, documentation and graphical symbols.

This third edition cancels and replaces the second edition published in 2002 and constitutes a global technical revision with the extended definition of the concept of variables introducing: internal variable, input variable and output variable.

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

FDIS	Report on voting
3/1135/FDIS	3/1138/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.

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

INTRODUCTION

This International Standard is mainly aimed at people such as design engineers, maintenance engineers, etc., who need to specify the behaviour of a system, e.g. the control and command of an automation system, safety component, etc. This specification language should also serve as a communication means between designers and users of automated systems.

GRAFCET SPECIFICATION LANGUAGE FOR SEQUENTIAL FUNCTION CHARTS

1 Scope

This International Standard defines the GRAFCET[1] specification language for the functional description of the behaviour of the sequential part of a control system.

This standard specifies the symbols and rules for the graphical representation of this language, as well as for its interpretation.

This standard has been prepared for automated production systems of industrial applications. However, no particular area of application is excluded.

Methods of development of a specification that makes use of GRAFCET are beyond the scope of this standard. One method is for example the "SFC language" specified in IEC 61131-3, which defines a set of programming languages for programmable controllers.

NOTE See Annex C for further information on the relations between IEC 60848 and implementation languages such as the SFC of IEC 61131-3.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

(void)

3 Terms and definitions

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

NOTE The definitions of the terms in 3.1 apply only in the context of the GRAFCET specification language.

3.1 Terms in the GRAFCET

3.1.1
action
GRAFCET language element associated with a step, indicating an activity to be performed on output or internal variables

3.1.2
directed link
GRAFCET language element indicating the evolution paths between steps by connecting steps to transitions and transitions to steps

3.1.3
grafcet chart
function chart using the GRAFCET specification language

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1 GRAFCET: GRAphe Fonctionnel de Commande Etape Transition.

Note 1 to entry: The “grafcet chart” can, in short form, be called “grafcet”.

3.1.4
input event
event characterized by the change of at least one value of all input variables of the sequential part of the system

3.1.5
internal event
event characterized by an input event associated with the situation of the sequential part of the system

3.1.6
interpretation
part of the GRAFCET specification language enabling the linkage of:

– the input variables and the structure, by the means of the transition-condition; and

– the output variables and the structure, by the means of the actions

3.1.7
situation
state of the system described by the GRAFCET specification language and characterized by the active steps at a given instant

3.1.8
step
GRAFCET language element used for the definition of the state of the sequential part of the system

Note 1 to entry: A step can be active or inactive.

Note 2 to entry: The set of active steps represents the situation of the system.

3.1.9
transient evolution
evolution characterized by the clearing of several successive transitions on the occurrence of a single input event

3.1.10
transition
GRAFCET language element indicating a possible evolution of the activity between two or more steps

Note 1 to entry: The possible evolution is realised by clearing the transition.

3.1.11
transition-condition
GRAFCET language element associated with a transition indicating the result of a boolean expression

Note 1 to entry: The transition-condition can be either true or false.

3.1.12
variable
scalar quantity defined by its name and Boolean, numeric value

3.1.13
input variable
variable which may influence the behaviour described by the grafcet chart

EXAMPLE Boolean variable indicating the violation of a temperature limit.

Note 1 to entry: The variable may belong to the environment or to some other system component.

3.1.14
output variable
variable which may be influenced by the behaviour described by the grafcet chart

EXAMPLE Setpoint of a PID-controller.

Note 1 to entry: The variable may belong to the environment or to some other system component.

3.1.15
internal variable
variable used inside the grafcet chart and invisible for other system components and the environment

EXAMPLES Step variable X* (symbol 2.1 of Table 1), step duration T* (symbol 2.2 of Table 1), loop counter within a grafcet chart.

3.2 Terms, general purpose

3.2.1
chart
graph
graphical presentation describing the behaviour of a system, for example the relations between two or more variable quantities, operations or states

3.2.2
structure
part of the GRAFCET specification language enabling the description of the possible evolution between situations

3.2.3
system
set of interrelated elements considered in a defined context as a whole and separated from their environment

Note 1 to entry: Such elements may be material objects and concepts as well as their results (e.g. forms of organisation, mathematical methods, programming languages).

Note 2 to entry: The system is considered to be separated from the environment and from the other external systems by an imaginary surface, which cuts the links between them and the system.

Note 3 to entry: The language GRAFCET can be used to describe the logical behaviour of any kind of system.

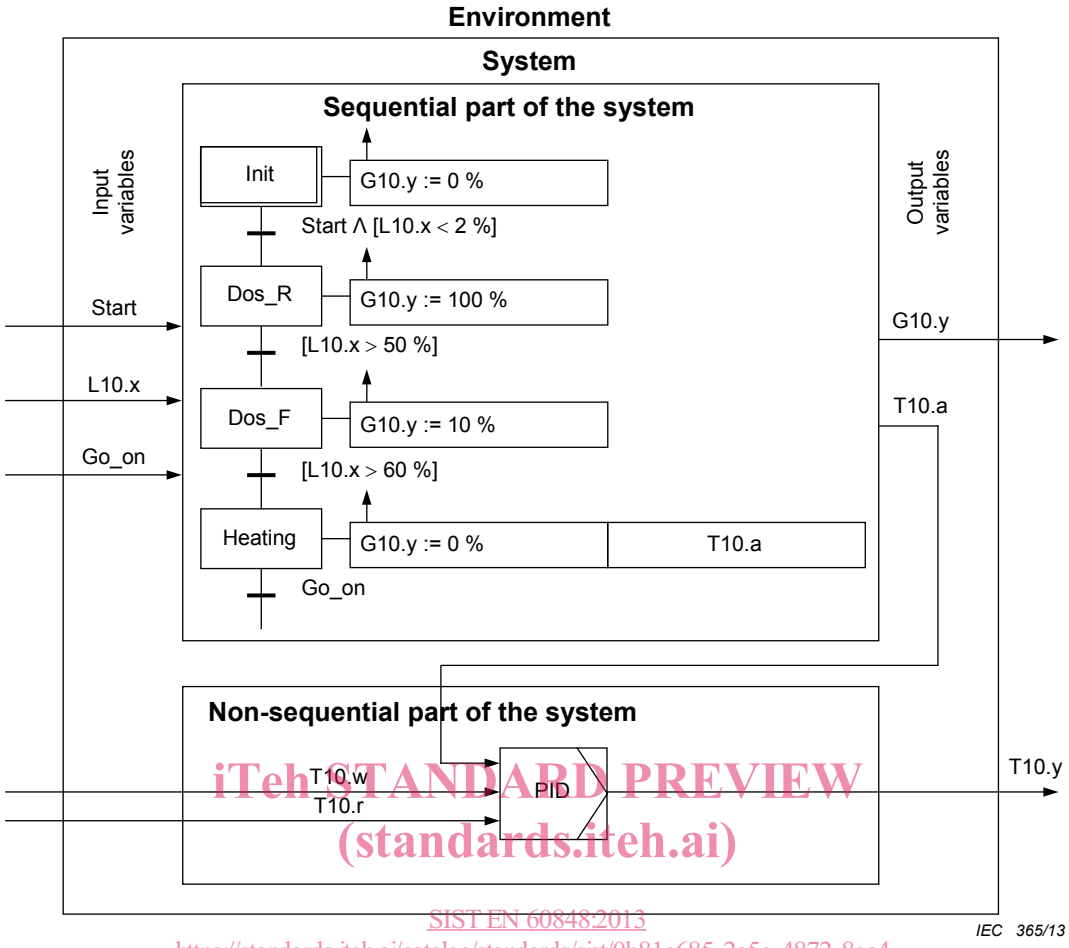
[SOURCE: IEC 60050-351:1998, 351-11-01]

4 General principles

4.1 Context

The implementation of an automated system requires, in particular, a description relating cause and effect. To do this, the logical aspect of the desired behaviour of the system will be described.

The sequential part of the system is the logical aspect of this physical system (see Figure 1). The behaviour indicates the way in which the output variables depend on the input variables. The object of the grafcet chart is to specify the behaviour of the sequential part of the systems.



L10.x tank level

T10.a temperature loop – automatic mode

T10.r temperature loop – measured value

G10.y dosing valve – position

T10.w temperature loop – setpoint

T10.y temperature loop – manipulated value

Figure 1 – Graphical representation of the sequential part of a system

4.2 GRAFCET, a behaviour specification language

The GRAFCET specification language enables a grafcet chart to be created showing the expected behaviour of a given sequential system. This language is characterized mainly by its graphic elements, which, associated with an alphanumerical expression of variables, provides a synthetic representation of the behaviour, based on an indirect description of the situation of the system.

The behaviour description on states is the following: the "monomarked" states correspond to the situations of the grafcet chart, which implies the uniqueness of the situation at a given instant. The states are connected to each other by means of an evolution condition, which allows the passage from one situation to another one to be described.

For reasons of convenience, the behaviour description based on states is better replaced by a description based on steps. In the grafcet chart several steps may be active simultaneously, the situation being then characterized by the set of active steps at the considered moment. The evolution of one set of steps to another is translated by one or several transitions, each characterized by:

- its preceding steps,
- its succeeding steps,