



BSI Standards Publication

Energy management system application program interface (EMS-API)

Part 301: Common information model (CIM) base

National foreword

This British Standard is the UK implementation of EN IEC 61970-301:2020. It is identical to IEC 61970-301:2020. It supersedes BS EN 61970-301:2017, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PEL/57, Power systems management and associated information exchange.

A list of organizations represented on this committee can be obtained on request to its committee manager.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2020
Published by BSI Standards Limited 2020

ISBN 978 0 539 00157 0

ICS 33.200

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 September 2020.

Amendments/corrigenda issued since publication

Date	Text affected
------	---------------

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN IEC 61970-301

August 2020

ICS 33.200

Supersedes EN 61970-301:2017 and all of its
amendments and corrigenda (if any)

English Version

**Energy management system application program interface
(EMS-API) - Part 301: Common information model (CIM) base
(IEC 61970-301:2020)**

Interface de programmation d'application pour système de
gestion d'énergie (EMS-API) - Partie 301: Base de modèle
d'information commun (CIM)
(IEC 61970-301:2020)

Schnittstelle für Anwendungsprogramme für
Netzführungssysteme (EMS-API) - Teil 301: Allgemeines
Informationsmodell (CIM), Basismodell
(IEC 61970-301:2020)

This European Standard was approved by CENELEC on 2020-07-31. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of document 57/2210/FDIS, future edition 7 of IEC 61970-301, prepared by IEC/TC 57 "Power systems management and associated information exchange" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61970-301:2020.

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) 2021-05-01
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2023-07-31

This document supersedes EN 61970-301:2017 and all of its amendments and corrigenda (if any).

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

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association.

Endorsement notice

The text of the International Standard IEC 61970-301:2020 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 61850-7-3	NOTE	Harmonized as EN 61850-7-3
IEC 61968-11:2013	NOTE	Harmonized as EN 61968-11:2013 (not modified)
IEC 61970-501	NOTE	Harmonized as EN 61970-501
IEC 62325 (series)	NOTE	Harmonized as EN IEC 62325 (series)

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61850	series	Communication networks and systems for power utility automation - Part 10: Conformance testing	EN 61850	series
IEC 61850-7-4	2010	Communication networks and systems for power utility automation - Part 7-4: Basic communication structure - Compatible logical node classes and data object classes	EN 61850-7-4	2010
IEC 61968	series	Application integration at electric utilities - System interfaces for distribution management - Part 1: Interface architecture and general recommendations	EN IEC 61968	series
IEC/TS 61970-2	-	Energy management system application program interface (EMS-API) - Part 2: Glossary	CLC/TS 61970-2	-
UML 2.0 Specification	-	Object Management Group: UML 2.0 Specification	-	-

CONTENTS

FOREWORD.....	35
INTRODUCTION.....	37
1 Scope.....	39
2 Normative references	39
3 Terms and definitions	40
4 CIM specification	40
4.1 Overview.....	40
4.2 CIM modelling notation	41
4.3 CIM packages.....	41
4.4 CIM classes and relationships.....	43
4.4.1 Classes	43
4.4.2 Generalization	44
4.4.3 Simple association.....	45
4.4.4 Aggregation.....	46
4.5 CIM model concepts and examples.....	46
4.5.1 Concepts	46
4.5.2 Containment, equipment hierarchies and naming.....	47
4.5.3 Names model	48
4.5.4 Connectivity model	49
4.5.5 Inheritance hierarchy	52
4.5.6 Transformer model	54
4.5.7 Transformer tap modelling	56
4.5.8 Phase wire modelling.....	69
4.5.9 Grounding devices modelling.....	71
4.5.10 Cuts, clamps and jumpers model	75
4.5.11 Measurements and controls.....	79
4.5.12 Regulating control models	84
4.5.13 DC model for CIM	85
4.5.14 Static Var Compensator Voltage Regulation	107
4.5.15 ICCP Configuration Model	108
4.5.16 Feeder Model	115
4.5.17 Control area modelling.....	115
4.6 Modelling guidelines	117
4.6.1 Modelling for change	117
4.6.2 Process for amendments to the CIM	117
4.6.3 Changes to the CIM UML model	118
4.6.4 Changes to the CIM standards documents.....	118
4.6.5 Deprecations	118
4.6.6 CIM profiles	118
4.7 Modelling tools.....	119
4.8 User implementation conventions.....	119
4.8.1 Conventions beyond UML	119
4.8.2 Number of terminals for ConductingEquipment objects	119
4.8.3 Nominal quantities	120
4.8.4 Datatypes	120
4.9 CIM modelling examples	120
5 Detailed model	120

5.1	Overview.....	120
5.2	Context.....	120
6	Package Base	122
6.1	General.....	122
6.2	Package Domain.....	122
6.2.1	General	122
6.2.2	ActivePower datatype	128
6.2.3	ActivePowerChangeRate datatype.....	129
6.2.4	ActivePowerPerCurrentFlow datatype.....	129
6.2.5	ActivePowerPerFrequency datatype	129
6.2.6	Admittance datatype	129
6.2.7	AngleDegrees datatype	130
6.2.8	AngleRadians datatype.....	130
6.2.9	ApparentPower datatype.....	130
6.2.10	Area datatype	130
6.2.11	Boolean primitive	131
6.2.12	Capacitance datatype	131
6.2.13	CapacitancePerLength datatype	131
6.2.14	Classification datatype.....	131
6.2.15	Conductance datatype	131
6.2.16	ConductancePerLength datatype	132
6.2.17	CostPerEnergyUnit datatype.....	132
6.2.18	CostPerHeatUnit datatype	132
6.2.19	CostPerVolume datatype	132
6.2.20	CostRate datatype	133
6.2.21	Currency enumeration	133
6.2.22	CurrentFlow datatype	137
6.2.23	Damping datatype.....	137
6.2.24	Date primitive	137
6.2.25	DateInterval compound.....	137
6.2.26	DateTime primitive.....	138
6.2.27	DateTimeInterval compound	138
6.2.28	Decimal primitive	138
6.2.29	DecimalQuantity compound	138
6.2.30	Displacement datatype	138
6.2.31	Duration primitive	139
6.2.32	Emission datatype	139
6.2.33	Float primitive.....	139
6.2.34	FloatQuantity compound.....	139
6.2.35	Frequency datatype	139
6.2.36	HeatRate datatype.....	140
6.2.37	Hours datatype	140
6.2.38	Impedance datatype	140
6.2.39	Inductance datatype	140
6.2.40	InductancePerLength datatype	141
6.2.41	Integer primitive.....	141
6.2.42	IntegerQuantity compound.....	141
6.2.43	KiloActivePower datatype	141
6.2.44	Length datatype.....	142

6.2.45	Mass datatype	142
6.2.46	Minutes datatype	142
6.2.47	Money datatype	142
6.2.48	MonthDay primitive	143
6.2.49	MonthDayInterval compound	143
6.2.50	PU datatype	143
6.2.51	PerCent datatype	143
6.2.52	Pressure datatype	143
6.2.53	Reactance datatype	144
6.2.54	ReactancePerLength datatype	144
6.2.55	ReactivePower datatype	144
6.2.56	RealEnergy datatype	144
6.2.57	Resistance datatype	145
6.2.58	ResistancePerLength datatype	145
6.2.59	RotationSpeed datatype	145
6.2.60	Seconds datatype	146
6.2.61	Speed datatype	146
6.2.62	String primitive	146
6.2.63	StringQuantity compound	146
6.2.64	Susceptance datatype	146
6.2.65	SusceptancePerLength datatype	147
6.2.66	Temperature datatype	147
6.2.67	Time primitive	147
6.2.68	TimeInterval compound	147
6.2.69	UnitMultiplier enumeration	148
6.2.70	UnitSymbol enumeration	149
6.2.71	Voltage datatype	154
6.2.72	VoltagePerReactivePower datatype	154
6.2.73	Volume datatype	154
6.2.74	VolumeFlowRate datatype	155
6.2.75	WaterLevel datatype	155
6.3	Package Core	155
6.3.1	General	155
6.3.2	ACDCTerminal	160
6.3.3	BaseFrequency	161
6.3.4	BasePower	162
6.3.5	BaseVoltage	162
6.3.6	BasicIntervalSchedule	163
6.3.7	Bay	163
6.3.8	BreakerConfiguration enumeration	164
6.3.9	BusbarConfiguration enumeration	165
6.3.10	ConductingEquipment	165
6.3.11	ConnectivityNode	166
6.3.12	ConnectivityNodeContainer	167
6.3.13	Curve	167
6.3.14	CurveData root class	168
6.3.15	CurveStyle enumeration	169
6.3.16	Equipment	169
6.3.17	EquipmentContainer	170

6.3.18	Feeder	171
6.3.19	GeographicalRegion	172
6.3.20	IdentifiedObject root class	173
6.3.21	IrregularIntervalSchedule	174
6.3.22	IrregularTimePoint root class	174
6.3.23	Name root class	175
6.3.24	NameType root class	175
6.3.25	NameTypeAuthority root class	176
6.3.26	OperatingParticipant	176
6.3.27	OperatingShare root class	177
6.3.28	PSRType	177
6.3.29	PhaseCode enumeration	178
6.3.30	PowerSystemResource	179
6.3.31	RegularIntervalSchedule	179
6.3.32	RegularTimePoint root class	180
6.3.33	ReportingGroup	181
6.3.34	ReportingSuperGroup	181
6.3.35	SubGeographicalRegion	182
6.3.36	Substation	183
6.3.37	Terminal	184
6.3.38	VoltageLevel	185
6.4	Package Wires	186
6.4.1	General	186
6.4.2	AsynchronousMachineKind enumeration	201
6.4.3	ACLineSegment	202
6.4.4	ACLineSegmentPhase	203
6.4.5	AsynchronousMachine	204
6.4.6	Breaker	206
6.4.7	BusbarSection	208
6.4.8	Clamp	209
6.4.9	CompositeSwitch	210
6.4.10	Conductor	211
6.4.11	Connector	212
6.4.12	CoolantType enumeration	213
6.4.13	Cut	213
6.4.14	Disconnecter	215
6.4.15	DisconnectingCircuitBreaker	216
6.4.16	EarthFaultCompensator	217
6.4.17	EnergyConnection	218
6.4.18	EnergyConsumer	219
6.4.19	EnergyConsumerPhase	221
6.4.20	EnergySchedulingType	222
6.4.21	EnergySource	222
6.4.22	EnergySourcePhase	224
6.4.23	ExternalNetworkInjection	225
6.4.24	FrequencyConverter	227
6.4.25	Fuse	228
6.4.26	Ground	229
6.4.27	GroundingImpedance	230

6.4.28	GroundDisconnector	231
6.4.29	Jumper	232
6.4.30	Junction	234
6.4.31	Line	234
6.4.32	LinearShuntCompensator	235
6.4.33	LinearShuntCompensatorPhase	237
6.4.34	LoadBreakSwitch	237
6.4.35	MutualCoupling	239
6.4.36	NonlinearShuntCompensator	240
6.4.37	NonlinearShuntCompensatorPhase	241
6.4.38	NonlinearShuntCompensatorPhasePoint root class	242
6.4.39	NonlinearShuntCompensatorPoint root class	243
6.4.40	PerLengthImpedance	243
6.4.41	PerLengthLineParameter	244
6.4.42	PerLengthPhaseImpedance	244
6.4.43	PerLengthSequenceImpedance	245
6.4.44	PetersenCoil	246
6.4.45	PetersenCoilModeKind enumeration	247
6.4.46	PhaseImpedanceData root class	247
6.4.47	PhaseShuntConnectionKind enumeration	248
6.4.48	PhaseTapChanger	249
6.4.49	PhaseTapChangerAsymmetrical	250
6.4.50	PhaseTapChangerLinear	251
6.4.51	PhaseTapChangerNonLinear	252
6.4.52	PhaseTapChangerSymmetrical	254
6.4.53	PhaseTapChangerTable	255
6.4.54	PhaseTapChangerTablePoint	255
6.4.55	PhaseTapChangerTabular	256
6.4.56	Plant	257
6.4.57	PowerElectronicsConnection	258
6.4.58	PowerElectronicsConnectionPhase	259
6.4.59	PowerTransformer	260
6.4.60	PowerTransformerEnd	262
6.4.61	ProtectedSwitch	264
6.4.62	RatioTapChanger	266
6.4.63	RatioTapChangerTable	267
6.4.64	RatioTapChangerTablePoint	267
6.4.65	ReactiveCapabilityCurve	268
6.4.66	Recloser	269
6.4.67	RegulatingCondEq	270
6.4.68	RegulatingControl	271
6.4.69	RegulatingControlModeKind enumeration	273
6.4.70	RegulationSchedule	273
6.4.71	RotatingMachine	274
6.4.72	Sectionalizer	276
6.4.73	SeriesCompensator	277
6.4.74	ShortCircuitRotorKind enumeration	278
6.4.75	ShuntCompensator	278
6.4.76	ShuntCompensatorPhase	280