

TECHNICAL SPECIFICATION



**Energy management system application program interface (EMS-API) –
Part 556: CIM based graphic exchange format (CIM/G)**



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2016 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.

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
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

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

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 It also gives information on projects, replaced and withdrawn publications.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

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

The world's leading online dictionary of electronic and electrical terms containing 20 000 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

65 000 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

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

generated by EVS

TECHNICAL SPECIFICATION



**Energy management system application program interface (EMS-API) –
Part 556: CIM based graphic exchange format (CIM/G)**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.200

ISBN 978-2-8322-3654-3

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

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references.....	7
3 Terms and definitions	7
4 Relationship of this technical specification with other standards.....	8
5 Use cases	9
6 Structure of diagram file and definition file.....	11
6.1 General.....	11
6.2 Diagram file structure.....	11
6.3 Definition files structure.....	12
7 Basic shape graphic element	13
8 Power system graphic element.....	14
8.1 General.....	14
8.2 User-defined power system graphic element.....	14
8.3 Reference of user-defined graphic element.....	15
9 Examples of some graphic elements and diagram	17
9.1 Breaker graphic element	17
9.2 Dynamic Text graphic element.....	17
9.3 Link graphic element.....	18
9.4 Bay graphic element.....	18
9.5 Voltage level diagram.....	19
9.6 Substation or power plant diagram.....	20
9.7 Power grid graphic diagram.....	20
10 Mechanism of runtime display	21
10.1 Mechanism of runtime local display	21
10.2 Mechanism of runtime remote browsing	22
10.3 Menu description.....	22
Annex A (informative) Definition of power system graphic element	25
Annex B (informative) Definition of colour identification base on voltage level.....	31
Annex C (informative) Default value of diagram object style	33
Annex D (informative) An example of power plant one-line diagram.....	34
Annex E (informative) Example of menu definition.....	35
Bibliography	36
Figure 1 – Relationship with other standards	9
Figure 2 – Scenario of off-line application.....	10
Figure 3 – Scenario of common MMI and online browsing.....	10
Figure 4 – Structure of diagram file	11
Figure 5 – Structure of definition file.....	12
Figure 6 – Definition of power system graphic element	15
Figure 7 – Reference of user-defined graphic element.....	16
Figure 8 – Definition of Breaker element.....	17

Figure 9 – Reference of Breaker element	17
Figure 10 – Definition of Dynamic Text graphic element.....	17
Figure 11 – Reference of Dynamic Text graphic element	18
Figure 12 – Reference of Link graphic element.....	18
Figure 13 – An example of Bay element definition.....	19
Figure 14 – Reference of a bay element	19
Figure 15 – Example of Voltage level diagram	19
Figure 16 – Example of Substation diagram with voltage level	20
Figure 17 – Example of Substation diagram without voltage level.....	20
Figure 18 – Example of Power grid graphic diagram	21
Figure 19 – Mechanism of runtime local display.....	22
Figure 20 – Mechanism of runtime remote browsing	22
Figure 21 – Menu description	23
Figure D.1 – Example of power plant one-line diagram	34
Table 1 – Common elements and attributes of SVG	13
Table 2 – Common drawing attributes	14
Table B.1 – Examples of colour value and legend.....	31

preview generated by EVS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ENERGY MANAGEMENT SYSTEM APPLICATION
PROGRAM INTERFACE (EMS-API) –****Part 556: CIM based graphic exchange format (CIM/G)**

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.

The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a technical specification when

- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 61970-556, which is a technical specification, has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
57/1731/DTS	57/1770/RVC

Full information on the voting for the approval of this technical specification can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 61970 series, published under the general title *Energy management system application program interface (EMS-API)*, can be found on the IEC website.

In this technical specification, the following print types are used:

- *attributes for user defined graphic elements: in italic type.*

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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

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 technical specification is part of the IEC 61970 series that define an Application Program Interface (API) for an Energy Management System (EMS).

IEC 61970-301 specifies a Common Information Model (CIM): a logical view of the physical aspects of an electric utility operation. The CIM is described using the Unified Modelling Language (UML), a language used to specify, visualize, and document systems in an object oriented manner.

This part of IEC 61970, which is a technical specification, specifies how to exchange CIM based graphic objects using XML, which details how to display an object. This document defines a format to facilitate efficient graphic data transfer, which will meet the real-time requirements for on-line remote diagram browsing and exchanging.

ENERGY MANAGEMENT SYSTEM APPLICATION PROGRAM INTERFACE (EMS-API) –

Part 556: CIM based graphic exchange format (CIM/G)

1 Scope

This part of IEC 61970, which is a technical specification, specifies a CIM-based graphic exchange format (CIM/G). It includes graphic file structure and graphic element definitions.

This document supports a mechanism for off-line exchange of graphic displays and on-line remote browsing of diagrams among distinct SCADA/EMS systems that may be provided by multiple vendors and located in different places.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 61970-301, *Energy management system application program interface (EMS-API) – Part 301: Common information model (CIM) base*

IEC 61970-453, *Energy management system application program interface (EMS-API) – Part 453: Diagram layout profile*

IEC TS 61970-555, *Energy management system application program interface (EMS-API) – Part 555: CIM based efficient model exchange format*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

domain object

instance of a class that models a Real-World Object with a unique identity

Note 1 to entry: A domain object inherits from a CIM *Identified Object*; it is normally not a diagram object. The definition of Domain object refers to IEC 61970-453. In this document, it indicates the graphic model of power system equipment.

3.2

diagram

electronic equivalent of a seamless paper plan