

**SLOVENSKI STANDARD**  
**SIST EN IEC 61970-301:2020**  
**01-november-2020**

**Nadomešča:**  
**SIST EN 61970-301:2017**

---

**Aplikacijski programski vmesnik za sistem upravljanja z energijo (EMS-API) - 301.  
del: Osnova skupnega informacijskega modela (CIM)**

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

Schnittstelle für Anwendungsprogramme für Netzführungssysteme (EMS-API) - Teil 301:  
Allgemeines Informationsmodell (CIM), Basismodell  
**(standards.iteh.ai)**

Interface de programmation d'application pour système de gestion d'énergie (EMS-API) -  
Partie 301: Base de modèle d'information commun (CIM)  
<https://standards.iteh.ai/catalog/standards/sist-iec-61970-301-2020>

**Ta slovenski standard je istoveten z: EN IEC 61970-301:2020**

---

**ICS:**

|           |   |  |
|-----------|---|--|
| 29.240.30 | Krmilna oprema za elektroenergetske sisteme | Control equipment for electric power systems |
| 35.200    | Vmesniška in povezovalna oprema             | Interface and interconnection equipment      |

**SIST EN IEC 61970-301:2020**

**en**

## iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN IEC 61970-301:2020](#)

<https://standards.iteh.ai/catalog/standards/sist/fe314d65-c95d-426c-86fa-5a09cd4d105b/sist-en-iec-61970-301-2020>

**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.

**(standards.iteh.ai)**

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.

[SIST EN IEC 61970-301:2020](#)

<https://standards.iteh.ai/catalog/standards/sist/fe314d65-c95d-426c-86fa->

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

**EN IEC 61970-301:2020 (E)****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.

## iTeh STANDARD REVIEW Endorsement notice (standards.iteh.ai)

The text of the International Standard IEC 61970-301:2020 was approved by CENELEC as a European Standard without any modification.  
<https://standards.iteh.ai/catalog/standards/sist/fe314d65-c95d-426c-86fa->

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](http://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  | -              | -           |

## iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN IEC 61970-301:2020](#)

<https://standards.iteh.ai/catalog/standards/sist/fe314d65-c95d-426c-86fa-5a09cd4d105b/sist-en-iec-61970-301-2020>



# INTERNATIONAL STANDARD



---

Energy management system application program interface (EMS-API) –  
Part 301: Common information model (CIM) base  
[\(standards.iteh.ai\)](https://standards.iteh.ai/)

SIST EN IEC 61970-301:2020  
<https://standards.iteh.ai/catalog/standards/sist/fe314d65-c95d-426c-86fa-5a09cd4d105b/sist-en-iec-61970-301-2020>

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

---

ICS 33.200

ISBN 978-2-8322-8502-2

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

## 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 |

iTech STANDARD PREVIEW  
(standards.itech.ai)

|        |   |     |
|--------|---|-----|
| 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.....<br><b>(standards.iteh.ai)</b>  | 186 |
| 6.4.1  | General .....   | 186 |
| 6.4.2  | AsynchronousMachineKind enumeration.....<br><a href="https://standards.iteh.ai/catalog/standards/sist-en-iec-61970-301-2020">SIST EN IEC 61970-301:2020</a> | 201 |
| 6.4.3  | ACLineSegment.....<br><a href="https://standards.iteh.ai/catalog/standards/sist-en-iec-61970-301-2020">SIST EN IEC 61970-301:2020</a>                       | 202 |
| 6.4.4  | ACLineSegmentPhase.....<br><a href="https://standards.iteh.ai/catalog/standards/sist-en-iec-61970-301-2020">SIST EN IEC 61970-301:2020</a>                  | 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 | Disconnect.....   | 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 | PerLengthPhasorImpedance .....                       | 244 |
| 6.4.43 | PerLengthSequencerImpedance .....                    | 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 | PhaseTapChangeTable .....                            | 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 | Sectionaliser .....                                  | 276 |
| 6.4.73 | SeriesCompensator .....                              | 277 |
| 6.4.74 | ShortCircuitRotorKind enumeration .....              | 278 |
| 6.4.75 | ShuntCompensator .....                               | 278 |
| 6.4.76 | ShuntCompensatorPhase .....                          | 280 |

|         |   |     |
|---------|---|-----|
| 6.4.77  | SinglePhaseKind enumeration .....                 | 281 |
| 6.4.78  | StaticVarCompensator.....                         | 282 |
| 6.4.79  | SVCControlMode enumeration.....                   | 283 |
| 6.4.80  | Switch .....                                      | 283 |
| 6.4.81  | SwitchPhase.....                                  | 285 |
| 6.4.82  | SwitchSchedule .....                              | 286 |
| 6.4.83  | SynchronousMachine.....                           | 287 |
| 6.4.84  | SynchronousMachineOperatingMode enumeration ..... | 290 |
| 6.4.85  | SynchronousMachineKind enumeration .....          | 290 |
| 6.4.86  | TapChanger.....                                   | 290 |
| 6.4.87  | TapChangerControl .....                           | 292 |
| 6.4.88  | TapChangerTablePoint root class .....             | 293 |
| 6.4.89  | TapSchedule .....                                 | 294 |
| 6.4.90  | TransformerControlMode enumeration .....          | 295 |
| 6.4.91  | TransformerCoreAdmittance .....                   | 295 |
| 6.4.92  | TransformerEnd.....                               | 296 |
| 6.4.93  | TransformerMeshImpedance .....                    | 297 |
| 6.4.94  | TransformerStarImpedance .....                    | 298 |
| 6.4.95  | TransformerTank .....                             | 299 |
| 6.4.96  | TransformerTankEnd .....                          | 299 |
| 6.4.97  | VoltageControlZone .....                          | 300 |
| 6.4.98  | WireSegment.....                                  | 301 |
| 6.4.99  | WireSegmentPhase .....                            | 302 |
| 6.4.100 | WindingConnection enumeration .....               | 303 |
| 6.5     | Package LoadModel .....                           | 303 |
| 6.5.1   | General .....                                     | 303 |
| 6.5.2   | ConformLoad.....                                  | 304 |
| 6.5.3   | ConformLoadGroup .....                            | 306 |
| 6.5.4   | ConformLoadSchedule .....                         | 306 |
| 6.5.5   | DayType .....                                     | 307 |
| 6.5.6   | EnergyArea .....                                  | 308 |
| 6.5.7   | LoadArea.....                                     | 308 |
| 6.5.8   | LoadGroup .....                                   | 309 |
| 6.5.9   | LoadResponseCharacteristic .....                  | 309 |
| 6.5.10  | NonConformLoad.....                               | 311 |
| 6.5.11  | NonConformLoadGroup .....                         | 312 |
| 6.5.12  | NonConformLoadSchedule .....                      | 313 |
| 6.5.13  | PowerCutZone.....                                 | 314 |
| 6.5.14  | Season .....                                      | 314 |
| 6.5.15  | SeasonDayTypeSchedule .....                       | 315 |
| 6.5.16  | StationSupply .....                               | 315 |
| 6.5.17  | SubLoadArea.....                                  | 317 |
| 6.6     | Package Generation .....                          | 317 |
| 6.6.1   | General .....                                     | 317 |
| 6.6.2   | Package GenerationTrainingSimulation .....        | 318 |
| 6.6.3   | Package Production.....                           | 334 |
| 6.7     | Package DC.....                                   | 386 |
| 6.7.1   | General .....                                     | 386 |
| 6.7.2   | ACDCCConverter.....                               | 390 |

|        |  |     |
|--------|--|-----|
| 6.7.3  | ACDCCConverterDCTerminal .....                 | 393 |
| 6.7.4  | CsConverter .....                              | 394 |
| 6.7.5  | DCTopologicalNode .....                        | 396 |
| 6.7.6  | CsOperatingModeKind enumeration .....          | 397 |
| 6.7.7  | CsPpccControlKind enumeration .....            | 397 |
| 6.7.8  | DCBaseTerminal .....                           | 397 |
| 6.7.9  | DCBreaker .....                                | 398 |
| 6.7.10 | DCBusbar .....                                 | 399 |
| 6.7.11 | DCChopper .....                                | 400 |
| 6.7.12 | DCConductingEquipment .....                    | 401 |
| 6.7.13 | DCConverterOperatingModeKind enumeration ..... | 402 |
| 6.7.14 | DCConverterUnit .....                          | 402 |
| 6.7.15 | DCDisconnector .....                           | 403 |
| 6.7.16 | DCEquipmentContainer .....                     | 404 |
| 6.7.17 | DCGround .....                                 | 405 |
| 6.7.18 | DCLine .....                                   | 406 |
| 6.7.19 | DCLineSegment .....                            | 407 |
| 6.7.20 | DCNode .....                                   | 408 |
| 6.7.21 | DCPolarityKind enumeration .....               | 409 |
| 6.7.22 | DCSeriesDevice .....                           | 409 |
| 6.7.23 | DCShunt .....                                  | 410 |
| 6.7.24 | DCSwitch .....                                 | 411 |
| 6.7.25 | DCTerminal .....                               | 412 |
| 6.7.26 | DCTopologicalIsland .....                      | 413 |
| 6.7.27 | PerLengthDCLineParameter .....                 | 413 |
| 6.7.28 | VsCapabilityCurve .....                        | 414 |
| 6.7.29 | VsConverter .....                              | 414 |
| 6.7.30 | VsPpccControlKind enumeration .....            | 417 |
| 6.7.31 | VsQpccControlKind enumeration .....            | 417 |
| 6.8    | Package Equivalents .....                      | 418 |
| 6.8.1  | General .....                                  | 418 |
| 6.8.2  | EquivalentBranch .....                         | 419 |
| 6.8.3  | EquivalentEquipment .....                      | 422 |
| 6.8.4  | EquivalentInjection .....                      | 423 |
| 6.8.5  | EquivalentNetwork .....                        | 425 |
| 6.8.6  | EquivalentShunt .....                          | 426 |
| 6.9    | Package AuxiliaryEquipment .....               | 427 |
| 6.9.1  | General .....                                  | 427 |
| 6.9.2  | AuxiliaryEquipment .....                       | 428 |
| 6.9.3  | CurrentTransformer .....                       | 429 |
| 6.9.4  | FaultIndicator .....                           | 430 |
| 6.9.5  | PostLineSensor .....                           | 431 |
| 6.9.6  | PotentialTransformer .....                     | 432 |
| 6.9.7  | PotentialTransformerKind enumeration .....     | 433 |
| 6.9.8  | Sensor .....                                   | 434 |
| 6.9.9  | SurgeArrester .....                            | 435 |
| 6.9.10 | WaveTrap .....                                 | 435 |
| 6.10   | Package Meas .....                             | 436 |
| 6.10.1 | General .....                                  | 436 |

|         |   |     |
|---------|---|-----|
| 6.10.2  | Accumulator .....                       | 440 |
| 6.10.3  | AccumulatorLimit .....                  | 441 |
| 6.10.4  | AccumulatorLimitSet .....               | 441 |
| 6.10.5  | AccumulatorReset .....                  | 442 |
| 6.10.6  | AccumulatorValue .....                  | 443 |
| 6.10.7  | Analog .....                            | 444 |
| 6.10.8  | AnalogControl .....                     | 444 |
| 6.10.9  | AnalogLimit .....                       | 445 |
| 6.10.10 | AnalogLimitSet .....                    | 446 |
| 6.10.11 | AnalogValue .....                       | 446 |
| 6.10.12 | Command .....                           | 447 |
| 6.10.13 | Control .....                           | 448 |
| 6.10.14 | Discrete .....                          | 449 |
| 6.10.15 | DiscreteValue .....                     | 450 |
| 6.10.16 | IOPoint .....                           | 451 |
| 6.10.17 | Limit .....                             | 452 |
| 6.10.18 | LimitSet .....                          | 452 |
| 6.10.19 | Measurement .....                       | 453 |
| 6.10.20 | MeasurementValue .....                  | 454 |
| 6.10.21 | MeasurementValueQuality .....           | 455 |
| 6.10.22 | MeasurementValueSource .....            | 456 |
| 6.10.23 | Quality61850 root class .....           | 456 |
| 6.10.24 | RaiseLowerCommand .....                 | 457 |
| 6.10.25 | SetPoint .....                          | 458 |
| 6.10.26 | StringMeasurement .....                 | 459 |
| 6.10.27 | StringMeasurementValue .....            | 460 |
| 6.10.28 | Validity enumeration .....              | 460 |
| 6.10.29 | ValueAliasSet .....                     | 461 |
| 6.10.30 | ValueToAlias .....                      | 462 |
| 6.11    | Package Topology .....                  | 462 |
| 6.11.1  | General .....                           | 462 |
| 6.11.2  | BusNameMarker .....                     | 464 |
| 6.11.3  | TopologicalIsland .....                 | 464 |
| 6.11.4  | TopologicalNode .....                   | 465 |
| 6.12    | Package DiagramLayout .....             | 466 |
| 6.12.1  | General .....                           | 466 |
| 6.12.2  | Diagram .....                           | 467 |
| 6.12.3  | DiagramObject .....                     | 468 |
| 6.12.4  | DiagramObjectGluePoint root class ..... | 469 |
| 6.12.5  | DiagramObjectPoint root class .....     | 470 |
| 6.12.6  | DiagramObjectStyle .....                | 470 |
| 6.12.7  | DiagramStyle .....                      | 471 |
| 6.12.8  | OrientationKind enumeration .....       | 471 |
| 6.12.9  | TextDiagramObject .....                 | 472 |
| 6.12.10 | VisibilityLayer .....                   | 473 |
| 6.13    | Package OperationalLimits .....         | 473 |
| 6.13.1  | General .....                           | 473 |
| 6.13.2  | ActivePowerLimit .....                  | 475 |
| 6.13.3  | ApparentPowerLimit .....                | 476 |

iTech STANDARD PREVIEW  
(standards.itech.ai)