IEC 61968-9

Edition 3.0 2024-07

INTERNATIONAL STANDARD

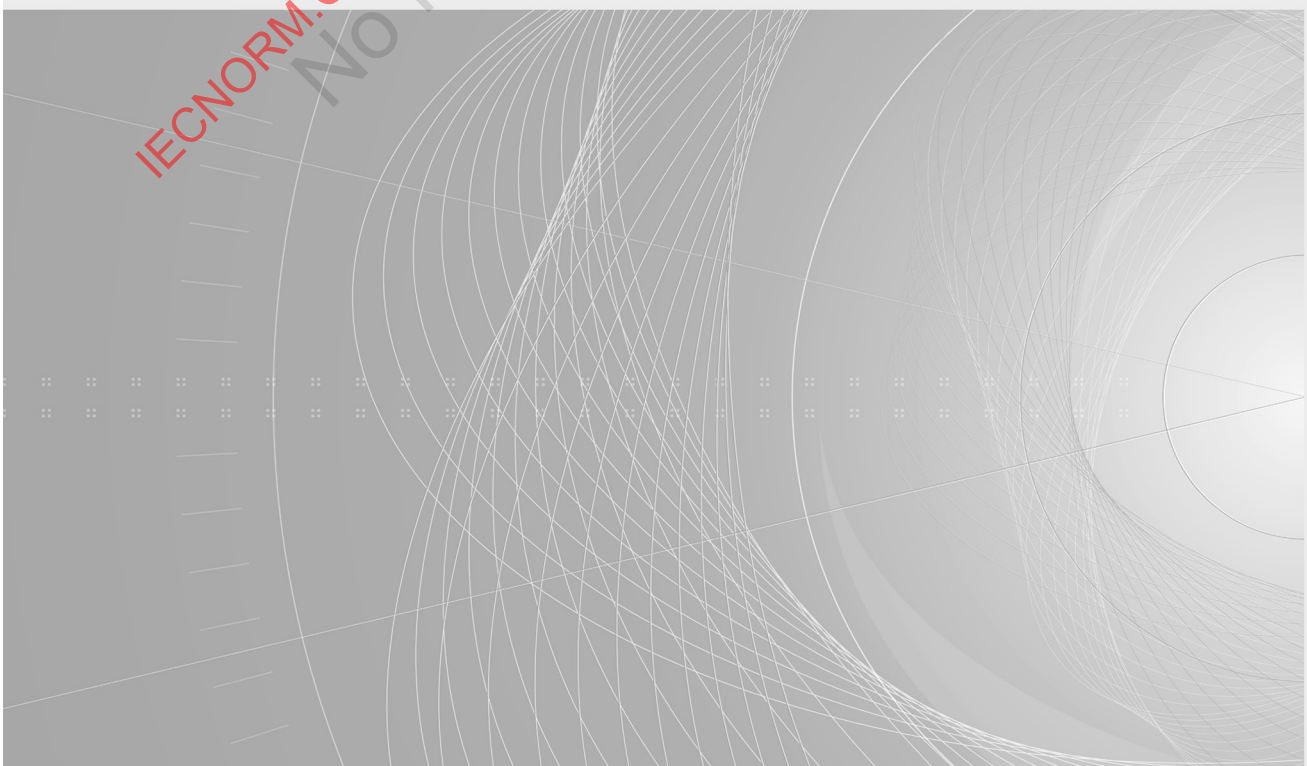
NORME INTERNATIONALE

colour inside

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

Enterprise business function interfaces for utility operations – Part 9: Interfaces for meter reading and control

Interfaces de fonctions métier d'entreprise pour l'exploitation des services – Partie 9: Interfaces pour le relevé et la commande des compteurs



IEC 61968-9:2024-07(en-fr)

THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2024 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.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
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 corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform
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 once a month by email.

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: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch
Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024 WG-9
Single user licence
IEC SyC SG on Smart Grids
No reproduction or circulation
Oct 2024

A propos de l'IEC
La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC
Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC - webstore.iec.ch/advsearchform
La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, …). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished
Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc
Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch
Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications, symboles graphiques et le glossaire. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

Electropedia - www.electropedia.org
Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 500 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 25 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

IEC 61968-9

Edition 3.0 2024-07

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

Enterprise business function interfaces for utility operations – Part 9: Interfaces for meter reading and control

Interfaces de fonctions métier d'entreprise pour l'exploitation des services – Partie 9: Interfaces pour le relevé et la commande des compteurs

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 33.200

ISBN 978-2-8322-9296-9

Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.

® Registered trademark of the International Electrotechnical Commission
Marque déposée de la Commission Electrotechnique Internationale

CONTENTS

FOREWORD 13
INTRODUCTION 16
1 Scope 17
2 Normative references 18
3 Terms, definitions and abbreviated terms 19
3.1 Terms and definitions 19
3.2 Abbreviated terms 21
4 Reference and information models 21
4.1 General approach to messaging 21
4.2 General approach to metering systems 22
4.3 Meter reading and control functions and components 22
4.4 Static information model 23
4.4.1 General 23
4.4.2 Classes for meter reading and control 24
4.4.3 Classes related to meter reading and control 26
5 Meter reading and control message types 27
5.1 General 27
5.2 End device event messages 28
5.2.1 General 28
5.2.2 Applications 28
5.2.3 Message format 33
5.3 Meter reading messages 35
5.3.1 General 35
5.3.2 Applications 36
5.3.3 Message formats 41
5.4 End device control messages 54
5.4.1 General 54
5.4.2 Applications 54
5.4.3 Message format 61
5.5 Meter service requests 65
5.5.1 General 65
5.6 Metering system events 66
5.6.1 General 66
5.6.2 Applications – Firmware upgrade 67
5.6.3 Message formats 67
5.7 Premises area networks 67
5.7.1 General 67
5.7.2 Applications 68
5.7.3 Message formats 70
5.8 Master data management messages 70
5.8.1 General 70
5.8.2 Applications 71
5.8.3 Message formats 74
Annex A (informative) Recommended use of message type verbs 84
Annex B (informative) Reply error codes 88
Annex C (normative) Procedure for the generation of a ReadingType name 89

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
IEEE SA WG on Smart Grids
Single user licence
No reproduction or circulation
Oct 2024

C.1 General 89
C.2 Understanding the important attributes of a data element name 89
C.2.1 General 89
C.2.2 Attribute #1, macroPeriod 89
C.2.3 Attribute #2, aggregate 90
C.2.4 Attribute #3, measuringPeriod 91
C.2.5 Attribute #4, accumulation 94
C.2.6 Attribute #5, flowDirection 97
C.2.7 Attribute #6, commodity 104
C.2.8 Attribute #7, measurementKind 106
C.2.9 Attribute #8, interharmonicNumerator 113
C.2.10 Attribute #9, interharmonicDenominator 113
C.2.11 Attribute #10, argumentNumerator 114
C.2.12 Attribute #11, argumentDenominator 114
C.2.13 Attribute #12, tou 116
C.2.14 Attribute #13, cpp 116
C.2.15 Attribute #14, consumptionTier 117
C.2.16 Attribute #15, phases 118
C.2.17 Attribute #16, multiplier 122
C.2.18 Attribute #17, unit 123
C.2.19 Attribute #18, currency 140
C.3 Using data element attributes to define the ReadingType name – Construction formula with example ReadingType codes 140
Annex D (normative) Quality code enumerations 146
D.1 General 146
D.2 Identification of the system offering commentary on the data 146
D.3 Construction 146
D.4 Quality code system identifier 146
D.5 Quality code categorization 147
D.6 Quality code index 148
D.7 Example quality codes 158
Annex E (normative) EndDeviceEventType enumerations 160
E.1 General 160
E.2 Alarm conditions 160
E.2.1 General 160
E.2.2 Clearing alarm conditions and communicating state/condition changes 160
E.3 Event data 161
E.4 The 4-Part ID: EndDeviceEventType 163
E.5 EndDeviceType 163
E.6 EndDeviceDomain 165
E.7 EndDeviceSubDomain 166
E.8 EndDeviceEventOrAction 172
E.9 Normative EndDeviceEventTypes 180
Annex F (normative) EndDeviceControlType enumerations 201
F.1 General 201
F.2 Normative EndDeviceControlType Enumerations 201
Annex G (normative) XML schemas for message payloads 204
G.1 General 204
G.2 ComModuleConfig 204

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEEE WG 21 Smart Grids
No reproduction or circulation
Oct 2024

G.3 EndDeviceConfig 204
G.4 EndDeviceControls 204
G.5 EndDeviceEvents 204
G.6 GetComModuleConfig 205
G.7 GetEndDeviceConfig 205
G.8 GetEndDeviceControls 205
G.9 GetEndDeviceEvents 205
G.10 GetEndDeviceGroups 205
G.11 GetMeterConfig 205
G.12 GetMeterReadings 205
G.13 GetMeterReadSchedules 205
G.14 GetUsagePointConfig 206
G.15 GetUsagePointGroups 206
G.16 GetUsagePointLocationConfig 206
G.17 MasterDataLinkageConfig 206
G.18 MeterConfig 206
G.19 MeterReadings 206
G.20 MeterReadSchedules 206
G.21 UsagePointConfig 206
G.22 UsagePointGroups 207
G.23 UsagePointLocationConfig 207
Annex H (normative) Querying data using Get profiles 208
H.1 General 208
H.2 GetMeterReadings 208
H.3 GetEndDeviceConfig 209
Annex I (informative) Master data management transaction processing 211
Annex J (informative) Master data management use cases 212
J.1 General 212
J.2 Sample XML for Exemplary Master Data Management use cases 228
J.2.1 General 228
J.2.2 Create MeterConfig – Two Meters – Step 1 229
J.2.3 Create MeterConfig – Two Meters – Step 2 231
J.2.4 Create MeterConfig – Two Meters – Step 3 231
J.2.5 Create MeterConfig – Two Meters – Step 4 232
J.2.6 Update MeterConfig (add MeterMultipliers, modify formNumber and ConfigurationEvent) – Step 1 233
J.2.7 Update MeterConfig (add MeterMultipliers, modify formNumber and ConfigurationEvent) – Step 2 235
J.2.8 Update MeterConfig (add MeterMultipliers, modify formNumber and ConfigurationEvent) – Step 3 236
J.2.9 UpdateMeterConfig (add MeterMultipliers, modify formNumber and ConfigurationEvent) – Step 4 237
J.2.10 Update MeterConfig (delete details) – Step 1 238
J.2.11 Update MeterConfig (delete details) – Step 2 239
J.2.12 Update MeterConfig (delete details) – Step 3 240
J.2.13 Update MeterConfig (delete details) – Step 4 241
J.2.14 Delete MeterConfig – Step 1 242
J.2.15 Delete MeterConfig – Step 2 243
J.2.16 Delete MeterConfig – Step 3 244

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

J.2.17 Delete MeterConfig – Step 4 245
J.2.18 Create UsagePointConfig – Step 1 246
J.2.19 Create UsagePointConfig – Step 2 247
J.2.20 Create UsagePointConfig – Step 3 247
J.2.21 Create UsagePointConfig – Step 4 248
J.2.22 Create MasterDataLinkageConfig – Step 1 249
J.2.23 Create MasterDataLinkageConfig – Step 1 250
J.2.24 Create MasterDataLinkageConfig – Step 3 251
J.2.25 Create MasterDataLinkageConfig – Step 4 252
J.2.26 Delete MasterDataLinkageConfig – Step 1 253
J.2.27 Delete MasterDataLinkageConfig – Step 2 254
J.2.28 Delete MasterDataLinkageConfig – Step 3 255
J.2.29 Delete MasterDataLinkageConfig – Step 4 256
J.2.30 Execute OperationSet – Step 1 256
J.2.31 Execute OperationSet – Step 2 258
J.2.32 Execute OperationSet – Step 3 259
J.2.33 Execute OperationSet – Step 4 259
J.2.34 Change ObjectNamesConfig 260
Annex K (normative) EUMED Metering UML Model 261
K.1 EUMED Metering profile and associated European regulation 261
K.1.1 The EUMED Metering profile 261
K.1.2 The Associated European regulation 261
K.2 EUMED Metering global view 262
K.3 EUMED Metering Entities 265
K.3.1 General 265
K.3.2 MeterReadingSet Entity 265
K.3.3 MeterReading Entity 265
K.3.4 Meter Entity 266
K.3.5 Customer Entity 266
K.3.6 IntervalBlock Entity 267
K.3.7 IntervalReading Entity 267
K.3.8 ReadingQuality Entity 268
K.3.9 UsagePoint Entity 269
K.3.10 UsagePointLocation Entity 269
K.3.11 ReadingType Entity 270
K.3.12 Name Entity 273
K.3.13 NameType Entity 273
K.3.14 NameTypeAuthority Entity 274
K.4 EUMED Metering Datatypes 275
K.4.1 General 275
K.4.2 AccumulationKind enumeration Datatype 276
K.4.3 AggregateKind enumeration Datatype 277
K.4.4 CommodityKind enumeration Datatype 278
K.4.5 Currency enumeration Datatype 279
K.4.6 CustomerKind enumeration Datatype 282
K.4.7 DateTimeInterval compound Datatype 283
K.4.8 FlowDirectionKind enumeration Datatype 283
K.4.9 MacroPeriodKind enumeration Datatype 285
K.4.10 MeasurementKind enumeration Datatype 285

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
ENSG WG on Smart Grids
No reproduction or circulation
Oct 2024

K.4.11 MeasuringPeriodKind enumeration Datatype 288
K.4.12 PhaseCode enumeration Datatype 290
K.4.13 RationalNumber compound Datatype 291
K.4.14 ReadingInterharmonic compound Datatype 291
K.4.15 UnitMultiplier enumeration Datatype 291
K.4.16 UnitSymbol enumeration Datatype 292
Annex L (normative) EUMED Metering XSD schema 298
L.1 EUMED Metering Entities global view 298
L.1.1 General 298
L.1.2 MeterReadingSet Entity 298
L.1.3 MeterReading Entity 298
L.1.4 Meter Entity 299
L.1.5 Customer Entity 299
L.1.6 IntervalBlock Entity 300
L.1.7 IntervalReading Entity 300
L.1.8 ReadingQuality Entity 301
L.1.9 UsagePoint Entity 302
L.1.10 UsagePointLocation Entity 302
L.1.11 ReadingType Entity 302
L.1.12 Name Entity 303
L.1.13 NameType Entity 304
L.1.14 NameTypeAuthority Entity 304
L.2 EUMED Metering Entities description 305
L.3 EUMED Metering Datatypes Description 311
Annex M (informative) Contextualization and examples of EUMED metering messages 351
M.1 Overview 351
M.2 EUMED Metering Load Curve message payload 351
M.3 EUMED Metering Max Power message payload 352
M.4 EUMED Metering Index message payload 352
Bibliography 355

Figure 1 – IEC 61968-9 scope 18
Figure 2 – Outage Detection, request/reply message exchange, Example 1 29
Figure 3 – Outage Detection, request / reply message exchange, Example 2 29
Figure 4 – Outage Detection, publish/subscribe exchange, Example 1 30
Figure 5 – Outage Detection, publish/subscribe exchange, Example 2 31
Figure 6 – Meter Health Event exchange, Example 1 32
Figure 7 – Meter Health Event exchange, Example 2 32
Figure 8 – Power quality event exchange, Example 1 33
Figure 9 – Power quality event exchange, Example 2 33
Figure 10 – End device event message format 34
Figure 11 – EndDeviceEvents example 35
Figure 12 – Example use of meter read schedule to create subscription 36
Figure 13 – Example manual meter reading exchange 37
Figure 14 – Example On-Request meter read 39
Figure 15 – Historical MeterData exchange 40

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single User licence
IEEE SWG on Smart Grids
No reproduction or circulation
Oct 2024

Figure 16 – Example billing inquiry message exchange 40
Figure 17 – Meter readings message format 41
Figure 18 – Reading structure 44
Figure 19 – Timestamps assigned between systems 45
Figure 20 – Conventions for timeStamp and timePeriod 45
Figure 21 – IntervalBlock structure 46
Figure 22 – Interval data timestamp generation 47
Figure 23 – Time interval conventions 47
Figure 24 – ReadingType structure 48
Figure 25 – MeterReadings Example 1 49
Figure 26 – MeterReadings Example 2 50
Figure 27 – Coincident readings example 51
Figure 28 – Final meter reading coincident with disconnect example 51
Figure 29 – GetMeterReadings example 52
Figure 30 – Meter read schedules message format 53
Figure 31 – Example load control message exchange 55
Figure 32 – Example message exchange for LC unit installation 56
Figure 33 – Example message exchange for change of customer program 57
Figure 34 – Example message exchange for change of customer program w/o MDM 57
Figure 35 – Example for change of customer program with meter change out 58
Figure 36 – Example message exchange for meter connect/disconnect 59
Figure 37 – Example of remote connect/disconnect directly between CIS and MS 60
Figure 38 – Example message exchange for real-time price signal 61
Figure 39 – End device controls message format 62
Figure 40 – EndDevice example 63
Figure 41 – EndDeviceControl example 64
Figure 42 – EndDeviceControls disconnect by group example 64
Figure 43 – EndDeviceControls meter connection example 65
Figure 44 – Example end device event message exchange due to meter changeout 66
Figure 45 – Example firmware upgrade message exchange 67
Figure 46 – Pairing of a PAN device 68
Figure 47 – PAN device events 69
Figure 48 – PAN device controls 70
Figure 49 – Master data linkages 72
Figure 50 – Message exchange for transferring usage point information 73
Figure 51 – Message exchange for transferring meter information 74
Figure 52 – Message exchange for transferring end device information 74
Figure 53 – MasterDataLinkageConfig message format 75
Figure 54 – MaterDataLinkageConfig example 76
Figure 55 – UsagePointConfig message format 77
Figure 56 – UsagePointConfig example 78
Figure 57 – UsagePointLocationConfig message format 79
Figure 58 – UsagePointLocationConfig example 80

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEEE WG on Smart Grids
No reproduction or circulation
Oct 2024

Figure 59 – End device config message format 81
Figure 60 – Meter configuration message 82
Figure 61 – MeterConfig example 83
Figure 62 – ComModuleConfig message format 83
Figure C.1 – Typical enumerations for accumulation behaviour 97
Figure C.2 – Typical enumerations for direction of flow 104
Figure C.3 – Voltage measurements 113
Figure E.1 – Event data 162
Figure E.2 – Multiple EndDeviceEventDetails Example 1 162
Figure E.3 – EndDeviceEventDetails example 2 163
Figure E.4 – EndDeviceEvent Example 3 163
Figure H.1 – GetMeterReadings 209
Figure H.2 – GetMeterConfig 210
Figure J.1 – Create MeterConfig – Two Meters – Step 1 230
Figure J.2 – Create MeterConfig – Two Meters – Step 2 231
Figure J.3 – Create MeterConfig – Two Meters – Step 3 232
Figure J.4 – Create MeterConfig – Two Meters – Step 4 233
Figure J.5 – Create MeterConfig – Update MeterConfig (add MeterMultiplies, modify formNumber and ConfigurationEvent) Step 1 234
Figure J.6 – Update MeterConfig (add MeterMultiplies, modify formNumber and ConfigurationEvent) Step 2 235
Figure J.7 – Update MeterConfig (add MeterMultiplies, modify formNumber and ConfigurationEvent) Step 3 236
Figure J.8 – Update MeterConfig (add MeterMultiplies, modify formNumber and ConfigurationEvent) Step 4 237
Figure J.9 – Update MeterConfig (delete details) – Step 1 238
Figure J.10 – Update MeterConfig (delete details) – Step 2 239
Figure J.11 – Update MeterConfig (delete details) – Step 3 240
Figure J.12 – Update MeterConfig (delete details) – Step 4 241
Figure J.13 – Delete MeterConfig – Step 1 242
Figure J.14 – Delete MeterConfig – Step 2 243
Figure J.15 – Delete MeterConfig – Step 3 244
Figure J.16 – Delete MeterConfig – Step 4 245
Figure J.17 – Create UsagePointConfig – Step 1 246
Figure J.18 – Create UsagePointConfig – Step 2 247
Figure J.19 – Create UsagePointConfig – Step 3 247
Figure J.20 – Create UsagePointConfig – Step 4 248
Figure J.21 – Create MasterDataLinkageConfig – Step 1 249
Figure J.22 – Create MasterDataLinkageConfig – Step 2 250
Figure J.23 – Create MasterDataLinkageConfig – Step 3 251
Figure J.24 – Create MasterDataLinkageConfig – Step 4 252
Figure J.25 – Delete MasterDataLinkageConfig – Step 1 253
Figure J.26 – Delete MasterDataLinkageConfig – Step 2 254
Figure J.27 – Delete MasterDataLinkageConfig – Step 3 255

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
IEC SC 57 WG 9 Smart Grids
Single user licence
No reproduction or circulation
Oct 2024

Figure J.28 – Delete MasterDataLinkageConfig – Step 4 256
Figure J.29 – Execute OperationSet – Step 1 258
Figure J.30 – Execute OperationSet – Step 2 258
Figure J.31 – Execute OperationSet – Step 3 259
Figure J.32 – Execute OperationSet – Step 4 260
Figure K.1 – EUMED Metering Class diagram 264
Figure L.1 – MeterReadingSet schema for EUMED Metering 298
Figure L.2 – The MeterReading schema used for EUMED Metering 299
Figure L.3 – Meter Entity 299
Figure L.4 – Customer Schema used for EUMED Metering 300
Figure L.5 – IntervalBlock Schema used for EUMED Metering 300
Figure L.6 – IntervalReading schema used for EUMED metering 301
Figure L.7 – ReadingQuality element for EUMED Metering 301
Figure L.8 – UsagePoint element used in EUMED Metering 302
Figure L.9 – UsagePointLocation element used in EUMED Metering 302
Figure L.10 – ReadingType element used in EUMED Metering 303
Figure L.11 – Name element used in EUMED Metering 304
Figure L.12 – NameType element used in EUMED Metering 304
Figure L.13 – NameTypeAuthority element used in EUMED Metering 304
Figure M.1 – Load curve XML message payload 351
Figure M.2 – Max power XML message payload 352
Figure M.3 – Index XML message payload (extract 1) 353
Figure M.4 – Index XML message payload (extract 2) 354

Table 1 – Business functions and abstract components 23
Table 2 – Classes for meter reading and control 24
Table 3 – Classes related to meter reading and control 27
Table 4 – IEC 61968-9 configuration profiles 71
Table A.1 – Recommended verb usage with related profiles 85
Table C.1 – Time-period of interest enumerations 90
Table C.2 – Data qualifier enumerations 91
Table C.3 – measuringPeriod enumerations 92
Table C.4 – Demand normalization scalars 93
Table C.5 – Accumulation behaviour enumerations 95
Table C.6 – Customary accumulation behaviour enumerations 97
Table C.7 – Direction of flow enumeration 98
Table C.8 – DirectionOfFlow enumeration equivalencies 103
Table C.9 – Commodity 104
Table C.10 – measurementKind Index 106
Table C.11 – Harmonic and Interharmonic enumerations 114
Table C.12 – Argument enumerations 115
Table C.13 – Time Of Use Enumerations 116
Table C.14 – Critical Peak Period Enumerations 116

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEEE WG on Smart Grids
No reproduction or circulation
Oct 2024

Table C.15 – Consumption Tier Enumerations 117
Table C.16 – Example Combinations of TOU and Consumption Tier Enumerations 117
Table C.17 – Phase enumerations 119
Table C.18 – Power of ten enumerations 122
Table C.19 – Historical concentration multiplier enumerations 123
Table C.20 – Base SI units of measure 125
Table C.21 – Derived SI units of measure with special names 125
Table C.22 – Derived SI Units of Measure without Special Names 127
Table C.23 – Non-SI Units of Measure accepted for use with the International System of Units 131
Table C.24 – Dimensionless and Concentration Units of Measure 132
Table C.25 – Non-SI units whose values in SI units shall be obtained experimentally 134
Table C.26 – Other Non-SI Units of Measure 135
Table C.27 – Non-SI Units Associated with the CGS and the CGS-Gaussian System of Units 139
Table C.28 – Currency units of measure (from ISO 4217) 140
Table C.29 – ReadingType Examples 142
Table D.1 – System identifier 147
Table D.2 – Example quality code categories 147
Table D.3 – Validity related codes 148
Table D.4 – Diagnostics related codes 149
Table D.5 – Power quality related codes 150
Table D.6 – Tamper / revenue protection related codes 150
Table D.7 – Data collection related codes 151
Table D.8 – Failed reasonability testing related codes 152
Table D.9 – Failed validation testing related codes 152
Table D.10 – Edit related codes 154
Table D.11 – Estimation related codes 155
Table D.12 – Questionable related codes 156
Table D.13 – Derived related codes 157
Table D.14 – Projected related codes 158
Table D.15 – Example Quality Codes 159
Table E.1 – Example pairings between meter events and EndDeviceEvent enumerated mnemonics 161
Table E.2 – EndDeviceType codes 164
Table E.3 – EndDeviceDomain Codes 165
Table E.4 – EndDeviceSubdomain codes 167
Table E.5 – EndDeviceEventOrAction codes 173
Table E.6 – Battery events 180
Table E.7 – Billing events 181
Table E.8 – Cartridge events 181
Table E.9 – Clock events 182
Table E.10 – Communication events 183
Table E.11 – Configuration events 184

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESG WG on Smart Grids
No reproduction or circulation
Oct 2024

Table E.12 – Demand events 185
Table E.13 – Firmware events 185
Table E.14 – GasSupply events 187
Table E.15 – Installation events 187
Table E.16 – LoadControl events 187
Table E.17 – LoadProfile events 188
Table E.18 – Logs events 188
Table E.19 – Memory events 189
Table E.20 – Metrology events 189
Table E.21 – MobileSecurity events 191
Table E.22 – Modem events 192
Table E.23 – ModuleFirmware events 192
Table E.24 – Network events 192
Table E.25 – PAN / HAN events 193
Table E.26 – Power events 194
Table E.27 – Pressure events 197
Table E.28 – RCDSwitch events 197
Table E.29 – Security events 198
Table E.30 – Temperature events 200
Table E.31 – VideoDisplay events 200
Table E.32 – WaterSupply events 200
Table F.1 – Demand Controls 201
Table F.2 – LoadControl Controls 202
Table F.3 – PAN / HAN Controls 202
Table F.4 – RCDSwitch Controls 202
Table J.1 – Exemplary master data management / data synchronization use cases 213
Table K.1 – Entities of the EUMED Metering Model 263
Table K.2 – Association ends of EUMED Metering ENTITIES:: MeterReadingSet with other classes 265
Table K.3 – Attributes of EUMED Metering ENTITIES::MeterReading 265
Table K.4 – Association ends of EUMED Metering ENTITIES:: MeterReading with other classes 266
Table K.5 – Attributes of EUMED Metering ENTITIES::Meter 266
Table K.6 – Association ends of EUMED Metering ENTITIES::Meter with other classes 266
Table K.7 – Attributes of EUMED Metering ENTITIES::Customer 267
Table K.8 – Association ends of EUMED Metering ENTITIES:: Customer with other classes 267
Table K.9 – Association ends of Metering::IntervalBlock with other classes 267
Table K.10 – Attributes of EUMED Metering ENTITIES::IntervalReading 268
Table K.11 – Association ends of EUMED Metering ENTITIES:: IntervalReading with other classes 268
Table K.12 – Attributes of EUMED Metering ENTITIES::ReadingQuality 268
Table K.13 – Association ends of EUMED Metering ENTITIES:: ReadingQuality with other classes 269
Table K.14 – Attributes of EUMED Metering ENTITIES::UsagePoint 269

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEC/SC 8G on Smart Grids
No reproduction or circulation
Oct 2024

Table K.15 – Association ends of EUMED Metering ENTITIES:: UsagePoint with other classes 269
Table K.16 – Attributes of EUMED Metering ENTITIES::UsagePointLocation 270
Table K.17 – Association ends of EUMED Metering ENTITIES:: UsagePointLocation with other classes 270
Table K.18 – Attributes of EUMED Metering ENTITIES::ReadingType 270
Table K.19 – Association ends of EUMED Metering ENTITIES:: ReadingType with other classes 273
Table K.20 – Attributes of EUMED Metering ENTITIES::Name 273
Table K.21 – Association ends of EUMED Metering ENTITIES::Name with other classes 273
Table K.22 – Attributes of EUMED Metering ENTITIES::NameType 274
Table K.23 – Association ends of EUMED Metering ENTITIES:: NameType with other classes 274
Table K.24 – Attributes of EUMED Metering ENTITIES::NameTypeAuthority 274
Table K.25 – Association ends of EUMED Metering ENTITIES:: NameTypeAuthority with other classes 274
Table K.26 – Association ends of EUMED Metering ENTITIES:: MeterReadingSet with other classes 275
Table K.27 – Datatypes of EUMED Metering Model 275
Table K.28 – Literals of EUMED Metering DATA TYPES::AccumulationKind 276
Table K.29 – Literals of EUMED Metering DATA TYPES::AggregateKind 277
Table K.30 – Literals of EUMED Metering DATA TYPES::CommodityKind 278
Table K.31 – Literals of EUMED Metering DATA TYPES::Currency 279
Table K.32 – Literals of EUMED Metering DATA TYPES::CustomerKind 283
Table K.33 – Attributes of EUMED Metering DATA TYPES::DateTimeInterval 283
Table K.34 – Literals of EUMED Metering DATA TYPES::FlowDirectionKind 284
Table K.35 – Literals of EUMED Metering DATA TYPES::MacroPeriodKind 285
Table K.36 – Literals of EUMED Metering DATA TYPES::MeasurementKind 286
Table K.37 – Literals of EUMED Metering DATA TYPES::MeasuringPeriodKind 289
Table K.38 – Literals of EUMED Metering DATA TYPES::PhaseCode 290
Table K.39 – Attributes of EUMED Metering DATA TYPES::RationalNumber 291
Table K.40 – Attributes of EUMED Metering DATA TYPES::ReadingInterharmonic 291
Table K.41 – Literals of EUMED Metering DATA TYPES::UnitMultiplier 292
Table K.42 – Literals of EUMED Metering DATA TYPES::UnitSymbol 293
Table L.1 – Association ends of EUMED Metering ENTITIES:: IntervalBlock with other classes 300

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
SUB-DC user licence
FESG WG on Smart Grids
No reproduction or circulation
Oct 2024

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

ENTERPRISE BUSINESS FUNCTION INTERFACES FOR UTILITY OPERATIONS –

Part 9: Interfaces for meter reading and control

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) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://patents.iec.ch. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 61968-9 has been prepared by IEC technical committee 57: Power systems management and associated information exchange. It is an International Standard.

This third edition cancels and replaces the second edition published in 2013. This edition constitutes a technical revision.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Withdrawn
Withdrawn
Withdrawn

This edition includes the following significant technical changes with respect to the previous edition:

a) IEC 61968-100:2022 has superseded IEC 61968-100:2013 that was used in many of the examples in IEC 61968-9:2013. Applicable portions of the current version of IEC 61968-9 have been updated to reflect message envelope and message exchange patterns specified in IEC 61968-100:2022. Although the use of IEC 61968-100 is highly recommended, it is possible to utilize IEC 61968-9 without using IEC 61968-100 message envelopes or exchange patterns. This was true for IEC 61968-9:2013 and remains true for this IEC 61968-9:2024.

b) Unless noted otherwise, the IEC 61968-9:2013 XSDs that remain in IEC 61968-9:2024 are unchanged except for changes that have been made for compatibility with IEC 61968-100:2022 as described in 61968-100:2022. This supports the abstract payload construct in the Message.xsd defined in IEC 61968-100:2022. As a result, these modified profiles have a new namespace. One notable exception is that the MeterReadSchedule.xsd has been replaced with a new MeterReadSchedules.xsd. It has structural changes to support improved functionality as described in 5.3.3. Another exception is that the GetMeterReadSchedule.xsd has been replaced with GetMeterReadSchedules.xsd. Also note that IEC 61968-8:2015 profiles listed in the table in Annex A will require edits in order to be compatible with IEC 61968-100:2022.

c) The "Verbs" listed in IEC 61968-9:2013, Annex A have been moved to IEC 61968-100:2022. Annex A now (in this third edition) instead provides a table which recommends the use of certain verbs to accompany profiles related to 61968-9;

d) The "Reply Error Codes" listed in IEC 61968:2013, Annex B have been moved to IEC 61968-100:2022. Annex B now (in this third edition) instead provides a few recommendations on how to handle certain error situations which might originate in 61968-9;

e) Customer profiles CustomerAccountConfig, CustomerAgreementConfig, CustomerConfig, GetAuxiliaryAgreementConfig, GetCustomerAccountConfig, GetCustomerAgreementConfig, GetServiceCategoryConfig, GetCustomerConfig, GetMeterServiceRequests, GetPricingStructureConfig, GetServiceLocationConfig, GetServiceSupplierConfig, MeterServiceRequests, PricingStructureConfig, ServiceCategoryConfig, ServiceLocationConfig, and ServiceSupplierConfig have been deleted from this document and moved to IEC 61968-8. However, certain references to these profiles have been retained for the sake of usability. A "MeterServiceRequest" which might by issued by a function within IEC 61968-9:2013, is now shared with 61968-8 which also could just as well have a need to issue such a request. Users of one part may have to refer to another part within the 61968 series in order to obtain a shared schema. Furthermore, certain names may change when they are moved from one part to another. For example, a "MeterServiceRequest" is now referred to as a (more generic) "ServiceRequest";

f) Additional enumerations have been provided in the annexes for ReadingTypes (Annex C), EndDeviceEventTypes (Annex E) and EndDeviceControlTypes (Annex F);

g) Statements have been added to certain figures, tables, schemas, and enumerations throughout the document that indicate that they are reproduced with the permission of the UCA International User Group (UCAIug). These items are derived from the Common Information Model (CIM);

h) The "Conventions for naming and identifying objects" provided in IEC 61968:2013, Annex G has been deleted. The user should instead consider IEC 61968-11, *Common information model (CIM) extensions for Operation Support* or IEC 61970-301, *Energy management system application program interface (EMS-API) – Part 301: Common information model (CIM) base*. This deletion causes subsequent Annexes in IEC 61968:2013, to be renumbered in this third edition;The "Notes on extended use of IEC 61968-100" provided in Annex M of IEC 61968:2013, have been deleted. It is recommended that the reader instead obtain a copy of the most recent version of 61968-100.

i) The profiles in IEC 61968-9:2013, Annex H "(Normative) XML Schemas for Message Payloads" and IEC 61968-9:2013, Annex I "(Informative) XML Schemas for Message Payloads" have been removed from the document. Instead, there is now (in this third edition) an Annex G which provides links to the profiles at the UCAIug website,

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Withdrawn

j) Small changes have been made to the document for better comprehension and usability;

k) Added normative and informative annexes (K,L, and M) to describe how IEC 61968-9 can be used to support European regulation regarding access to data and interoperability. In particular, these annexes describe the EUMED Metering profile, and serve to draft requirements to address provisions laid down in Articles 20, 23, and 24 of the Electricity Directive (EU) 2019/944. For more information refer to IEC 62325-451-10.

The text of this International Standard is based on the following documents:

Draft	Report on voting
57/2670/FDIS	57/2679/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 61968 series, published under the general title *Enterprise business function interfaces for utility operations*, can be found on the IEC website.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

This IEC standard includes Code Components i.e. components that are intended to be directly processed by a computer. Such content is any text found between the markers <CODE BEGINS> and <CODE ENDS>, or otherwise is clearly labelled in this standard as a Code Component.

The purchase of this IEC standard carries a copyright license for the purchaser to sell software containing Code Components from this standard to end users either directly or via distributors, subject to IEC software licensing conditions, which can be found at: https://www.iec.ch/webstore/custserv/pdf/CC-EULA.pdf.

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

- reconfirmed,
- withdrawn, or
- revised.

IMPORTANT – The "colour inside" logo on the cover page of this document 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.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEC SC WG on Smart Grids
No reproduction or circulation
Oct 2024

INTRODUCTION

The purpose of this part of IEC 61968 is to define a standard for the integration of Metering Systems (MS), which would include traditional (one or two-way) Automated Meter Reading (AMR) Systems, with other systems and business functions within the scope of IEC 61968. The scope of this document is the exchange of meter reading, transactions, event and control information between systems within the utility enterprise and between enterprises. The specific details of communication protocols those systems employ are outside the scope of this document. Instead, this document will recognize and model the general capabilities that can be potentially provided by advanced and/or legacy meter infrastructures, including two-way communication capabilities such as load control, dynamic pricing, outage detection, distributed energy resource (DER) control signals and on-request read.

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

ENTERPRISE BUSINESS FUNCTION INTERFACES FOR UTILITY OPERATIONS –

Part 9: Interfaces for meter reading and control

1 Scope

This part of IEC 61968 specifies the information content of a set of message types that can be used to support many of the business functions related to meter reading and control. Typical uses of the message types include meter reading, controls, events, customer data synchronization and customer switching. Although intended primarily for electrical distribution networks, IEC 61968-9 can be used for other metering applications, including non-electrical metered quantities necessary to support gas and water networks.

The purpose of this document is to define a standard for the integration of metering systems (MS), which includes traditional manual systems, and (one or two-way) automated meter reading (AMR) systems, and meter data management (MDM) systems with other enterprise systems and business functions within the scope of IEC 61968. The scope of this document is the exchange of information between metering systems, MDM systems and other systems within the utility enterprise. The specific details of communication protocols those systems employ are outside the scope of this document. Instead, this document will recognize and model the general capabilities that can be potentially provided by advanced and/or legacy meter infrastructures, including two-way communication capabilities such as load control, dynamic pricing, outage detection, distributed energy resource (DER) control signals and on-request read. In this way, this document will not be impacted by the specification, development and/or deployment of next generation meter infrastructures either through the use of standards or proprietary means.

Figure 1 describes the scope of this document from the perspective of direct and causal or indirect impacts of IEC 61968-9 messages. Where the focus of IEC 61968-9 is to define standard messages for the integration of enterprise applications, these messages may be directly or indirectly related to information flows within a broader scope. Examples would include messaging between head end systems and meters or PAN devices. The various components described later in this document will typically fall into either the category of a metering system (MS) head end, an MDM or other enterprise application (e.g. OMS, DRMS, CIS).

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Publicly Available Specification
Energy Management Systems WG 9
No reproduction or distribution

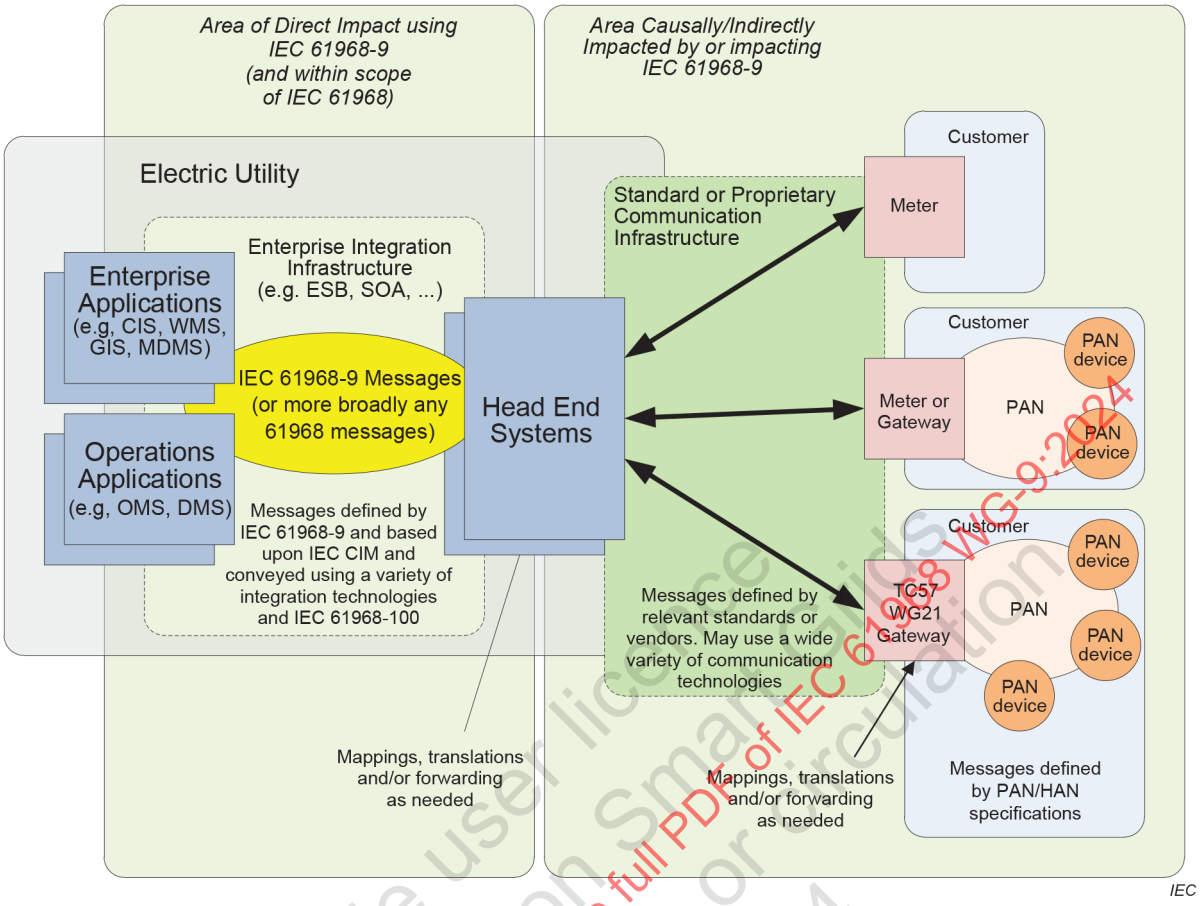


Figure 1 reproduced with the permission of UCAIug.

Figure 1 – IEC 61968-9 scope

The capabilities and information provided by a meter reading and meter data management systems are important for a variety of purposes, including (but not limited to) interval data, time-based demand data, time-based energy data (usage and production), outage management, service interruption, service restoration, quality of service monitoring, distribution network analysis, distribution planning, demand response, customer billing and work management. This standard also extends the CIM (Common Information Model) to support the exchange of meter data.

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 60050-112, *International Electrotechnical Vocabulary (IEV) – Part 112: Quantities and units*

IEC 60050-300, *International Electrotechnical Vocabulary (IEV) – Part 300: Electrical and electronic measurements and measuring instruments – Part 311: General terms relating to measurements – Part 312: General terms relating to electrical measurements – Part 313: Types of electrical measuring instruments – Part 314: Specific terms according to the type of instrument*

IEC 61968-1, *Application integration at electric utilities – System interfaces for distribution management – Part 1: Interface architecture and general recommendations*

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEC WG on Smart Grids
No reproduction or circulation
Oct 2024

IEC TS 61968-2, *Application integration at electric utilities – System interfaces for distribution management – Part 2: Glossary*

IEC 61968-8:2015, *Application integration at electric utilities – System interfaces for distribution management – Part 8: Interfaces for customer operations*

IEC 61968-11, *Application integration at electric utilities – System interfaces for distribution management – Part 11: Common information model (CIM) extensions for distribution*

IEC 61968-100:2022, *Application integration at electric utilities – System interfaces for distribution management – Part 100: IEC implementation profiles for application integration*

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

IEC TR 62051-1, *Electricity metering – Data exchange for meter reading, tariff and load control – Glossary of terms – Part 1: Terms related to data exchange with metering equipment using DLMS/COSEM*

ISO 4217:2015, *Codes for the representation of currencies*

ISO 8601:2004, *Data Elements and Interchange Formats – Information Interchange – Representation of Dates and Times*

CIM Meter Reading and Control Profile Messages, Edition 3, available at https://cimug.ucaiug.org

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-300, IEC TS 61968-2, IEC TR 62051-1, IEC 62055-31 and the following apply.

Where there is a difference between the definitions in this document and those contained in other referenced IEC standards, then those defined in IEC TS 61968-2 shall take precedence over the others listed, and those defined in IEC 61968-9 shall take precedence over those defined in IEC TS 61968-2.

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

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

3.1.1
demand response
set of processes and programs that are used to reduce consumption

Note 1 to entry: This may be done on an economic, mandatory or emergency basis.

3.1.2
end device
equipment located at the end of the communication system, usually on the customer premises

Note 1 to entry: An end device may perform functions such as metrology, connect/disconnect, load control, demand response, or other functions, and may have power relay and/or local communications capability. This is represented within the CIM using the EndDevice class. Meters and PAN devices are examples of end devices.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence for IEC WG on Smart Grids
No reproduction or circulation
Oct 2024

3.1.3
head end
component of a metering system that collects data from and issues controls to end devices

Note 1 to entry: A head end may also manage the communication system used to communicate with the end devices. From the perspective of enterprise integration, the head end acts as a proxy for end devices.

3.1.4
gateway
device that may be used to manage devices on a PAN and participate in internet-based interactions

Note 1 to entry: A gateway may apply a transformation from one protocol to another.

3.1.5
load control device
type of EndDevice which can receive signals causing it to shed load for the purposes of maintaining network reliability and/or commercial agreements

3.1.6
meter
type of end device which performs metrology and supports the tariffing of the distribution and/or transmission network

Note 1 to entry: This is represented using the CIM Meter class, which is a subclass of EndDevice.

Note 2 to entry: As an end device, a meter will typically, but not always, have a communication link with a head end system.

3.1.7
meter changeout
meter exchange
process of replacing an existing meter with a new meter

Note 1 to entry: The installer will customarily follow a work order which specifies a given location, and usually requires that he or she capture readings from the old and new meters, and record the time and day in which the work was performed.

3.1.8
meter data manager
system that manages meter data, and typically provides a variety of value added functionalities such as VEE

3.1.9
premises area network
fully inclusive of the scope of a home area network (HAN) as it also covers commercial premises

3.1.10
PAN device
type of end device that is located on a customer premises and communicates using a PAN

Note 1 to entry: A PAN device can typically accept controls and/or report events.

Note 2 to entry: PAN devices commonly use meters as communication gateways.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEEE SCC WG on Smart Grids
No reproduction or circulation
Oct 2024

3.2 Abbreviated terms

AM	asset management
AMR	automated meter reading
AMI	advanced metering infrastructure
CIM	common information model
CIS	customer information system
COSEM	companion specification for energy metering
DLMS UA	device language message specification user association
DMS	distribution management system
DR	demand response
DRMS	demand response management system
HAN	home area network
IDR	interval data recorder
IEC	International Electrotechnical Commission
LC	load control
LDC	load control system
LMS	load management system
MAM	meter asset management
MDM	meter data management
MDM	master data management
MM	meter maintenance
MR	meter reading
MS	metering system
NO	network operations
OMS	outage management system
POS	point of sale
PAN	premises area network (includes scope of HAN)
RF	radio frequency
SM	smart meter
UML	unified modeling language
VEE	validating, editing, and estimating
WM	work management
XSD	XML schema

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
TESC WG on Smart Grids
No reproduction or circulation
Oct 2024

4 Reference and information models

4.1 General approach to messaging

This document does not specify a particular technology to represent text, nor does it specify a particular technology to transport messages. However IEC 61968-100 is highly recommended.

Any use of IEC 61968-100:2022 for IEC 61968-9 related messaging should use the corresponding schemas provided in Annex G. The XSDs in Annex G include modifications for compatibility with IEC 61968-100:2022. Refer to IEC 61968-100:2022, Annex C for a description of these changes and a pointer to a tool that can be used to make the required modifications. The referenced tool is open source, Apache licensed, and maintained by UCAIug.

4.2 General approach to metering systems

The spinning disk in an electromechanical meter generally serves as a pulse initiator to the meter recorder module. In a similar fashion, solid-state meters may also employ a metrology unit that generates pulses which represent a fraction of a kWh, and if more sophisticated, the solid-state meter may have a meter recorder which is able to accumulate many different kinds of information and store it for presentation to the meter communications module using a message and table-driven protocol such as ANSI C12.19 or IEC 62056.

The most common metered data element is kWh, but many electricity meters can also capture kW, kVAr, kVArh, and other similar billing quantities. Some meters can also capture pure engineering quantities such as voltage, current, power factor, etc.

Some AMR systems attempt to add value to meters by adding functionality that the meter may lack. For simple meters (e.g. energy only) it is common for an AMR meter module to add the capability to perform demand metering, Interval Data Recording (IDR), maintain an energisation count, or even provide estimates of certain engineering quantities such as voltage.

Commercial and industrial meters often employ current transformers and voltage transformers to meter the actual service. Primary voltages and currents are scaled down using potential transformers (PTs) and current transformers (CTs) so that the meter does not have to be constructed to withstand the high voltages and currents actually delivered to the load. Secondary voltage or current values are those that are often measured directly by the meter. Secondary values are small percentage of the primary values that may actually delivered to or connected to the load. If secondary voltages and currents are measured by the meter, these can be converted back to primary values using the PT and CT ratios, which are just the ratio of primary to secondary values.

The metering system will convey meter data and other value-added data through the metering system network to the destination. Depending on the system, the journey may involve multiple steps through public or private networks, licensed or unlicensed RF spectrums, standardized or proprietary systems, in a one-way or two-way fashion.

Some general operations or services can be defined for a metering system. These general operations will translate to specific actions in the context of a given metering solution.

General operations can be scheduled or called on-demand. Each operation returns an answer with an optional status. A message encapsulates a general operation.

Readers of IEC 61968-9 interested in additional information may refer to other documents including IEC 62056, DLMS UA (Device Language Message Specification User Association) and the COSEM model: COmpanion Specification for Energy Metering.

4.3 Meter reading and control functions and components

It should be noted that the message types defined in this document may be sent or received by any type of component within a distribution management system (DMS) system.

Table 1 shows these functions and typical abstract components that are expected to be producers of information for these message types. Typical consumers of the information include, but are not restricted to, the other components as listed in IEC 61968-1.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEC Webstore
Multi-user licence
Reproduction or circulation
Not permitted
Oct 2024

Table 1 – Business functions and abstract components

Business functions	Business sub-functions	Abstract components
Meter reading and control (MR)	Metering system (MS)	Data collection
		End point controls
		End point reconfiguration
		Disconnect/reconnect
		Demand reset
		On request read
		Point of sale
		Outage detection and restoration verification
		Power reliability and quality events
		Metering system events
	Meter maintenance and asset management	End point install, configure, remove, repair, disconnect, reconnect
		End point asset history
		End point reconfiguration
		Special read
		Meter service request
		Tariffs
	Meter data management (MDM)	Meter data repository
		Usage history
		Validation, estimation and editing
		Customer billing data
		End device controls and events
	Demand response (DR)	Real-time pricing
		Emergency reductions
		Economic reductions
		Program registration
	Load management (LM)	Load analysis
		Load control
		Demand response
		Performance measurements
		Risk management

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESG WG on Smart Grids
No reproduction or circulation
Oct 2024

4.4 Static information model

4.4.1 General

The information model relevant to meter reading and control consists of classes that provide a template for the attributes for each message.

The classes are defined in detail in IEC 61968-11, *Common Information Model (CIM) extensions for distribution* or in IEC 61970-301, *Energy management system application program interfaces – Common Information Model core.*

4.4.2 Classes for meter reading and control

Table 2 lists classes used within message types. Usually all the attributes of these classes are contained within a message type. The descriptions provided describe usage within this document.

Classes described as type "Asset" are defined in the 61968/Assets package of the CIM.

Classes described as type "Metering" are defined in the 61968/Metering package of the CIM.

Classes described as type "Profile" are contextual profiles defined for 61968-9 that describe message definitions defined using CIM objects.

Table 2 – Classes for meter reading and control

Class/Noun	Type	Description
Channel	Metering	A single path for the collection or reporting of register values over a period of time. For example, a register which measures forward energy can have two channels, one providing bulk quantity readings and the other providing interval readings of a fixed interval size.
ComFunction	Metering	Communication function of communication equipment or a device such as a meter.
ComModuleConfig	Profile	Profile for configuring communications modules.
ConfigurationEvent	Metering	Used to report details on creation, change or deletion of an entity or its configuration.
DemandResponseProgram	Metering	Demand response program.
DeviceFunction	Metering	Function performed by a device such as a meter, communication equipment, controllers, etc.
EndDevice	Metering	The EndDevice is equipment that performs the role of an end device. It may contain functionality such as metrology, communications, load control, connect/disconnect, or other capabilities. It is known as "the meter", "a smart meter", an "advanced meter", "air conditioner", "refrigerator", "pool pump", etc. that a CommModule and/or Meter may monitor and/or control. The asset may be owned by a consumer, a service provider, utility or other party.
EndDeviceConfig	Profile	Message used to convey descriptions of one or more EndDevices.
EndDeviceControl	Metering	Used to issue commands to EndDevices such as meters. May be addressed by EndDevice or by EndDeviceGroup. EndDeviceControls may have control types and parameters.
EndDeviceControls	Profile	Message used to convey one or more EndDeviceControls
EndDeviceControlType	Metering	Defines types of EndDeviceControls
EndDeviceEvent	Metering	Used to report events detected by end devices such as meters. Each EndDeviceEvent has an event type and a timestamp.
EndDeviceEvents	Profile	Message used to convey one or more EndDeviceEvents.
EndDeviceEventType	Metering	Defines types of EndDeviceEvents
EndDeviceFirmware	Profile	Profile for EndDevice firmware configuration messages.
EndDeviceGroup	Metering	An EndDeviceGroup is used for grouping end devices for a variety of purposes including, but not limited to, load control and other types of demand response. An EndDeviceGroup may belong to another EndDeviceGroup, and an end device may belong to zero or more EndDeviceGroups. In some cases the group ID is maintained within the end device, but in other cases it can be managed by a metering system.
EndDeviceGroups	Profile	Use to convey changes in group membership

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence only, copying and networking prohibited
IEC CSC WG 09 Smart Grids
No reproduction or circulation

Class/Noun	Type	Description
GetComModuleConfig	Profile	Each profile will have a corresponding ""Get" profile that is used to convey parameters on GET requests. See Annex G.
GetCustomerMeterDataSet		
GetEndDeviceConfig		
GetEndDeviceControls		
GetEndDeviceEvents		
GetEndDeviceGroups		
GetMeterConfig		
GetMeterReadings		
GetMeterReadSchedule		
GetUsagePointConfig		
GetUsagePointGroups		
GetUsagePointLocationConfig		
IntervalBlock	Metering	Time sequence of Readings of the same ReadingType. Contained IntervalReadings may need conversion through the application of an offset and a scalar defined in associated Pending.
IntervalReading	Metering	Data captured at regular intervals of time. Interval data could be captured as incremental data, absolute data, or relative data. The source for the data is usually a tariff quantity or an engineering quantity. Data is typically captured in time-tagged, uniform, fixed-length intervals of 5, 10, 15, 30, or 60 minutes. NOTE Interval Data is sometimes also called "Interval Data Readings" (IDR).
LegacyObjectIdentificationRevisionSets	Part 100	This profile is used to create, change, or delete identifiers of CIM objects as described in IEC 61968-100:2022. It replaces the ObjectNamesConfig that previously existed in IEC 61968-9:2013.
MasterDataLinkageConfig	Profile	A message profile used to establish or modify relationships between objects.
Meter	Metering	The Meter class is used to describe meters. A Meter is a type of EndDevice typically used to measure and potentially monitor a customer load. The EndDevice class definition should be used as the basis for Meter class.
MeterConfig	Profile	Message profile for Meter configuration messages.
MeterReading	Metering	A set of values obtained from the meter. Each MeterReading may have multiple ReadingTypes, and each ReadingType may contain multiple values.
MeterReadings	Profile	Profile for conveying MeterReadings.
MeterReadSchedules	Profile	A MeterReadSchedules message is used to schedule meter readings.
MeterServiceRequests	Shared with Part 8.	A meter service request is a type of work that can be used for a variety of meter service related activities. These activities would include meter installation, meter change out, customer disconnect/reconnect, , etc. The user is referred to 61968-8 for the profile for ServiceRequests.
Pending	Metering	When present, a scalar conversion that is associatied with IntervalBlock and which needs to be applied to every contained IntervalReading value. This conversion results in a new associated ReadingType, reflecting the true dimensions of interval reading values after the conversion.
Reading	Metering	Specific value measured by a meter or other asset. Each Reading is associated with a specific ReadingType.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
FESG WG on Smart Grids
No reproduction or distribution

Class/Noun	Type	Description
ReadingQuality	Metering	Quality of a specific reading value or interval reading value. Note that more than one Quality may be applicable to a given Reading. Typically not unsed unless problems or unusual conditions occur (i.e., quality for each Reading is assumed to be 'Good' unless stated otherwise in associated ReadingQuality).
ReadingQualityType	Metering	Defines types for qualities that can be associated with a reading value.
ReadingType	Metering	Type of data conveyed by a specific Reading.
Register	Metering	Display for quantity that is metered on an end device such as a meter.
SimpleEndDeviceFunction	Metering	Simple end device function distinguished by 'kind': use this class for instances that cannot be represented by another end device function subtype.
UsagePointLocation	Metering	Location of an individual usage point. For residential or most businesses, it is typically the location of a meter on the customer's premises. For transmission, it is the point(s) of interconnection on the transmission provider's transmission system where capacity and/or energy transmitted by the transmission provider is made available to the receiving party. The point(s) of delivery is specified in the service agreement.
UsagePointLocationConfig	Profile	Message used to establish associations to UsagePointLocations.
UsagePoint	Metering	Logical point on a Distribution Network to which Meter Readings and/or End Device Events can be attributed. Used at the place where a physical or virtual meter may be located; however, it is not required that a Meter be present.
UsagePointConfig	Profile	Message used to establish associations to UsagePoints.
UsagePointGroup	Metering	Abstraction for management of group communications within a two-way AMR system or the data for a group of related usage points. Commands can be issued to all of the usage points that belong to a usage point group using a defined group address and the underlying AMR communication infrastructure.
UsagePointGroups	Profile	Message used to establish UsagePointGroups.

4.4.3 Classes related to meter reading and control

Table 3 lists those classes that are associated with meter reading and control classes but only the name of an instance is given within messages defined in this document. The detailed attributes of these classes are used in message types defined in other parts of IEC 61968.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEC WG ordered Copy
No reproduction or circulation
Oct 2024

Table 3 – Classes related to meter reading and control

Related Class	Reference	Description
Organisation	Common	This class is used to identify companies or divisions within companies. Organisations might have roles as utilities, contractors, suppliers, manufacturers, etc.
PowerSystemResource	Core (IEC 61970-301)	An entity that describes the logical view of a component part of the utility business. PowerSystemResources are further classified as EquipmentContainers e.g. Substations, ConductingEquipment, ProtectionEquipment etc. Instances of type PowerSystemResource may be related to instances of type Asset.
PowerTransformer	Wires (IEC 61970-301)	An electrical device consisting of two or more coupled windings, with or without a magnetic core, for introducing mutual coupling between electric circuits. Transformers can be used to control voltage and phase shift (MW flow).
ServiceLocation	Customers	A customer ServiceLocation has one or more UsagePoint(s). Meters are related to a UsagePoint. The location may be a point or a polygon depending on the specific circumstances For distribution, the ServiceLocation is typically the location of the utility customer's premises. Because a customer"s premises may have one or more meters, the UsagePoint is used to define the actual conducting equipment that the EndDevice attaches to at the utility customer"s ServiceLocation. For transmission, it is the point(s) of interconnection on the transmission provider's transmission system where capacity and/or energy transmitted by the transmission provider is made available to the receiving party.
TransformerTank	Wires (IEC 61970-301)	A transformer winding.
NOTE The class definitions provided here are for convenience purposes only. The normative definitions are provided by IEC 61968-11, which describes the distribution extensions to the IEC CIM.		

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEESG WG on Standards
Non-production use only
Oct 2024

5 Meter reading and control message types

5.1 General

The purpose of this Clause 5 is to describe the message types related to IEC 61968-9. It is important to note that some of these message types may also be used by other parts of IEC 61968. The general approach to the realization of message structures and XML schemas for IEC 61968 messages is described in IEC 61968-1 and IEC 61968-100.

Although they may be represented in sequence diagrams for context and completeness, this document does not describe message formats that are defined by other parts of IEC 61968. The message payload structures defined by this part of IEC 61968 are described in Clause 5.

The normative XML schemas for messages defined by this part are provided in Annex G, providing more detailed, annotated descriptions of the message structures. Message structures are diagrammed within Clause 5. The notation convention shows required elements with a solid outline, and optional elements with dashed outlines.

It is also important to note that the use cases and sequence diagrams provided in this document are informative in nature, and are intended to provide examples of usage for the normative messages definitions. There is no intent by this document to standardize specific business processes.

5.2 End device event messages

5.2.1 General

An event is a report of a change of state that may be of potential interest. End device event messages are designed as a means to convey changes in the state of an end device, either by the end device itself or by a proxy on behalf of an end device. End device events are viewed as a potential data stream which is not necessarily synchronized to the collection of meter reading for billing purposes. However, it may still be relevant to the billing process. A meter health alarm might be so severe that all readings from the meter have to be considered invalid. The data consumer (e.g. the MDM System) may receive the available relevant event data, and consider such during the validation, editing, and estimation process. It may also report event data to other enterprise systems and use the data to initiate actions such as creation of a MeterServiceRequest to repair or exchange a faulty meter.

5.2.2 Applications

5.2.2.1 General

This document views "events" as being different than "statuses." Most MR systems do not guarantee a timely delivery of an EndDeviceEvent. A "status" on the other hand is only useful if it is fresh. The status of an EndDevice is generally obtained using an "OnRequest" GetMeterReadings. The report of an EndDeviceEvent will eventually arrive to the utility back office and will be processed in turn. This implies that different applications will naturally fall into different types of message exchanges depending on both the underlying communication technology used by the MR system, as well as the need for having timely data. Some systems may have the ability to report an outage as an event. Other systems may treat it as a status. Most MR systems will report a change to meter health as an event, some may require it to be read as a status. Similarly most MR systems will report power quality as an event although some may treat it as a status.

5.2.2.2 Outage detection

When an outage is not due to a SCADA trip, electric utilities typically depend on the calls from the customers to identify the location of the fault. However, the use of a MS can provide another means to identify the location of trouble. It is often possible for a MS to determine that it has lost contact with a meter, in which case this can be reported as an EndDeviceEvent for potential use by an outage management system. It is important to note that loss of communications with a meter may not be sufficient to identify the existence of an outage, as it is common for some MS technologies to occasionally lose contact with meters for brief periods of time.

Some MS systems may be prone to false alarms as a result of the particular technology used to communicate with the meters. Many vendors are working to improve their technology and the accuracy of the data. The MDM, much like the role it sometimes plays in cleaning up metered data for billing applications, in many instances, can also play a role in cleaning up outage data supplied by the MS before it is relayed to the OMS. Such a decision, to route outage data through the MDM, depends on the capability of the MS to supply accurate data, the ability of the MDM to clean up data without introducing excessive delays, and the ability of the OMS to tolerate false alarms and delays. To support outage analysis and filtering of bad data, the MS may supply audit-trail data and quality of measurement data for the outage event, much like it supplies audit-trail data for billing reads.

Figure 2 describes a deployment in which the MDM is employed to broker outage information.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024

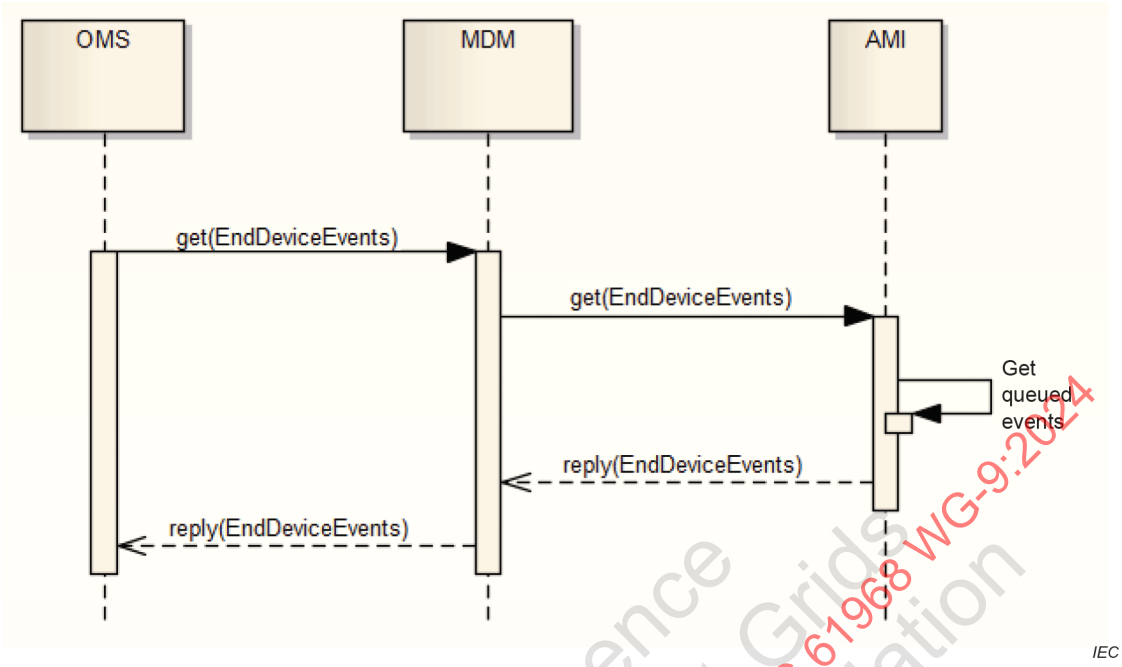


Figure 2 reproduced with the permission of UCAIug.

Figure 2 – Outage Detection, request/reply message exchange, Example 1

Outage management systems analyze the circuit in terms of network topology. The EndDeviceEventType can indicate an event as detected by an end device for consideration in the analysis, as well as other information such as trouble tickets. Where an EndDeviceEvent can indicate a condition of interest that may in fact be an outage, an outage is usually the consequence of outage analysis within an OMS that will group potentially many events together within a single outage.

The use of an MDM to broker outage data is at the discretion of the utility. In some deployments, the outage detection request from the OMS may be issued directly to the MS as in the example of Figure 3.

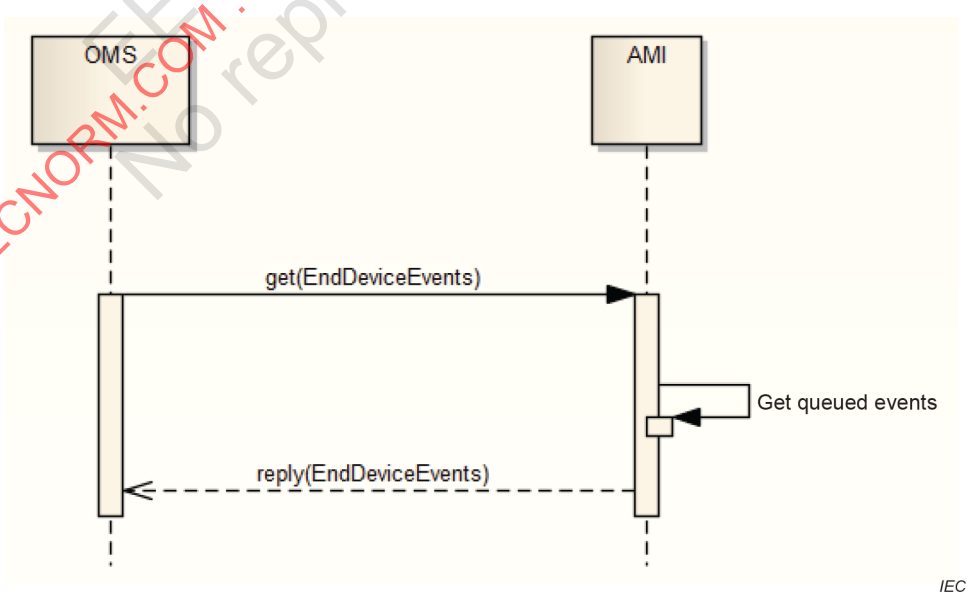


Figure 3 reproduced with the permission of UCAIug.

Figure 3 – Outage Detection, request / reply message exchange, Example 2

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single User licence
IEEE SA WG on Smart Grids
No reproduction or circulation
Oct 2024

A reply (synchronous or asynchronous) from the MS will likely be in the form of zero or more EndDeviceEvents. The mRID or names structure will identify the end devices (e.g. meters) affected by the outage or restoration. Some data consumers that interact with the MS might only know how to deal with meter IDs. Depending on the deployment, it may be required to limit the scope of exchanged mRIDs to that of meters IDs using the Name class and not to that of power system resources in general. EndDeviceEvent.status can indicate "live" or "dead". Some metering systems may supplement the status information with collaborative evidence using the EndDeviceEventDetails class. EndDeviceEventType can be used to indicate that the status applies to a meter or power transformer. The reason for the event can be described (e.g. EndDeviceEvent.reason = "consecutiveFailCounter") and quantified (e.g. EndDeviceEvent.severity = "3").

While the request/reply exchange is useful whenever the OMS needs supplementary information, some MS are able to self-detect outages. A pub/sub exchange is ideal in these situations. Figure 4 shows such an exchange at a deployment where the MDM serves as an information broker. Figure 5 shows a deployment with information going directly from the MS to the OMS.

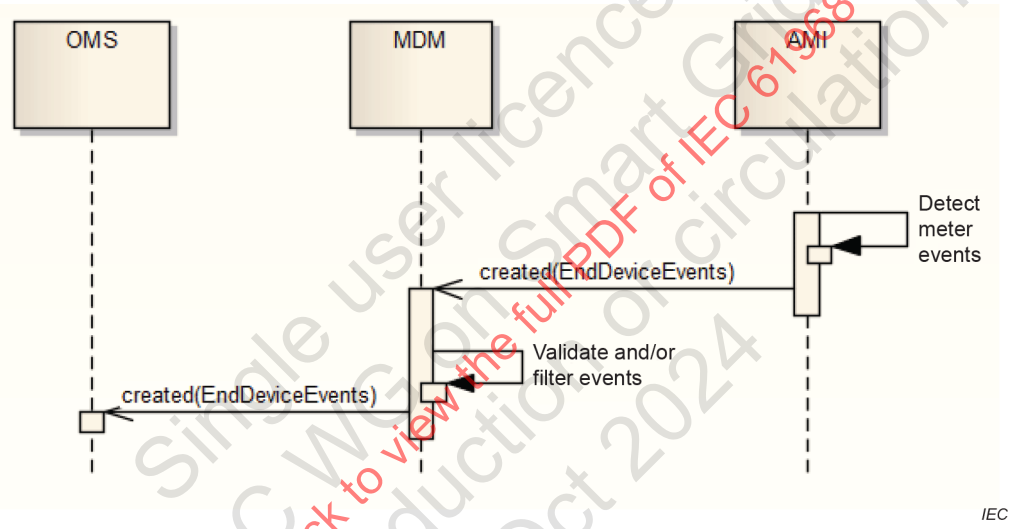


Figure 4 reproduced with the permission of UCAIug.

Figure 4 – Outage Detection, publish/subscribe exchange, Example 1

The sequence diagram in Figure 5 shows an example of event propagation without the use of an MDM.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEC SC WG on Smart Grids
No reproduction or circulation
Oct 2024

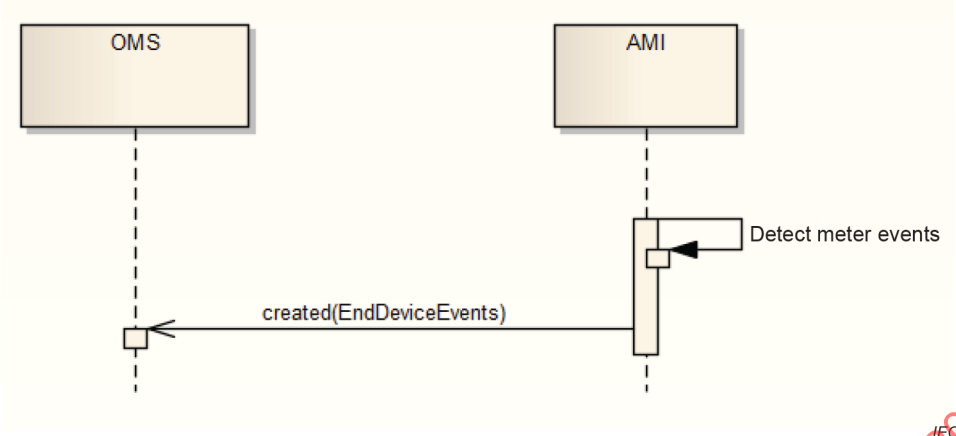


Figure 5 reproduced with the permission of UCAIug.

Figure 5 – Outage Detection, publish/subscribe exchange, Example 2

Some deployments may wish to limit the number of interfaces supported. The MeterReadings message structure also provides the means to convey EndDeviceEvents.

The preceding examples reflect the exchange of end device event messages to support outage management functions. As discussed previously, it is also frequently desirable to have an Outage Management System or MDM System make an on-demand read request to the Metering System to obtain the current energization status of a device. This is accomplished using a get(MeterReadings) exchange as described in 5.3. In such cases, the ReadingType (see Annex C) requested will indicate that it is the energization state that is being requested.

5.2.2.3 Meter Health Events

Some types of meters can sometimes generate meter health events, which can be used to identify issues with meter hardware, configuration or connection that should be resolved. The alarms include such things as diagnostic alarms, tamper alarms, or other unusual conditions. The severity of the alarm might range from a simple notification to "fatal". Often times, resolution of meter health events require a site visit, so typically they result in the creation of a MeterServiceRequest. Meter Health Events events are communicated using EndDeviceEvent messages.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single User Licence
EPG WG on Smart Grids
No reproduction or circulation
© IEC 2024

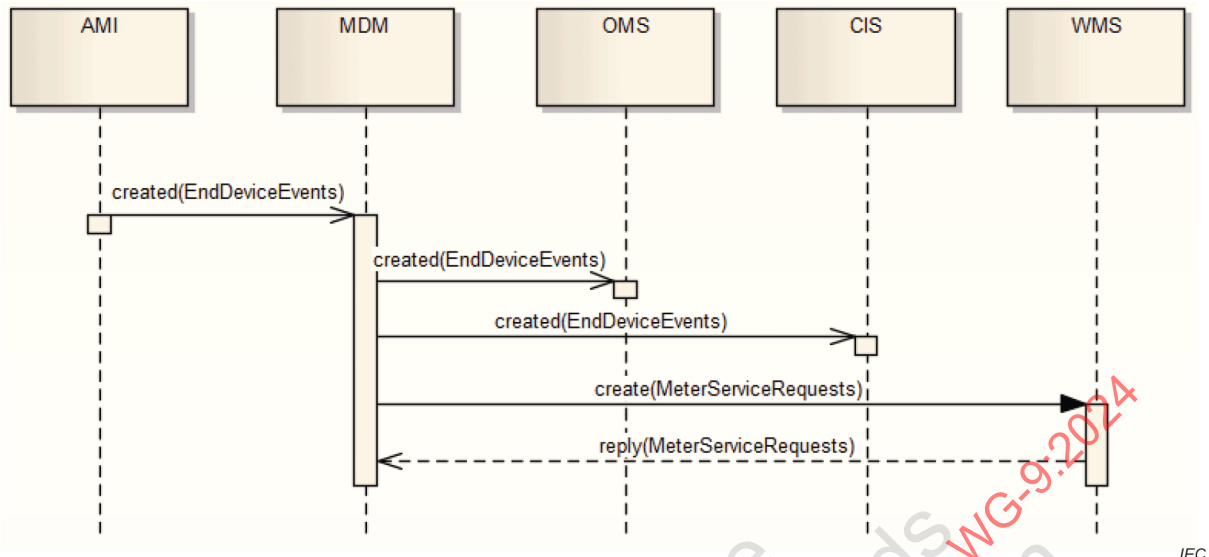


Figure 6 reproduced with the permission of UCAIug.

Figure 6 – Meter Health Event exchange, Example 1

In some deployments, the MDM will be present to broker meter health data for other stakeholders and potentially take action to initiate corrective actions as described in the scenario of Figure 6. Other installations however might not have an MDM or use it in this way. It is possible for the MS to publish data directly to the stakeholders that are equipped to receive it. Such an exchange is depicted in Figure 7.

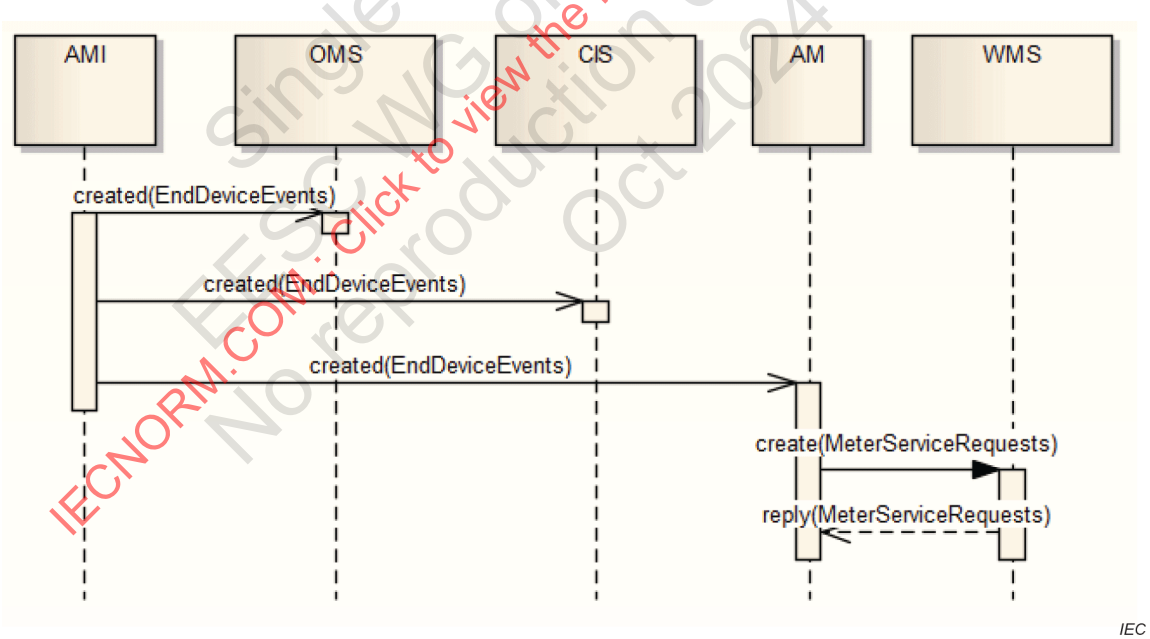


Figure 7 reproduced with the permission of UCAIug.

Figure 7 – Meter Health Event exchange, Example 2

5.2.2.4 Power Quality Event

Meters may collect information related to power quality, including but not limited to, momentary outage events, sustained outage events, low or high voltage events, and high distortion events. This information could be used for outage analysis, maintenance scheduling or capacity planning. Power quality events are a subtype of EndDeviceEvent.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEC SyC WG on Smart Grids
No reproduction or circulation
Oct 2024

Power quality events may be brokered (i.e. publications managed) by an MDM (as described in Figure 8), or sent directly to the various stakeholders (as described in Figure 9).

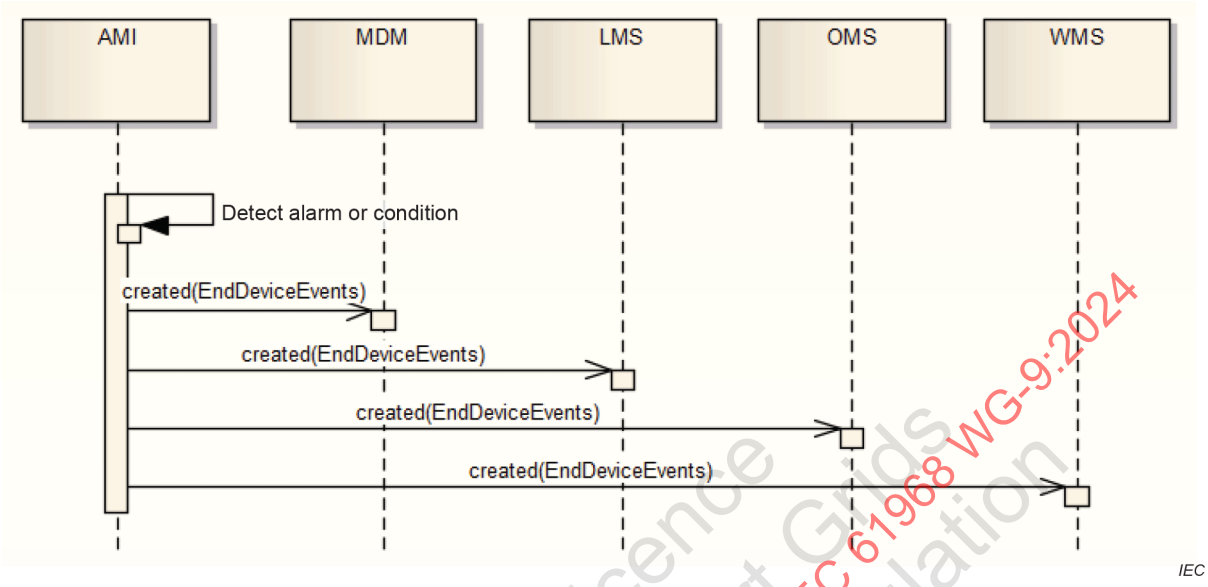


Figure 8 reproduced with the permission of UCAIug.

Figure 8 – Power quality event exchange, Example 1

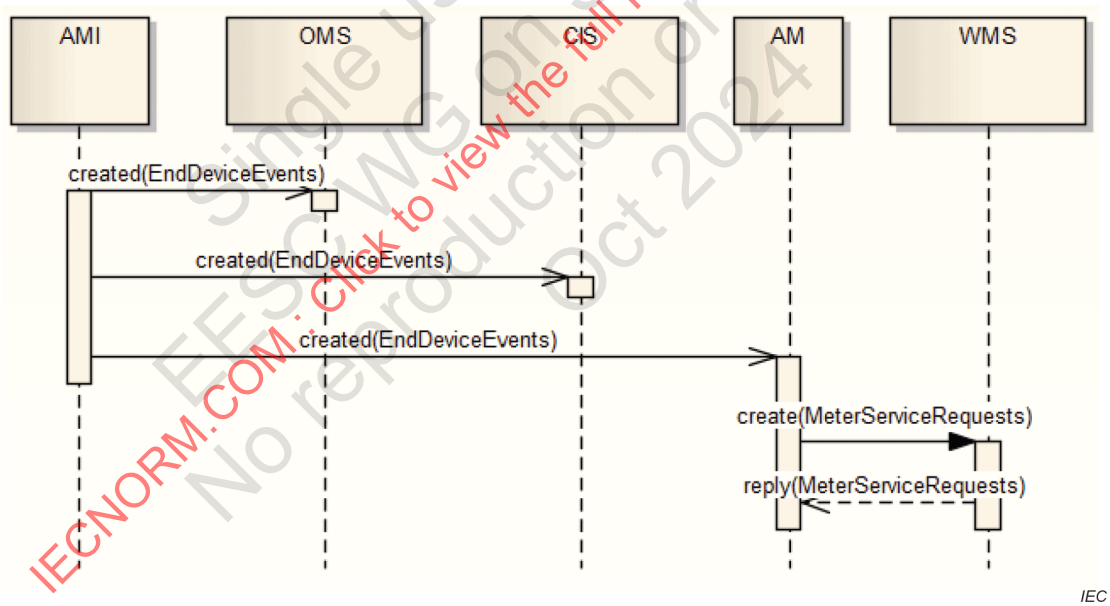


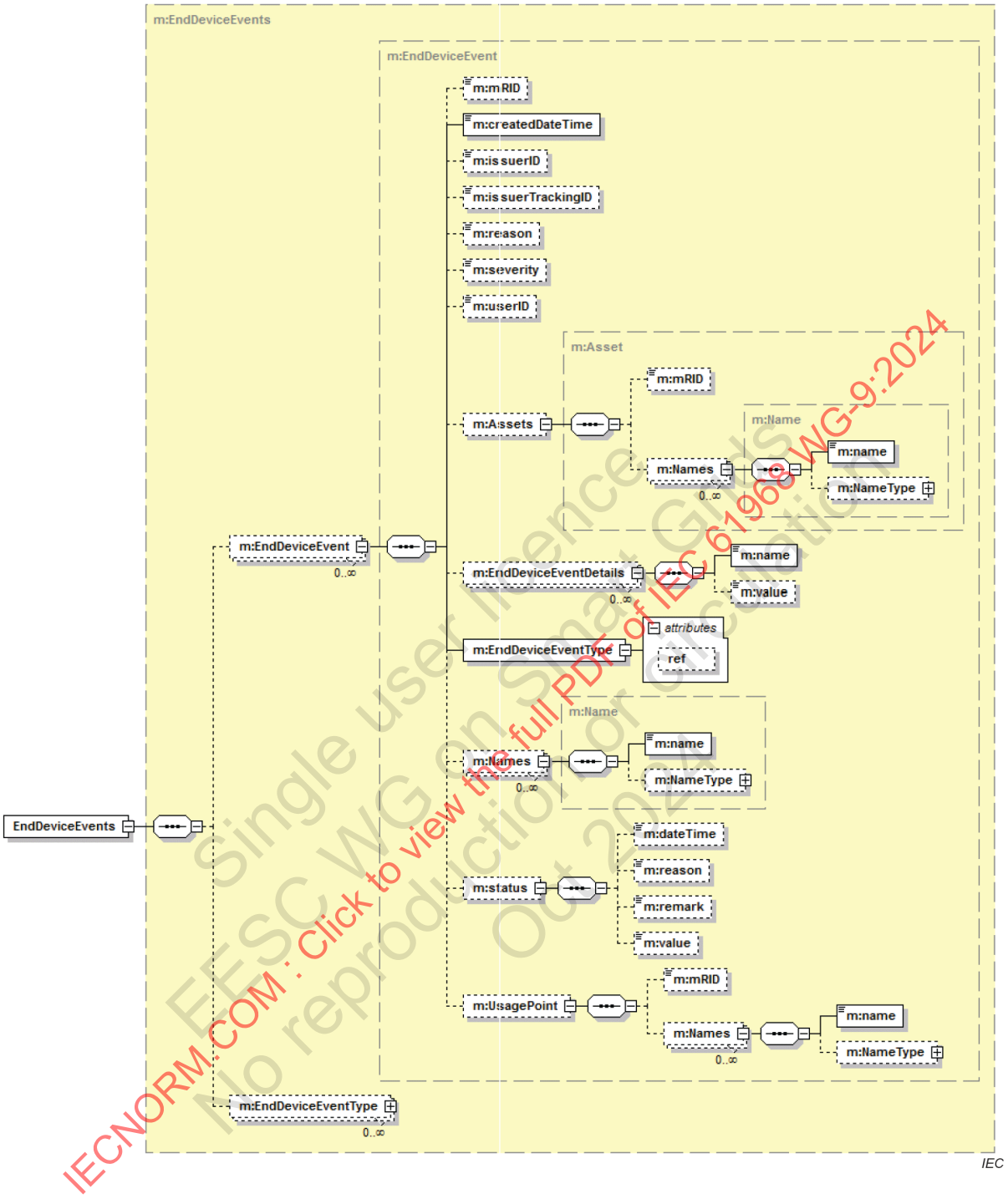
Figure 9 reproduced with the permission of UCAIug.

Figure 9 – Power quality event exchange, Example 2

5.2.3 Message format

Meter event messages are implemented using EndDeviceEvent structures in order to support a wider variety of event sources than just meters. The EndDeviceEvent.EndDeviceEventType (see Annex E) is a reference to an enumeration which indicates the type of event, such as outage detection, meter health, or power quality. The timestamp and mRID or a unique name of the end device are also required. The message format is described in Figure 10.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESG WG on Smart Grids
No reproduction or circulation
Oct 2024



IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or distribution
Oct 2024

Figure 10 reproduced with the permission of UCAIug.

Figure 10 – End device event message format

As noted by Figure 10, only the timestamp and EndDeviceEventType elements are required, along with either an mRID or a unique name of the end device. The EndDeviceEventType element will allow different event types (e.g. meter health, outage detection, etc.) to be differentiated. Different event types would allow for an EndDeviceEvent message to convey events related (including but not limited) to:

Sustained outage detection

Momentary outage detection

Low voltage threshold detection

High voltage threshold detection

Distortion

Meter health

Tamper detection

Revenue event

The detailed XML schema is provided in Annex G. The following is an XML example for an EndDeviceEvent.

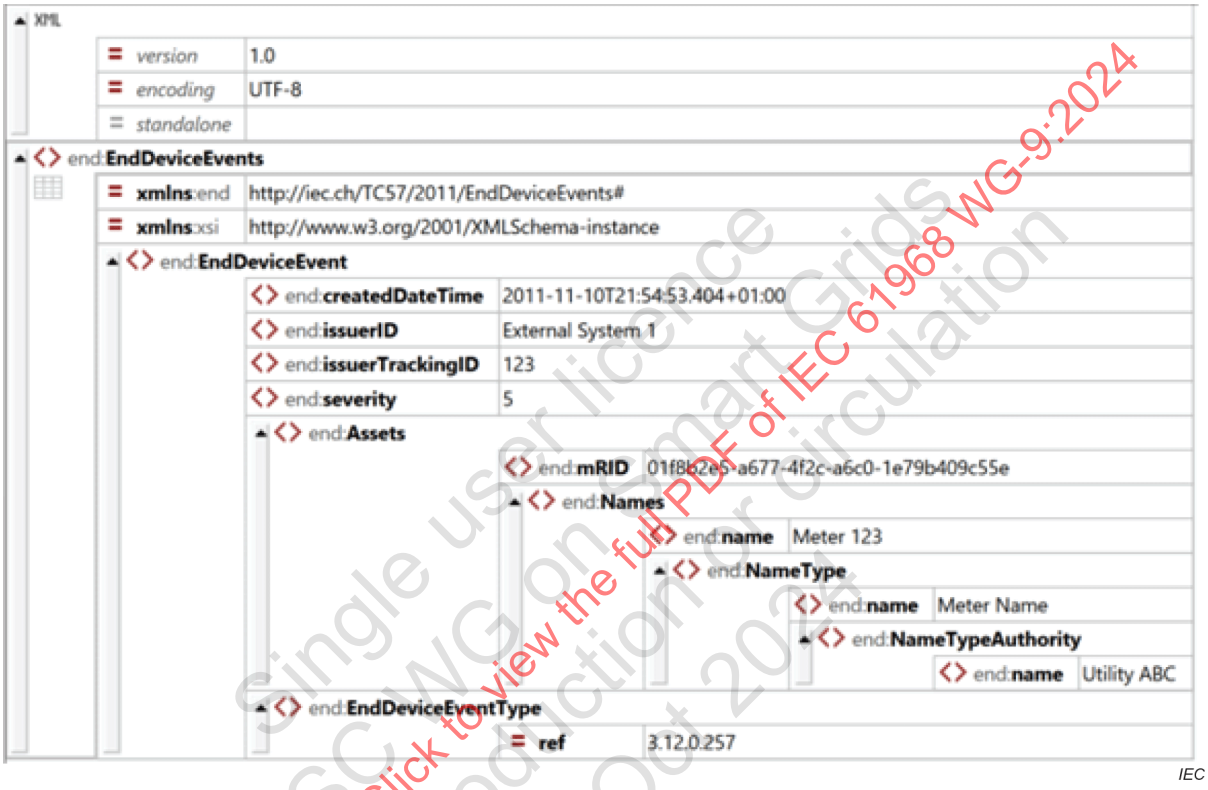


Figure 11 reproduced with the permission of the UCAIug.

Figure 11 – EndDeviceEvents example

The EndDeviceEvent is logically associated with an EndDevice and/or a UsagePoint, either of which can be identified by mRID and/or Name. As in IEC 61968-9:2009, an EndDeviceEvent is associated with an Asset, where typically this will be an EndDevice.

5.3 Meter reading messages

5.3.1 General

Meter readings messages are designed to allow data collected by or calculated on behalf of a meter to be conveyed. This may include measured quantities, calculated quantities, state information or collected history. Whenever a "measurement" is required from an end device, a MeterReading exchange is quite likely the appropriate tool for the job. The end device may have metrology capability, and if so, is most likely called a "meter". But there are other potential applications for MeterReading. If a data consumer wishes to measure the position of the switch on a connect/disconnect switch, this can be done as a MeterReading exchange. If a data consumer wishes to measure the "energisation" status of the end device, this can be done with a MeterReading exchange or alternatively, with an EndDeviceEvent exchange as described in 5.2.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
ETSC WG on Smart Grids
to reproduction or circulation
Oct 2024

5.3.2 Applications

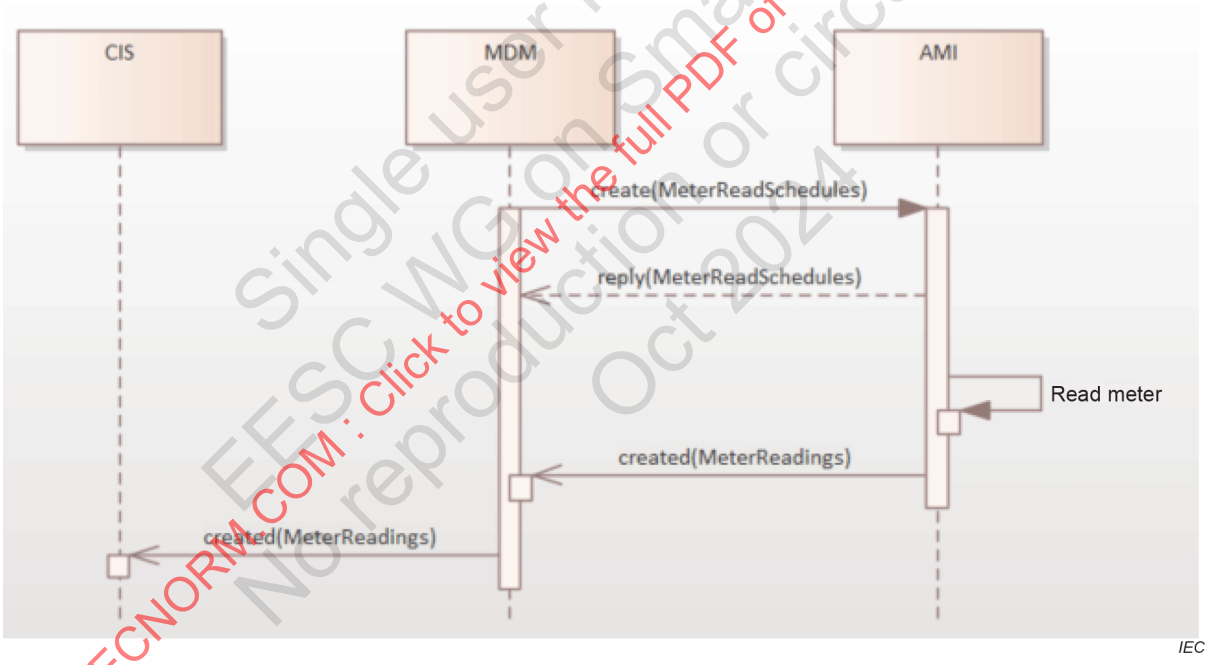
5.3.2.1 Periodic meter reads

It is necessary to periodically gather meter readings from a MS for billing through the customer billing system. The request for meter reading should specify a meter or group of meters, a type of reading to collect, and a frequency and duration of interest. The scheduled frequency may consist of regular or irregular periods. Not all deployments have systems that need to exchange the meter reading schedules, but if they do, the MeterReadSchedules profile may be used.

The MeterReadSchedules request may be initiated to the MS from any of the following:

- the CIS (in an effort to collect billing determinants);
- a planning and scheduling application (in an effort to acquire engineering data about the distribution network);
- an OMS (to establish a stream of status information);
- a meter data management system (in an effort to broker data for any or all of the above applications);
- the MS itself may also self-initiate a MeterReadSchedules.

An example for one such exchange (this one using an MDM) is shown in Figure 12.



IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

Figure 12 reproduced with the permission of UCAIug.

Figure 12 – Example use of meter read schedule to create subscription

In this example, the AMI system is treated as the system of record that owns the meter read schedule. It is being asked by the MDM to "create" a new schedule. In a different implementation, some other system such as the CIS may be the system of record for meter read schedules. In that case, the CIS would be the system to "create" the schedule. The "created" schedule would then be disseminated by the CIS to the other systems.

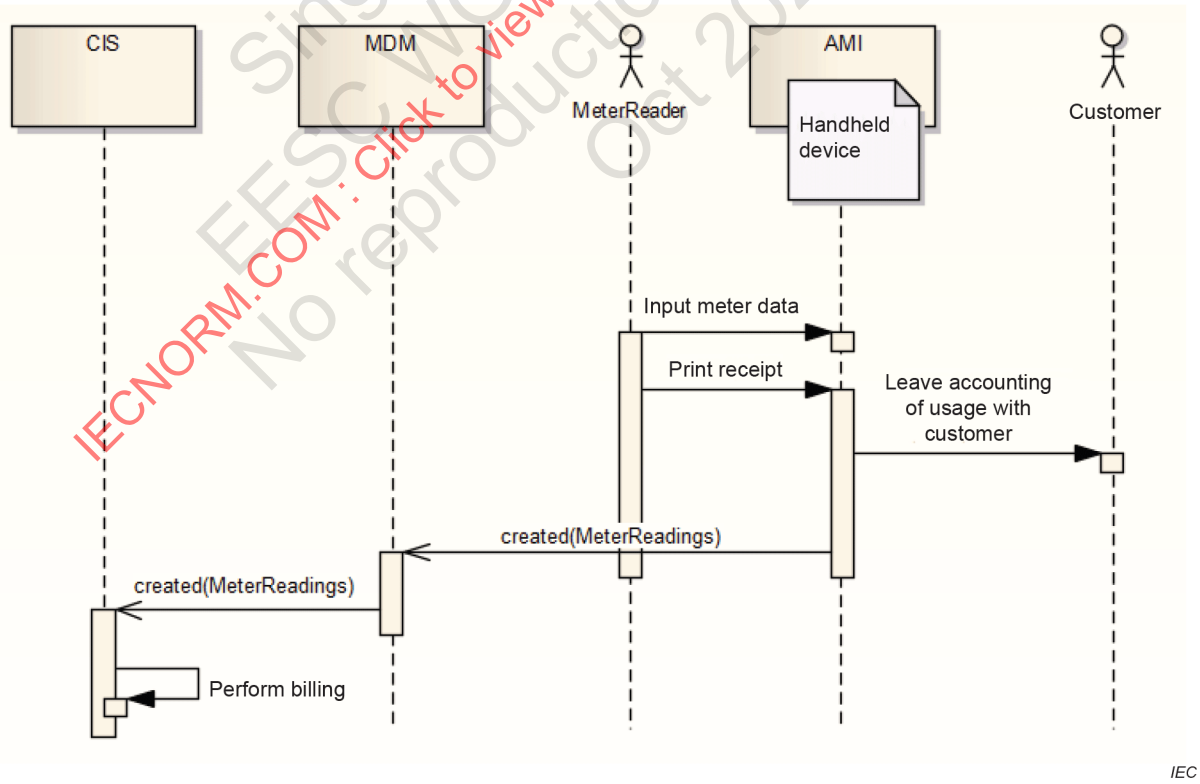
Some metering systems may have the ability to decouple MeterReading collection from MeterReading reporting. For Metering Systems without this capability, readings may be reported immediately upon collection. In the MeterReadSchedules request, MeterReadings may be requested using a variety of parameters, including:

- Specific meter, using the EndDevice mRID or Names.name. See IEC 61968-100:2022 for specification of the Names and Names related elements and for use of the LegacyObjectIdentificationRevisionSets message.
- EndDeviceGroups, where a EndDeviceGroup identifies a group address used within the Metering System
- UsagePoint where a meter is located, using UsagePoint mRID or Names.name
- UsagePointGroups, where UsagePointGroup identifies a groupAddress used within the Metering System
- As specified using a TimeSchedule
- ReadingTypes can be specified to identify the desired reading types

5.3.2.2 Manual meter reading

Meter readings can be obtained manually by a meter reader. Data collected may be maintained by the meter data manager. Meters may collect a number of different measurement types. Some types of meters may measure more than one phase, or may collect values for non-electrical measurements, such as water or gas.

A meter reader may input data shown on the panel of meter into a handheld device, which could be regarded as a metering system. Data input may occur several hundred times per day. A meter reader may present an account of the read to the customer. Note that this account is not an invoice. Billing would be generated normally by the CIS even in the manual reading case. Figure 13 shows such an exchange.



IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
EESC WG 09 Smart Grids
Single user licence
No reproduction or circulation
Oct 2024

Figure 13 reproduced with the permission of UCAIug.

Figure 13 – Example manual meter reading exchange

At the end of the day of work, all data stored in the handheld device is sent to the MDM via a communication network. The MDM publishes a message to the CIS informing of the creation of MeterReading.

Schedules for walking a manual meter reading route are decided well in advance of performing the work.

5.3.2.3 On-Request meter read

Meter read requests are issued to a MS in order to obtain meter readings on a per request basis. The MS will send a request to the desired meters. These can be used for billing inquiries, outage extent verification, verification of restoration and other business purposes..

Many utilities have a policy of routing all revenue readings through the MDM so that all data will receive the same level of validation. However, not all MDM systems are able to offer validation services for outage data. For those that do, the utility shall weigh the value of MDM validation over the time delay it may introduce, as well as the ability of the particular OMS solution to reject incongruent data. For this reason, the example diagram shows revenue readings routed through the MDM, but outage data routed around it.

It is important to note that not all metering systems support ""on-request" readings. For those that do, the implementation can also vary significantly.

On-request reads may be initiated to the MS from systems such as any of the following:

- The CIS (in an effort to collect billing determinants).
- A Planning and Scheduling application (in an effort to acquire engineering data about the distribution network).
- An OMS (in order to verify if a customer is affected by an outage or has been restored)
- A meter data management system (in an effort to broker data for any or all of the above applications).
- The MS itself may also directly initiate a meter read.

An example for one such exchange (this one using an MDM) is shown in Figure 14.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence EESG WG on Smart Grids No reproduction or circulation Oct 2024

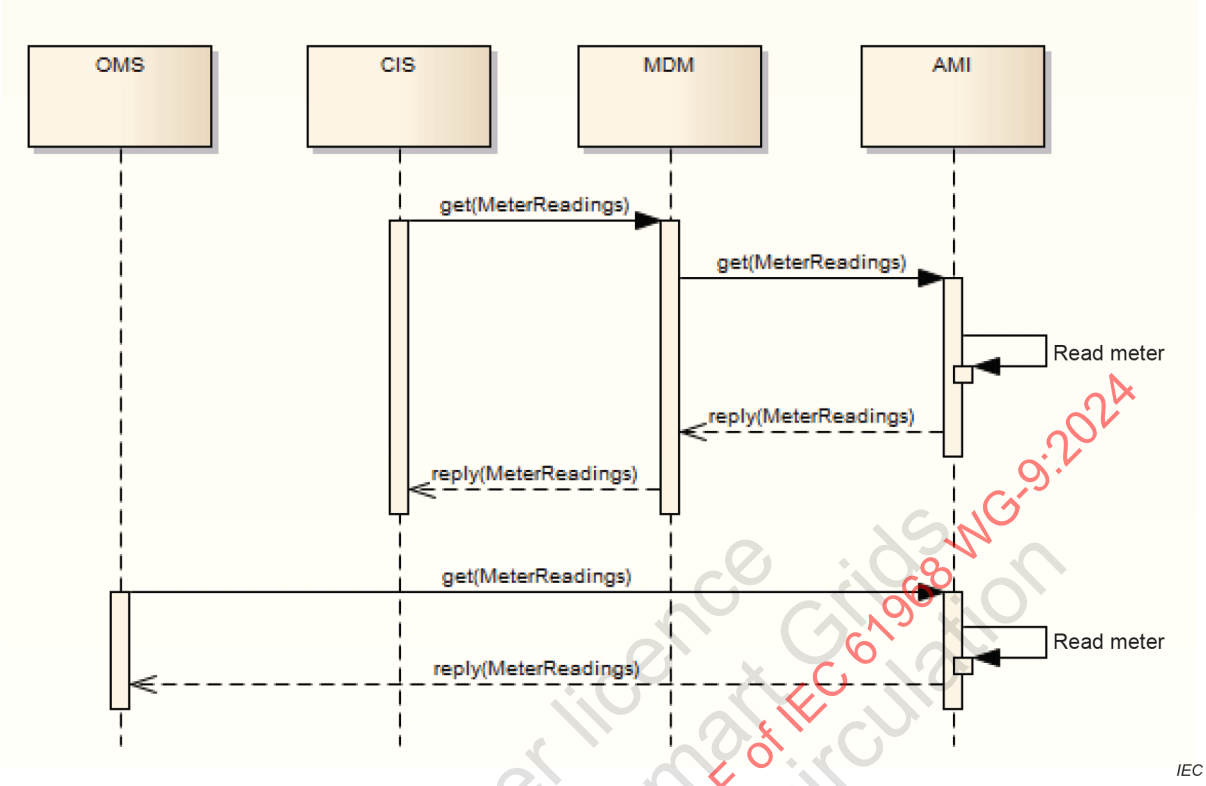


Figure 14 reproduced with the permission of UCAIug.

Figure 14 – Example On-Request meter read

In this example, the MeterReadings noun is used because a very specific meter is being addressed. However, an implementation may alternatively wish to use the GetMeterReadings noun. In comparing the two schemas (located in Annex G), one finds that the MeterReadings schema allows the requestor to specify one or more EndDeviceEventType and/or ReadingType to filter on. Meanwhile GetMeterReadings also supports named EndDevice, EndDeviceGroup, TimeSchedule, TransformerTank, UsagePoint, and UsagePointGroup. The same option applies to other types of meter readings (such as Historical meter data access below). Not all implementations will necessarily support both nouns, nor support all features possible within a given request format. More discussion of the "Get" nouns and recommended transactional patterns are described in IEC 61968-100.

5.3.2.4 Historical meter data access

A distribution network planner may use historical meter reading values as load information for capacity planning purposes. (See the request/reply example in Figure 15).This would permit usage to be aggregated to determine loads for a transformer or feeder.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEC WG on Smart Grids
No reproduction or circulation
Oct 24

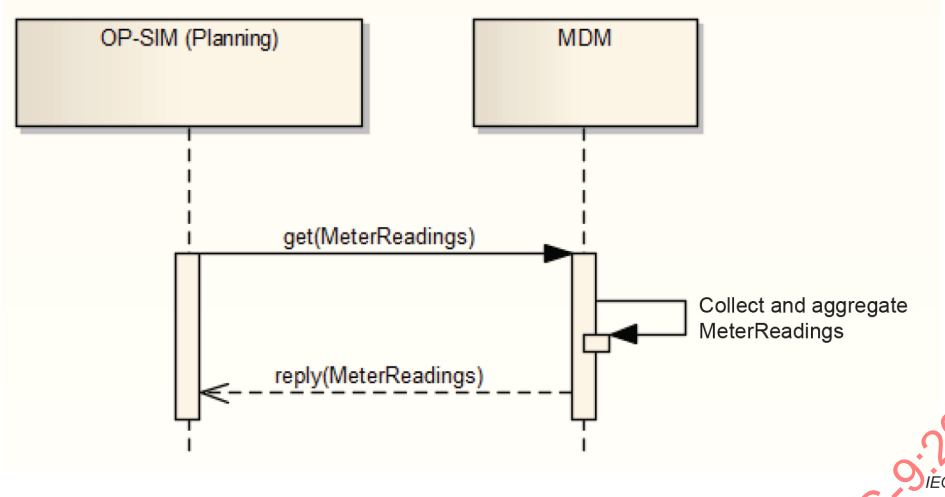


Figure 15 reproduced with the permission of UCAIug.

Figure 15 – Historical MeterData exchange

It is important to note the use of request parameters to qualify requests for meter data, filtering the results to obtain data for specific meters within specific timeframes.

5.3.2.5 Billing inquiry

A customer or an internal source may identify a customer billing issue. A meter read request in combination with historical meter reads may be used to resolve the billing issue. The top of Figure 16 shows an inquiry being satisfied by data which recently arrived, while later on in the day an inquiry is made which requires a fresh reading from the meter.

In some cases the desired data may be accessible from the MDM. In other cases, it may be necessary to issue a read request remotely through the MS, or manually through an IEC 61968-8 generic "service request."

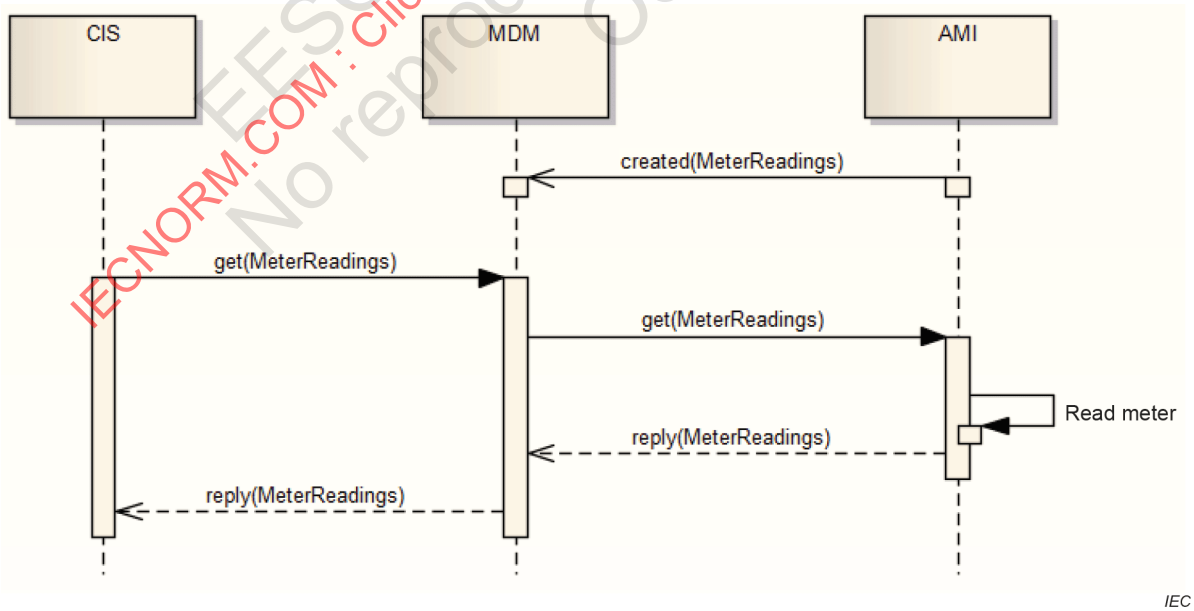


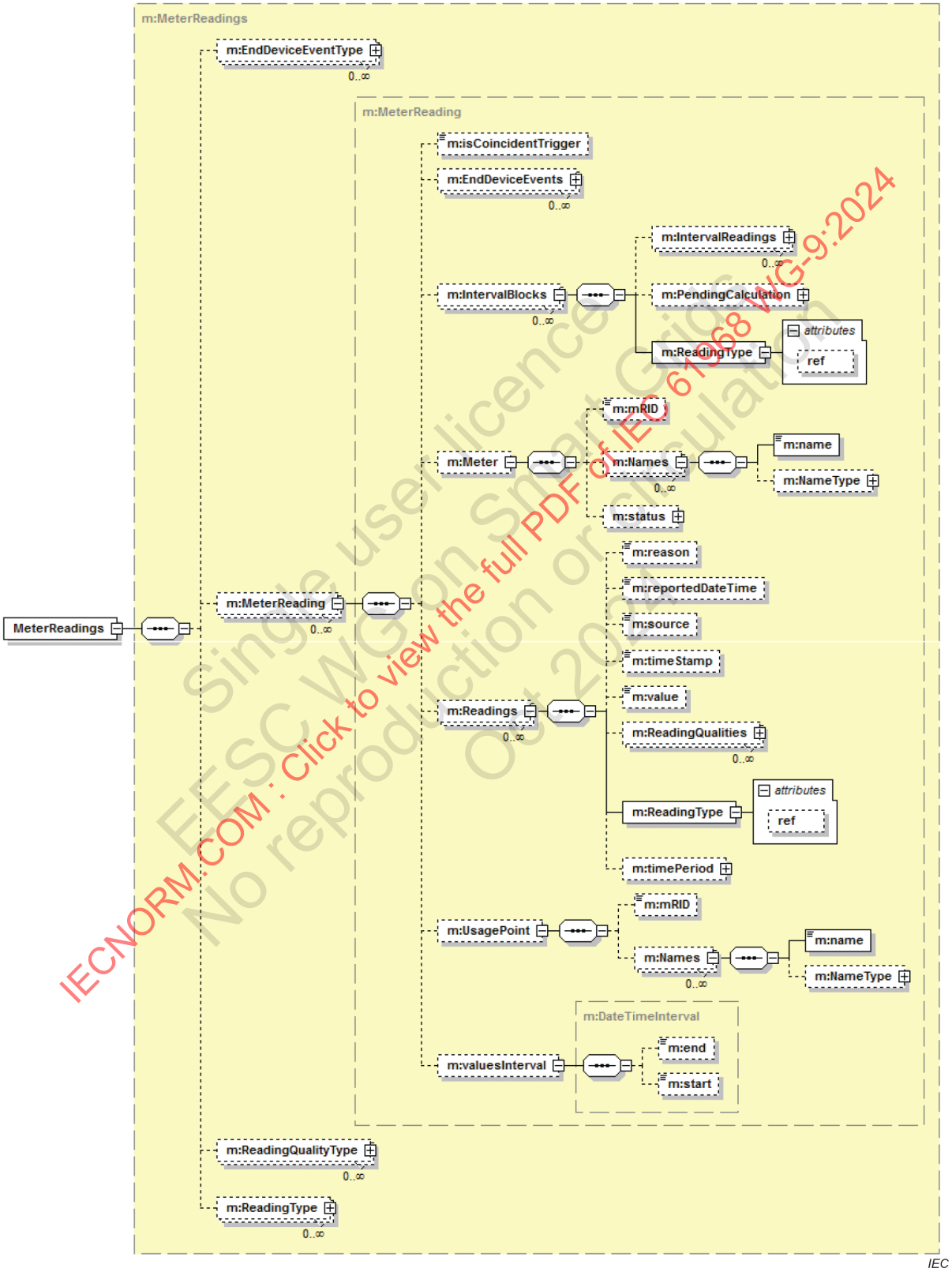
Figure 16 reproduced with the permission of UCAIug.

Figure 16 – Example billing inquiry message exchange

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
CEESC WG Smart Grids
No reproduction or circulation
Oct 2024

5.3.3 Message formats

Figure 17 shows the message format used to present meter readings from one or more end devices. Additional information on the MeterReadings structure is available in Annex G.



IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

Figure 17 reproduced with the permission of UCAIug.

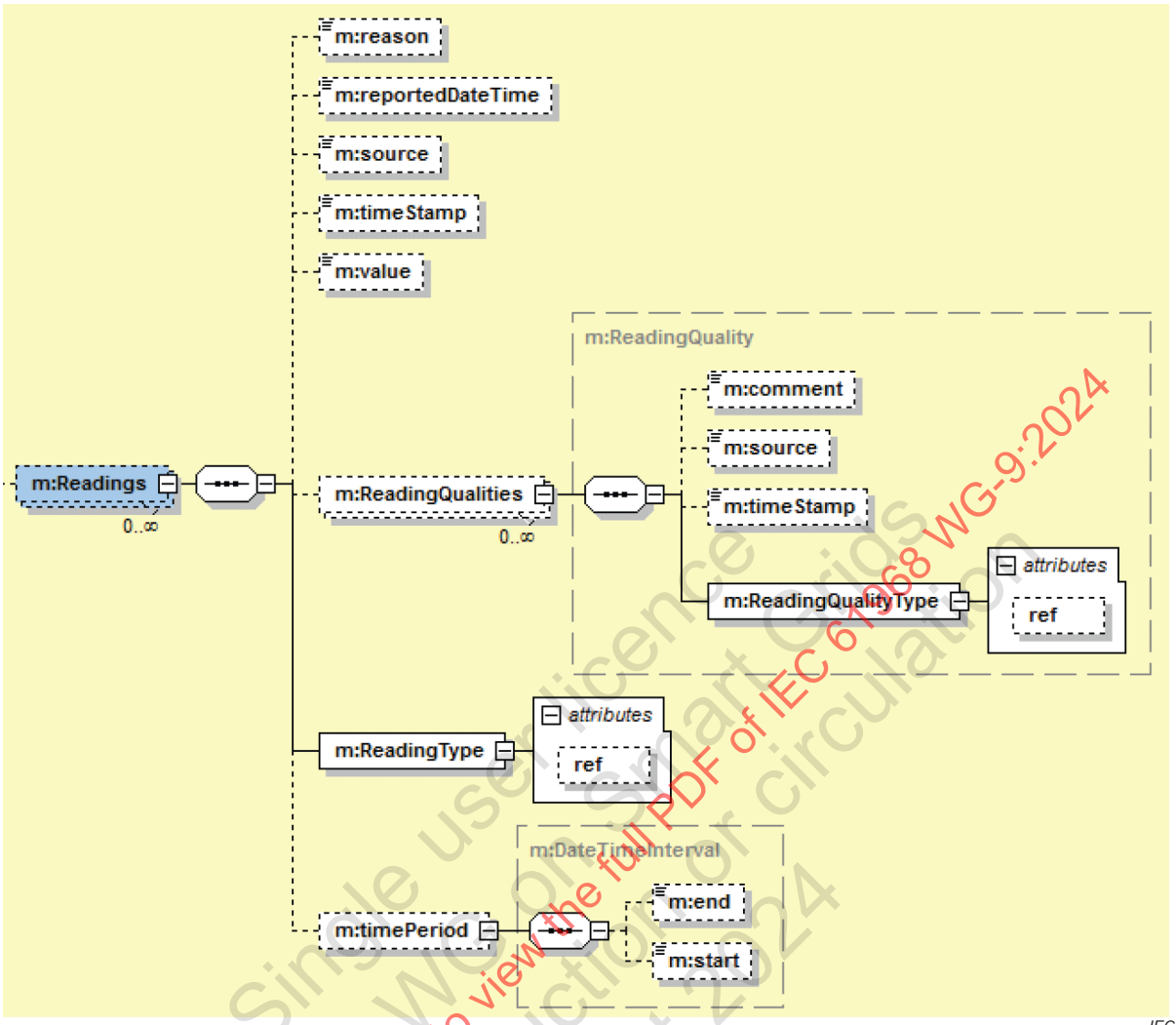
Figure 17 – Meter readings message format

The MeterReadings message structure allows for:

- readings from one or more meters
- reading values each have an associated reading type, timestamp and value
- many quality values can be associated with each reading value
- readings can be supplied in the form of interval blocks, where readings of a common reading type are grouped together
- event histories can be returned with meter readings

Figure 18 shows the details of the structure used to convey Readings, where each Reading identifies a specific ReadingType (by reference), value and optional quality codes.The timeStamp is used to identify when the reading was captured. The timePeriod can be used to identify a specific time interval. The optional reportedDateTime can be used to identify when the reading was actually reported. The ReadingType is used to identify the meaning of the reading, data type of the value and the meaning of the different time values.

Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024
IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024



IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

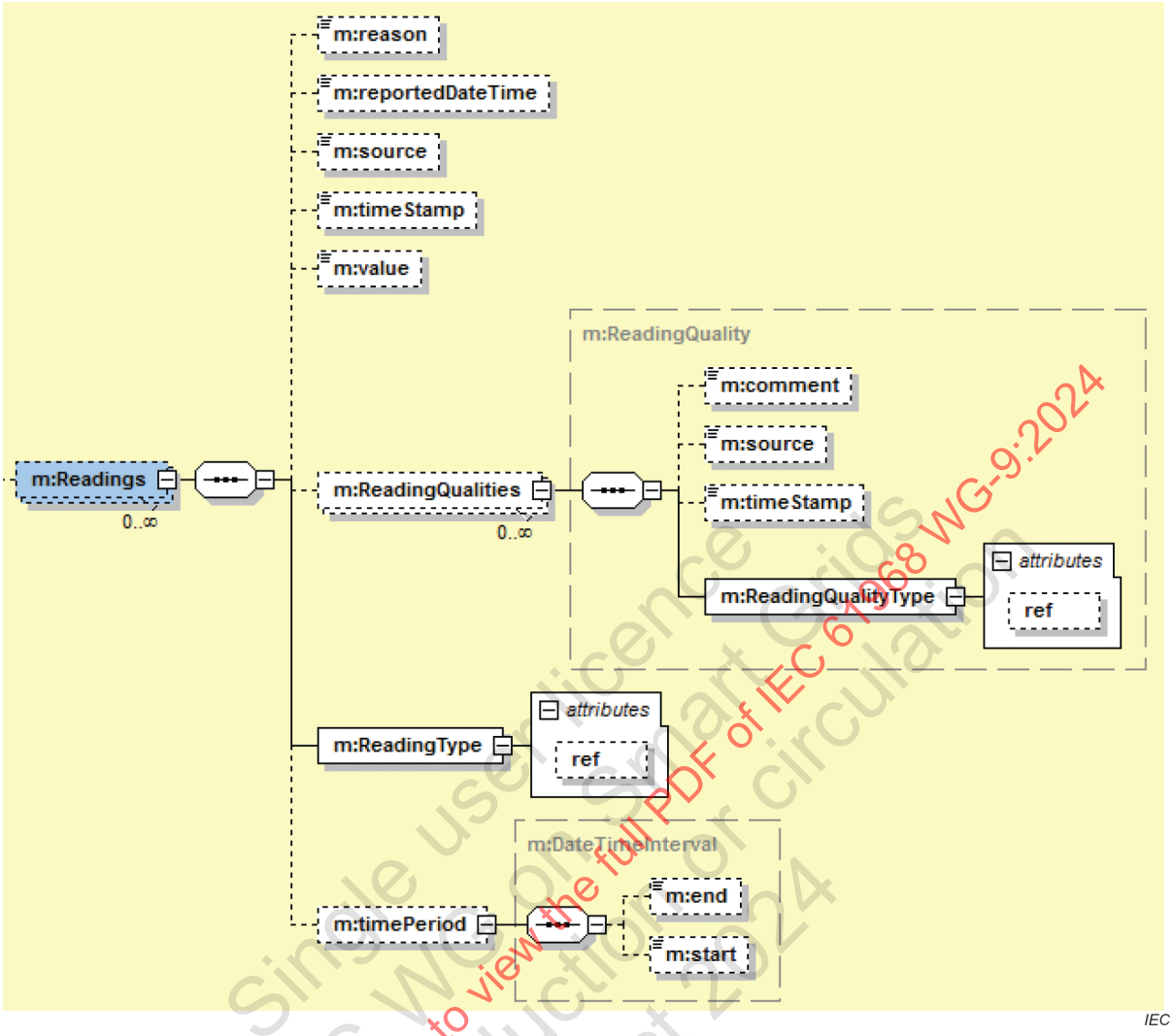


Figure 18 reproduced with the permission of UCAIug.

Figure 18 – Reading structure

Within a reading, the timeStamp and timePeriod attributes can be used to identify time-related aspects of the reading, with specific usage based upon reading type, where details are described in Annex C as needed. The examples given in Figure 19, and Figure 20 illustrate the general conventions for the use of timeStamp and timePeriod.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

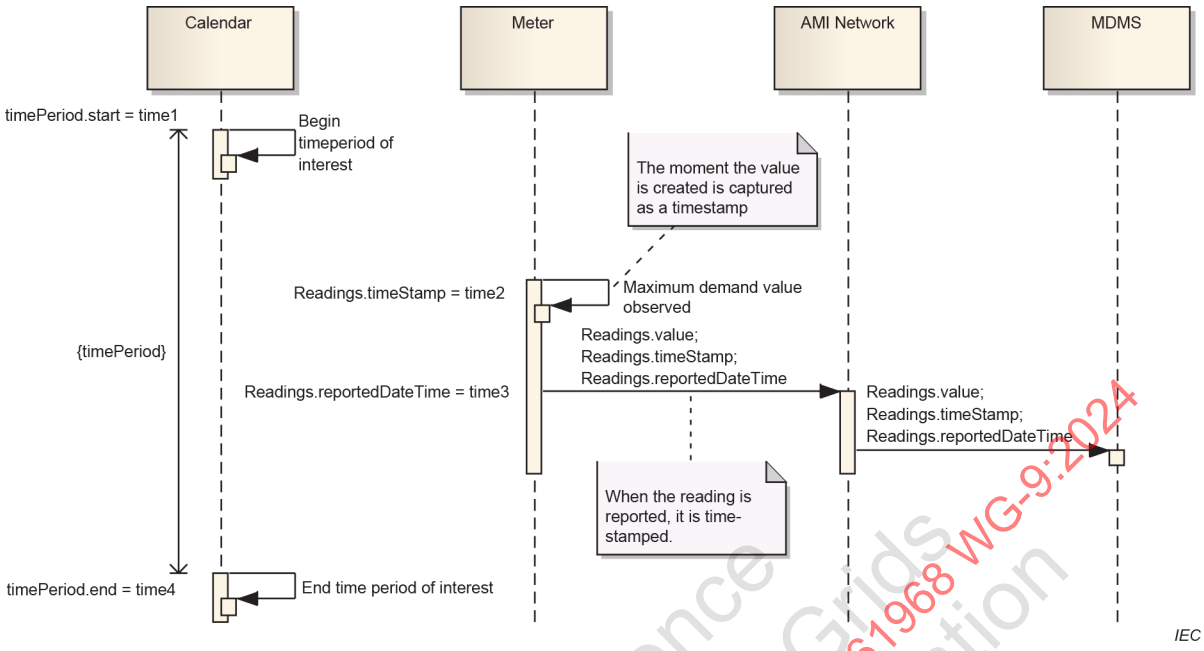


Figure 19 reproduced with the permission of UCAIug.

Figure 19 – Timestamps assigned between systems

Figure 19 shows the way that timestamps are assigned as values are created and passed between systems. From the perspective of the CIS and MDMS, there exists a "timePeriod" of interest for (perhaps) a billing period. A "get" request might specify this time range range using the <TimeSchedule> element in a get(MeterReadings) message, and the AMI or MDMS would "reply" with readings that fall within this range. Important points in time regarding the generation and reporting of the value are also timestamped. All of these timestamps are found within the meterReadings schema. Another view of the same example (with real dates and times) is expressed below in Figure 20.

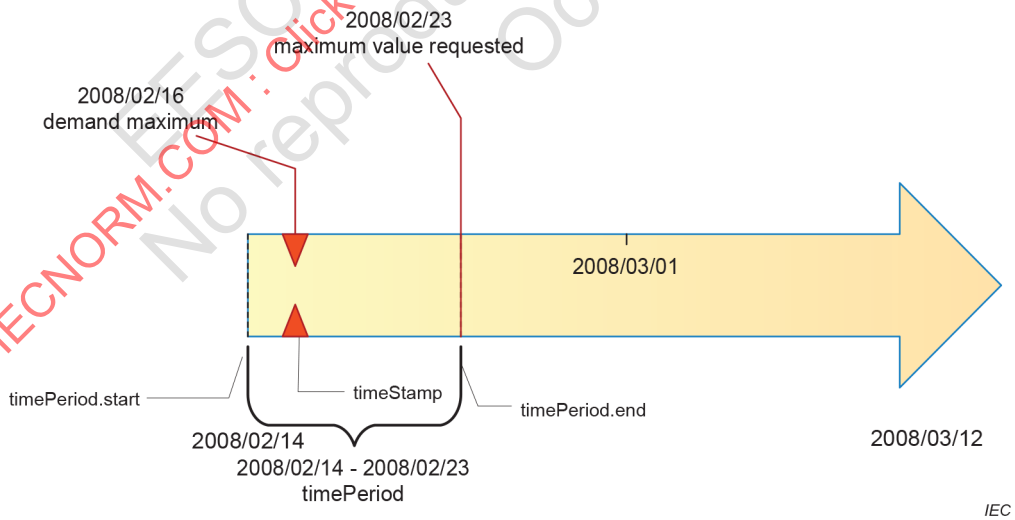


Figure 20 reproduced with the permission of UCAIug.

Figure 20 – Conventions for timeStamp and timePeriod

The IntervalBlock structure allows for a set of readings to be grouped by a common ReadingType and as a convenience for representation of a time series.

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
SMB User licence
ESC WG Smart Grids
No reproduction or circulation
Oct 2024

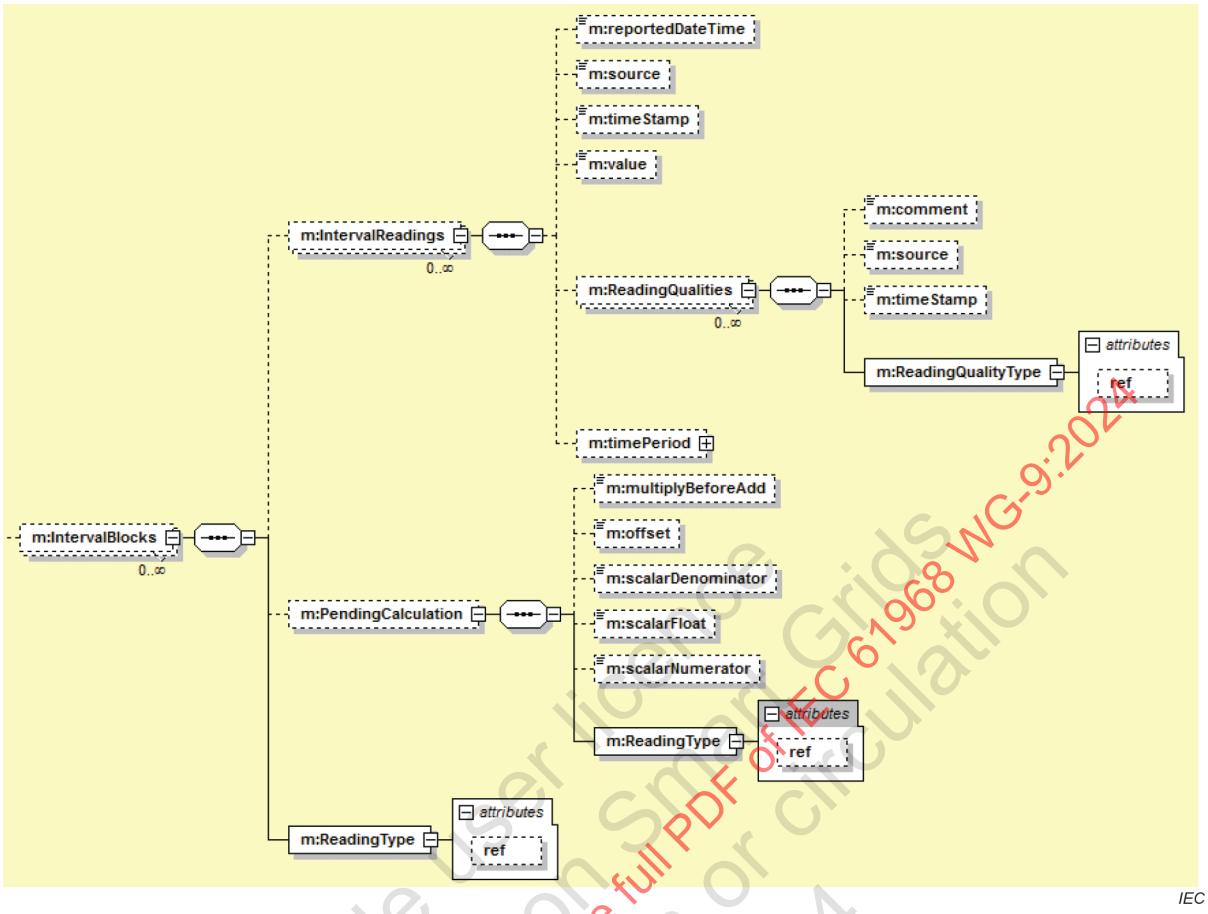


Figure 21 reproduced with the permission of UCAIug

Figure 21 – IntervalBlock structure

The following diagram shows the convention for use of a timeStamp for interval data where an associated reading type identifies that the reading value is for a specified interval.

Different MR systems work in different ways, but for the purpose of the standard, timestamps denote the end of the interval. The implied generation process is described in Figure 22.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single User License
IEC WG on Smart Grids
No reproduction or circulation
Oct 2024

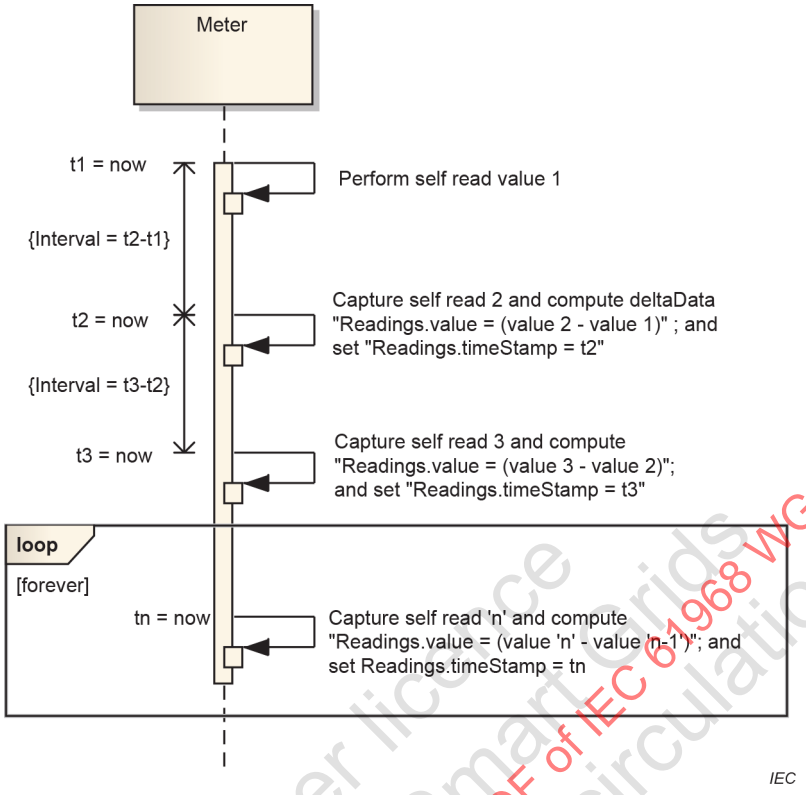


Figure 22 reproduced with the permission of UCAIug.

Figure 22 – Interval data timestamp generation

When a timestamp is used, it shall fall within a time range from 00:00:00 to 23:59:59 as depicted in Figure 23. A value of 23:59:59 plus 1 s places the time at midnight which is the start of the next day.

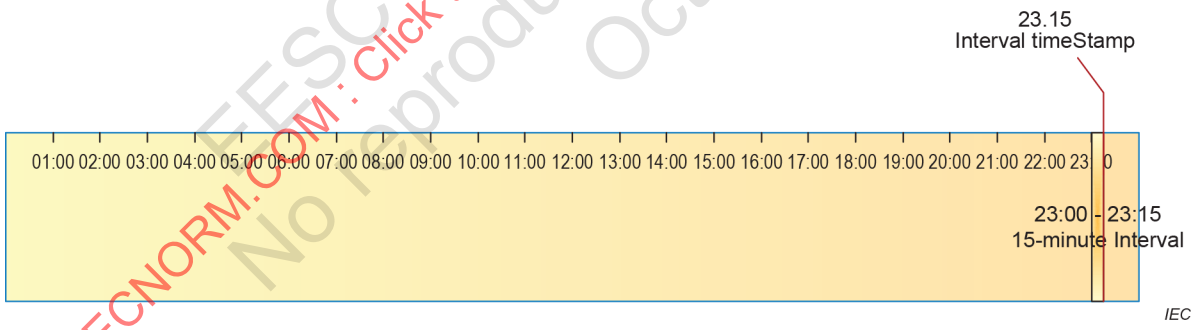


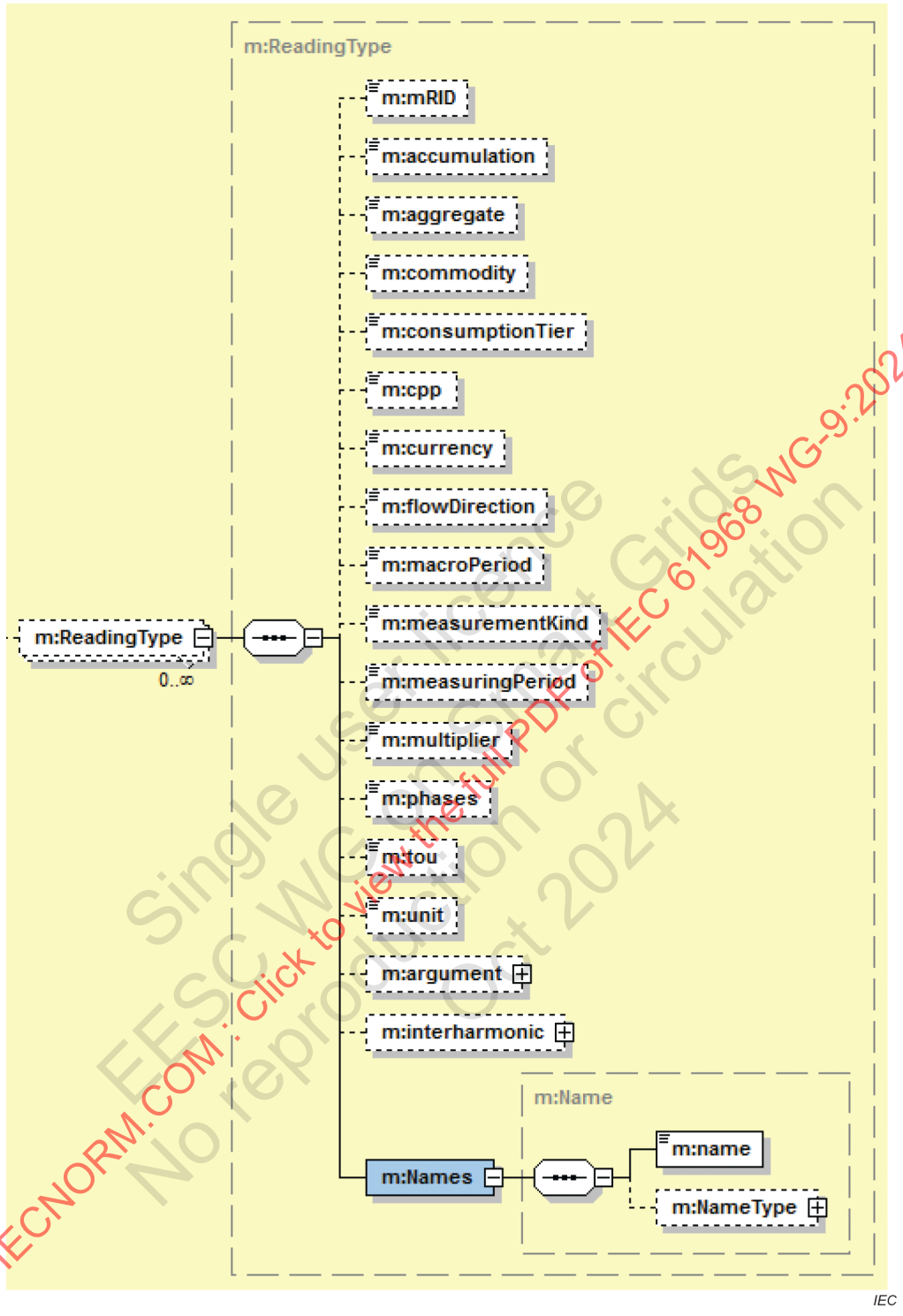
Figure 23 reproduced with the permission of UCAIug.

Figure 23 – Time interval conventions

Note that a day starts at 00:00. The day ends at 23:59:59. (Refer to ISO 8601 for more details around timekeeping.) It is important to note that interval data can be conveyed using IntervalBlocks with IntervalReadings or simply using Readings. IntervalBlocks shall be used in cases where the PendingCalculation elements are needed, otherwise they simply allow for a reduced XML footprint over Readings, which may be important in some situations.

Key to the reporting of a value from a meter is the reading type. The ReadingType class in the CIM is defined to allow capture of the information given in Figure 24 as related to the description of a reading type, as is more thoroughly defined in Annex C.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024 WG-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024



IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence
EESC WG 01 Smart Grids
No reproduction or circulation
Oct 2024

Figure 24 reproduced with the permission of UCAIug.

Figure 24 – ReadingType structure

While the ReadingType structure is present in the MeterReadings message, it should be expected that in normal practice it will not be populated, as it is anticipated that the consuming system will already be configured with the appropriate ReadingType definitions. The details of this and other classes specific to metering are described in the Metering package of the CIM. A more thorough discussion of reading types is provided in Annex C.

Readings are not limited to metering devices. Any EndDevice may potentially produce a measurement. In this edition of IEC 61968-9, the asset producing the reading shall be identified using the Meter class, even though the device may not be a meter. It is expected that all assets have a unique mRID or Names.name so that meters can be distinguished from remote connect/disconnect switches, and from other devices. It is expected that future editions of IEC 61968-9 will provide a more explicit method of dealing with readings from devices other than Meters.

Interval data has unique timestamp requirements. The extended capabilities of ISO 8601 provide the means to specify both a formal interval length (as an ISO 8601 "period" of time), as well as a fixed reference point.

Figure 25 and Figure 26 provide some example payloads of MeterReadings messages.

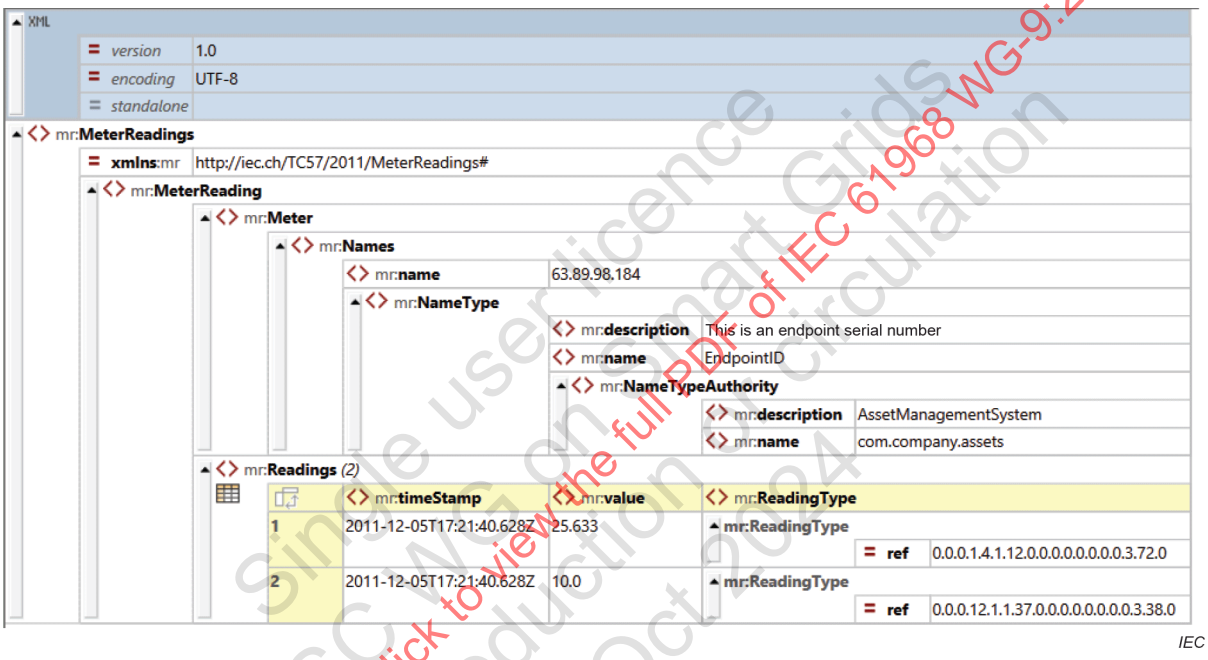


Figure 25 reproduced with the permission of UCAIug.

Figure 25 – MeterReadings Example 1

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
EESC WG on Smart Grids
Single user licence
No reproduction or circulation
Oct 2024

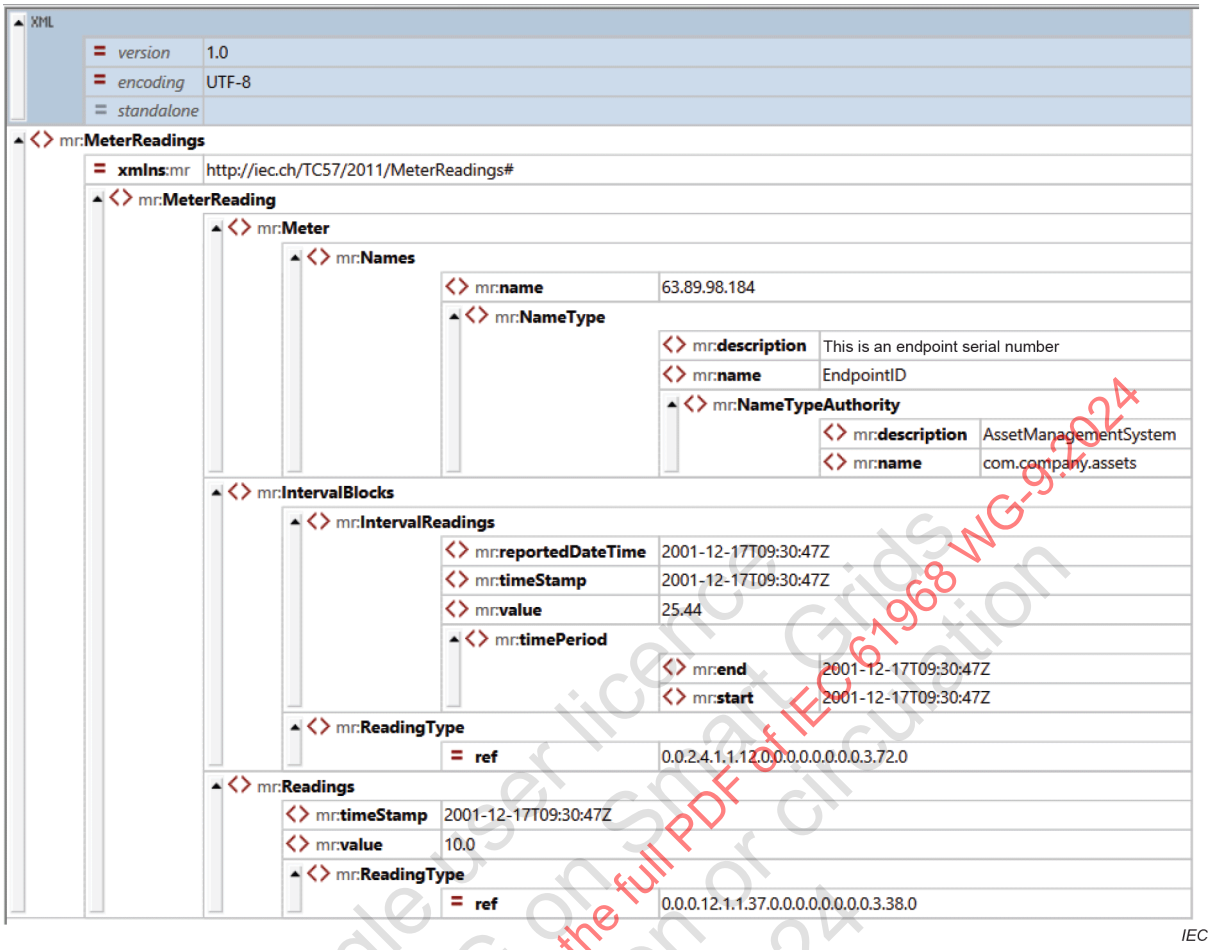


Figure 26 reproduced with the permission of UCAIug.

Figure 26 – MeterReadings Example 2

The concept of "coincident readings" deserves some attention. A coincident reading is a MeterReading that occurs at the same point in time as some other MeterReading or EndDeviceEvent.

Some meters have the ability to report a reading that was coincident with a certain other MeterReading or EndDeviceEvent (hereinafter referred to as the "trigger"). For example, it might record the "power factor coincident with the billing period maximum demand.

Additionally, some processes call for a coincident read to be reported. For example, when a meter is installed, it is common to capture an "initial reading." Similarly, when a meter is disconnected, it is common practice to capture a "final read" coincident with the disconnection event.

Some systems may perform analysis of the data in storage to identify analytically derived coincident readings. For example:

- the voltage at UsagePoint A at the time of the peak daily demand on the distribution transformer (UsagePointB) that serves UsagePoint A. (UsagePoint "B" could be either a real or a virtual UsagePoint.)
- the 15-minute interval consumption at UsagePoint A at the time of the peak demand on a distribution network (UsagePoint C) on a hot, summer day
- a BulkQuantity kwh reading for a UsagePoint at the time of an EndDeviceEvent such as a meter disconnect.

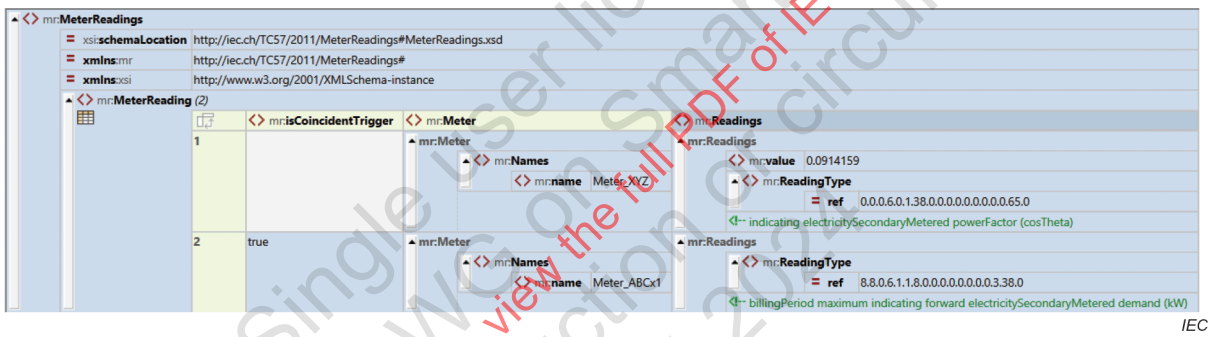
IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single-user licence
EESCWG on Smart Grids
No reproduction or circulation
Oct 2024

The MeterReading class has an optional Boolean element called "isCoincidentTrigger." The element doesn"t have to be used in a message, but if it is, there are rules for its interpretation. If any instance of a MeterReading message is marked with the isCoincidentTrigger Boolean set to "true", then all other MeterReadings within the same MeterReadings message are considered to be coincident with the so marked MeterReading. Only one MeterReading element within a single MeterReadings message may have its isCoincidentTrigger Boolean set to "true". If the isCoincidentTrigger Boolean is absent, it is defined to be "false". It is recommended that the "trigger" MeterReading should have a timeStamp if this information is available.

The GetMeterReadings profile can be used to request MeterReadings that are coincident with a given MeterReading. This can be accomplished by including in the GetMeterReadings message a MeterReadings element in which the isCoincidentTrigger Boolean is set to "true" – in other words by specifying the "trigger" MeterReading in the GetMeterReadings filter criteria.

NOTE It is recognized that there might be small differences in time between a coincident trigger and the reading(s) that are coincident with the trigger. For example, a reading taken in conjunction with a meter disconnect can actually be taken several seconds after the operation of the disconnect switch. It is outside the scope of this document to define the window for readings to be considered coincident.

In the following example (Figure 27,) a metering system identifies a power factor measurement that is coincident with the maximum demand for a given meter when the exact date and time of the maximum demand is not known:

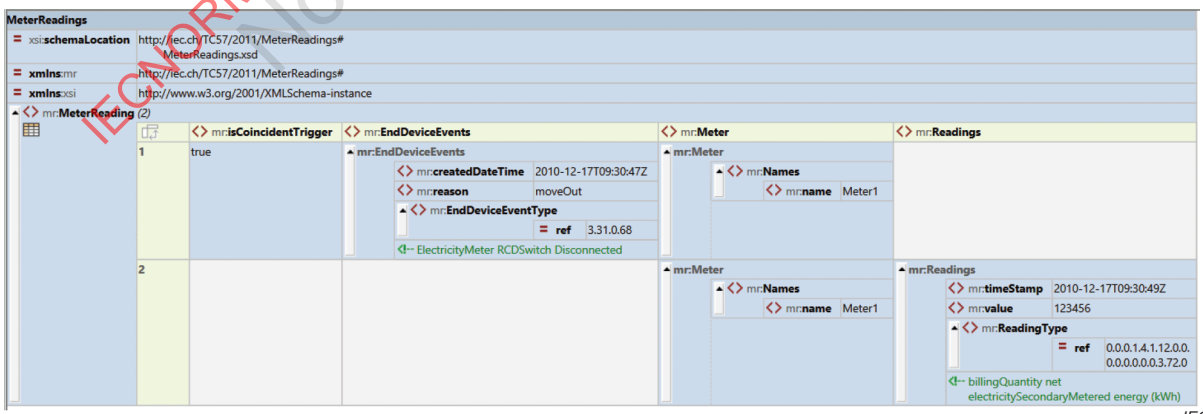


IEC

Figure 27 reproduced with the permission of UCAIug.

Figure 27 – Coincident readings example

In the next example (Figure 28,) a metering system or MDMS identifies the final meter reading coincident with disconnection of service via RCD:



IEC

Figure 28 reproduced with the permission of UCAIug.

Figure 28 – Final meter reading coincident with disconnect example

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEC SC WG on Smart Grids
No reproduction or circulation
Oct 2024

The next example (Figure 29) demonstrates a request to get meter readings from a metering system or MDMS which are coincident with a disconnect that occurred within a specified time interval. The request is an open-ended invitation to send any type of MeterReading data which is coincident with an RCDSwitch disconnect for a given EndDevice (meter). The response to this request could very well be nothing more than the "final meter reading" example provided above. (If a more specific response was sought, it would be possible to filter for only the desired ReadingType(s) by populating the ReadingType element in the GetMeterReadings profile.)

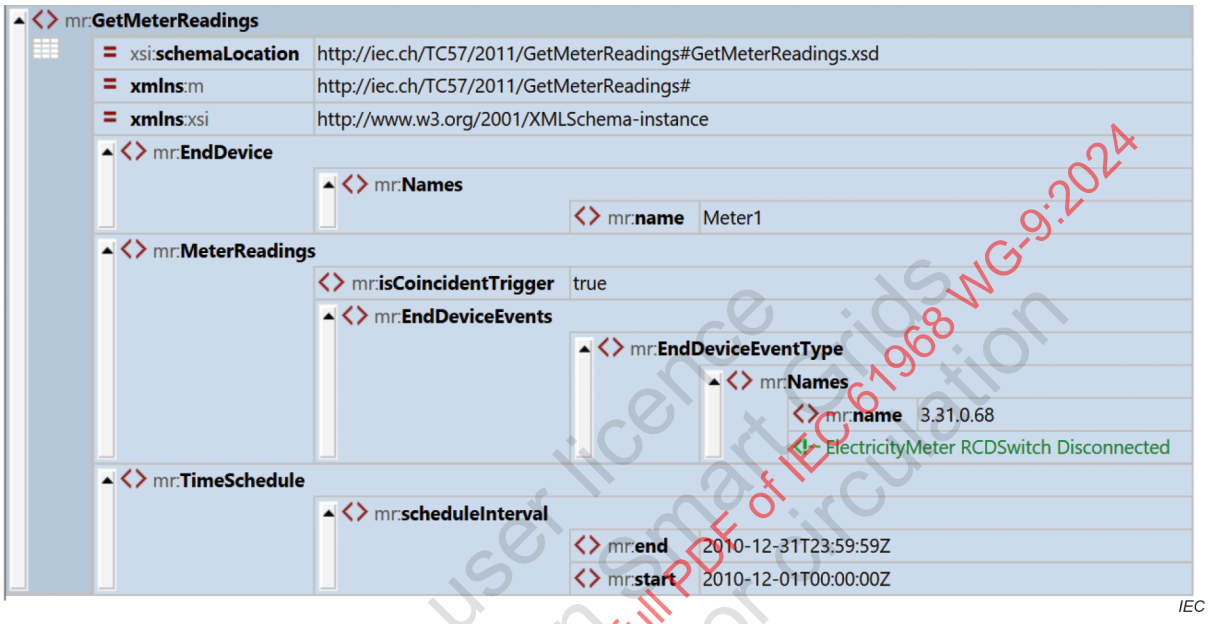


Figure 29 reproduced with the permission of UCAIug.

Figure 29 – GetMeterReadings example

When using timestamps as filters, note that the TimeSchedule.scheduleInterval elements are used to frame a request for data falling within a certain range. The MeterReadings response may populate the MeterReadings.MeterReading.valuesInterval elements to identify the range of dates offered in the response. The user will also find that interval data (which contains a time-ordered series of values) has no place in a discussion of coincident data. Only one interval may be coincident with a given event or another MeterReading. It therefore seems inappropriate to populate a series of MeterReading.IntervalBlocks.IntervalReadings elements. A single value may be presented as an interval, or the single interval value may be presented as a stand alone MeterReading.Readings instead.

The ability to schedule when meter readings are obtained is provided through the use of a MeterReadSchedules request.Note that the MeterReadSchedules.xsd depicted below replaces the MeterReadSchedule.xsd that appeared in IEC 61968-9:2013. The primary difference is that the current XSD has a new root element MeterReadSchedule that inherits from identifiedObject. This provides the ability to create, change, update, and delete individually identified MeterReadSchedules. Figure 30 describes the structure used for the payload of a MeterReadSchedules request message:

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEC WG on Smart Grids
No reproduction or circulation
Oct 2024

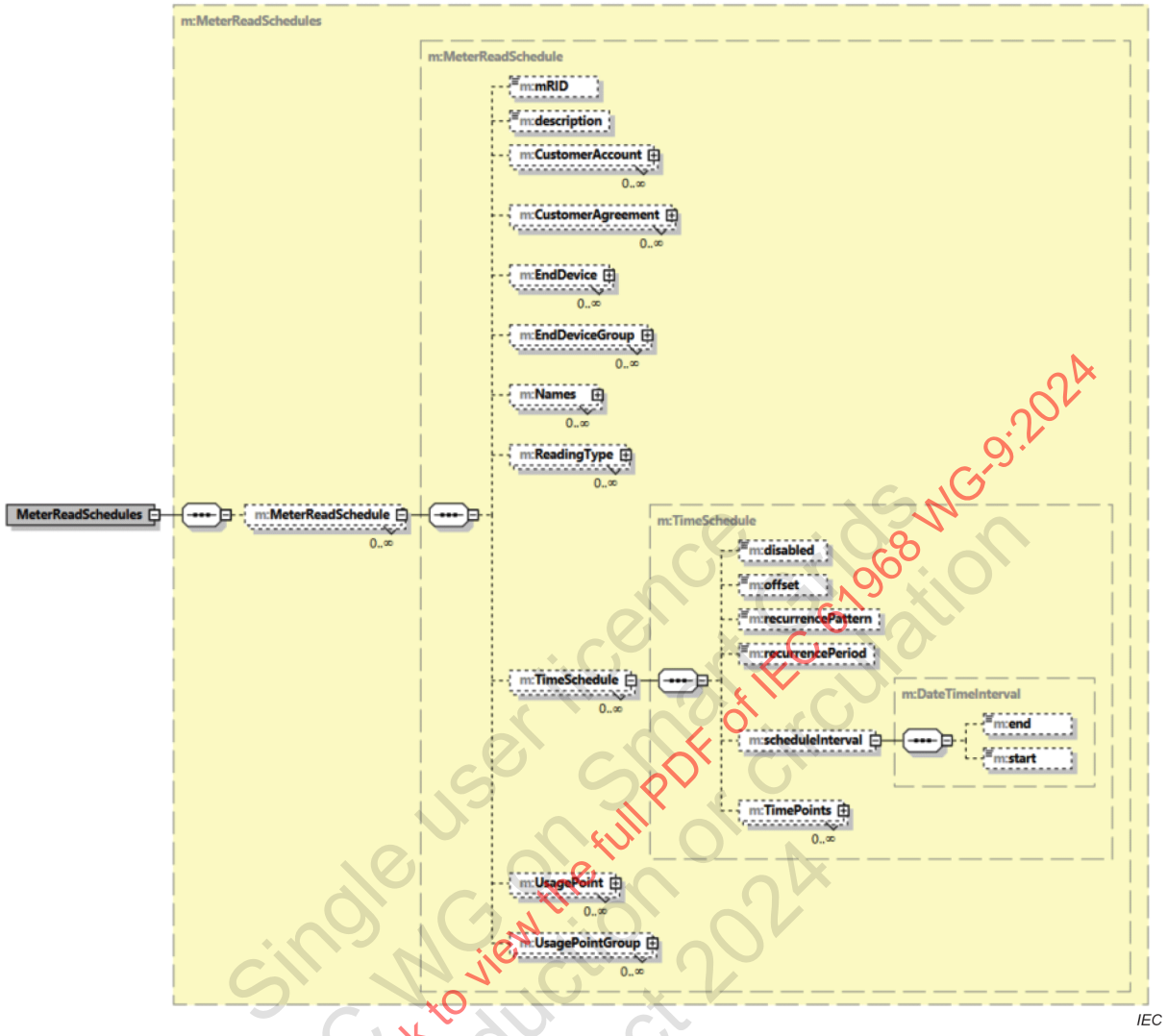


Figure 30 reproduced with the permission of UCAIug.

Figure 30 – Meter read schedules message format

Several elements in the TimeSchedule of the MeterReadSchedules are profile are unique to that profile and deserve special definition. These include:

disabled – True if this schedule is deactivated (disabled)

offset – The offset for the recurring (periodic) times in the TimeSchedule. Each point in the time series defined by scheduledInterval and either recurrencePeriod or recurrencePattern will be shifted by adding the offset value. The use of TimeSchedule.offset is not applicable when discrete TimePoints are specified in lieu of a recurrencePeriod or recurrencePattern.

recurrencePattern – Interval at which the scheduled action repeats, from the beginning of one action to the beginning of the next action (e.g., first Monday of every month, last day of the month, etc.). Used when the interval cannot be defined as a fixed number of seconds between points in time. The use of recurrencePattern is not applicable when recurrencePeriod is specified or when discrete TimePoints are specified in lieu of a recurrencePeriod or recurrencePattern.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence only, copying and networking prohibited
IEC Central Office, Geneva, Switzerland
No reproduction or circulation
Oct 2024

recurrencePeriod – Duration between time points, from the beginning of one action to the beginning of the next action. Used when the interval can be defined as a fixed number of seconds between points in time. The use of recurrencePeriod is not applicable when recurrencePattern is specified or when discrete TimePoints are specified in lieu of a recurrencePeriod or RecurrencePattern.

5.4 End device control messages

5.4.1 General

There are many types of end device control messages. These are used to send instructions to one or more end devices. EndDeviceControls may result in one or more consequential EndDeviceEvent message.

5.4.2 Applications

5.4.2.1 Load control

Load control (a.k.a. direct load control) requests can often be made to a MS for the purpose of load curtailment. This request would typically be initiated from network operations. Not all MS will have load control capabilities.

It should also be noted that this is different from a disconnect, where a disconnect results in the complete loss of power to a single customer.

A load control will typically result in the shedding of specifically configured loads (e.g. air conditioning, pumps, etc.)

The load control function executes load shed commands which are computed by load management software (contained in the network operations block). The load management software is used to compute an appropriate load-shed amount, and could potentially include many factors including the predicted duration of generation shortfalls, historical usage patterns, real-time usage data, and weather.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC Version Smart Grids
No reproduction or circulation
Oct 2024

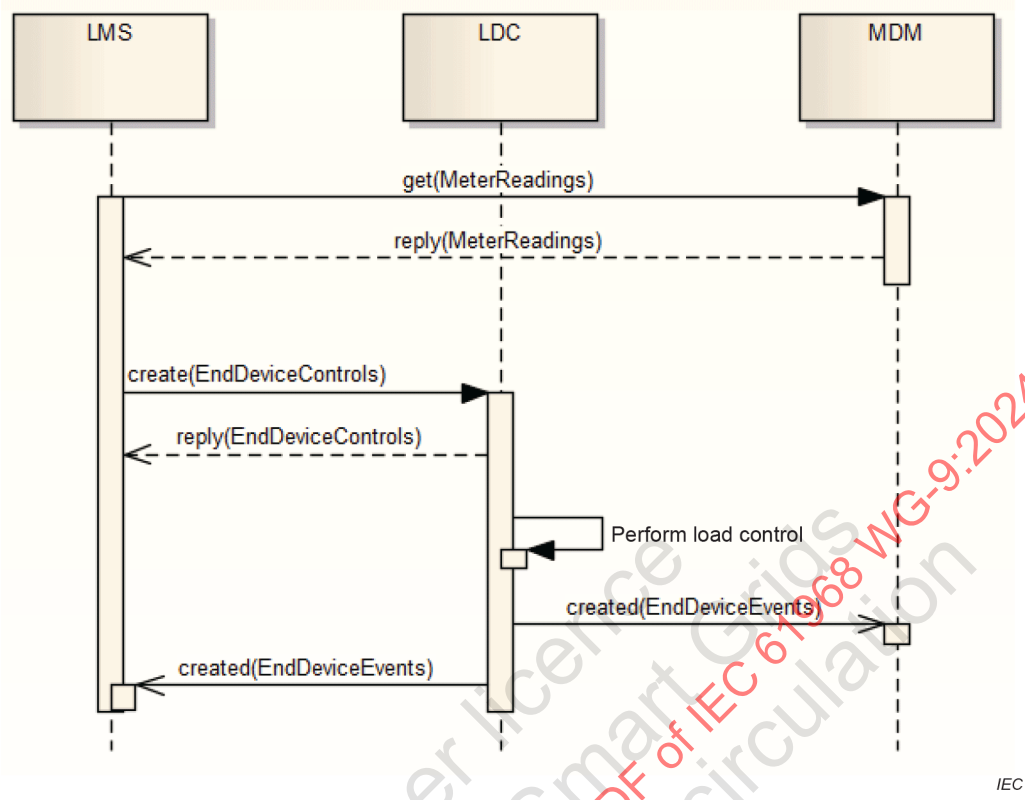


Figure 31 reproduced with the permission of UCAIug.

Figure 31 – Example load control message exchange

The example in Figure 31 shows how load history may be obtained from the MDM in the form of MeterReadings and used to perform load analysis. It also shows load control commands being issued by the LMS to the load control system. Deployments that do not support an MDM would interact directly with the MS instead.

Load control commands are implemented as a type of EndDeviceControl, where the command can be addressed by EndDeviceGroup (using a group address), by EndDevice (using mRID) or by CustomerAgreement.

Load control may also be implemented using PAN devices.

5.4.2.2 Load control device installation

The installation of load control units is usually more labour intensive than installing a meter, but the data exchange requirements are simpler. LC units are different from meters in the sense that they don't require periodic recalibration. Once an LC unit is installed it will probably remain in place for the life of the unit, even if the customer withdraws from the LC program, or if there is a change in tenancy.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
ESCoE WG on Smart Grids
No reproduction or circulation
Oct 2024

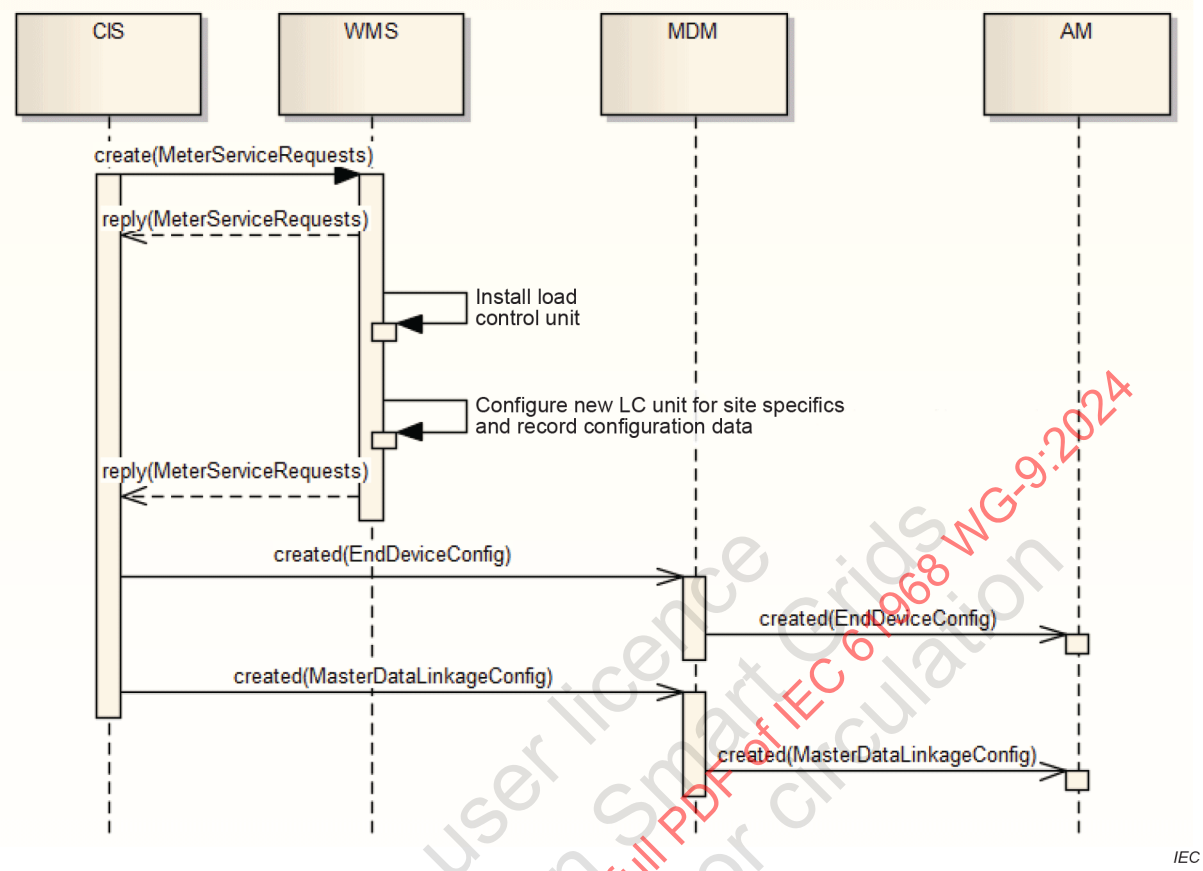


Figure 32 reproduced with the permission of UCAIug.

Figure 32 – Example message exchange for LC unit installation

Before travelling to the service location, the installer will know the customer account data, the type of load control unit to be installed, and the ratings of the device to be controlled. The installation data can confirm device ratings, and where appropriate, document the port number of the LC unit wired to the device. The results of the installation can be published to all of stakeholders as depicted in Figure 32.

5.4.2.3 Change of customer program

Particular metering solutions are usually chosen to fulfil specific metering needs as a result of customer program enrolment. In many cases, a flexible metering solution can provide coverage for a range of customer programs. When a customer transitions from enrolment in one program to another, it may simply require a change to the meter (or communication module) configuration. In extreme cases it may require a meter change out. In other cases, it may require no change at all. Changes to a configuration will need to be communicated amongst the stakeholders. An example exchange in which the deployment involves an MDM is described in Figure 33. Another example in which the deployment lacks an MDM is described in Figure 34.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EPRI WG on Smart Grids
No reproduction or circulation
Oct 2024

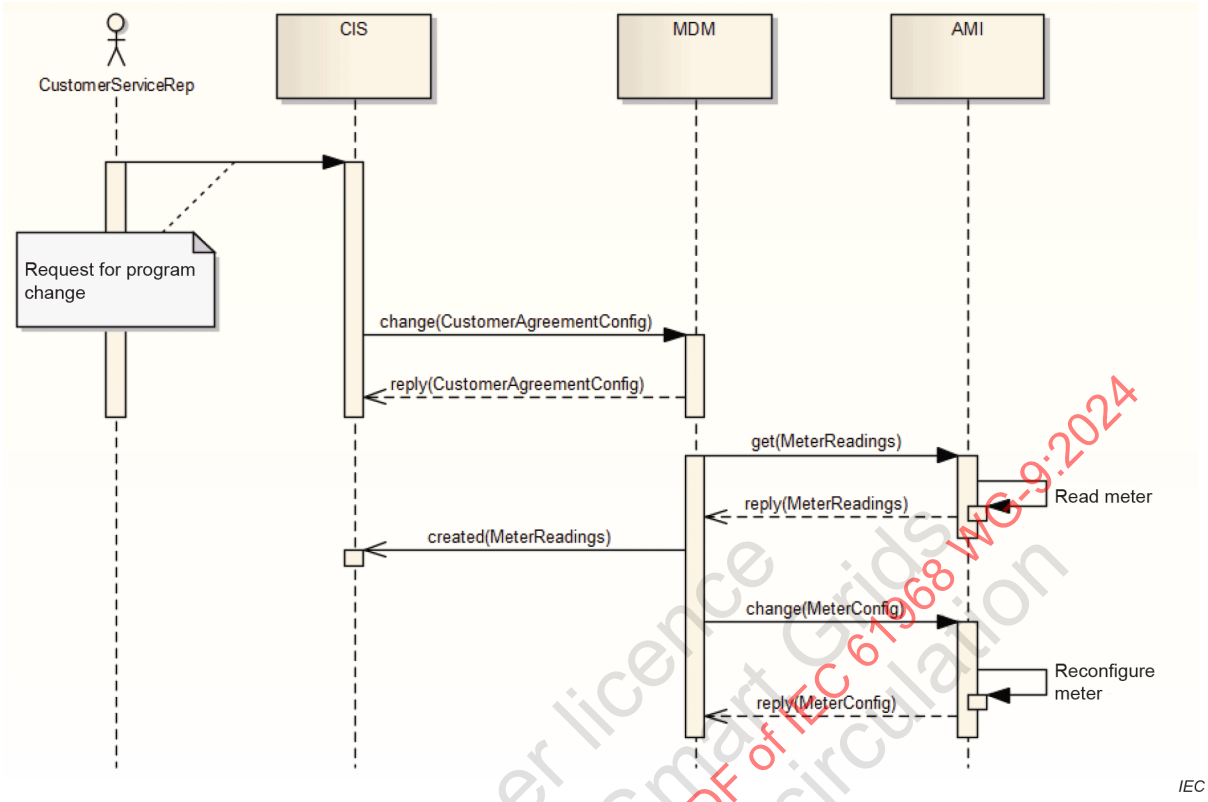


Figure 33 reproduced with the permission of UCAIug.

Figure 33 – Example message exchange for change of customer program

Changes to the meter configuration may be expressed as changes to the configuration of an EndDevice.

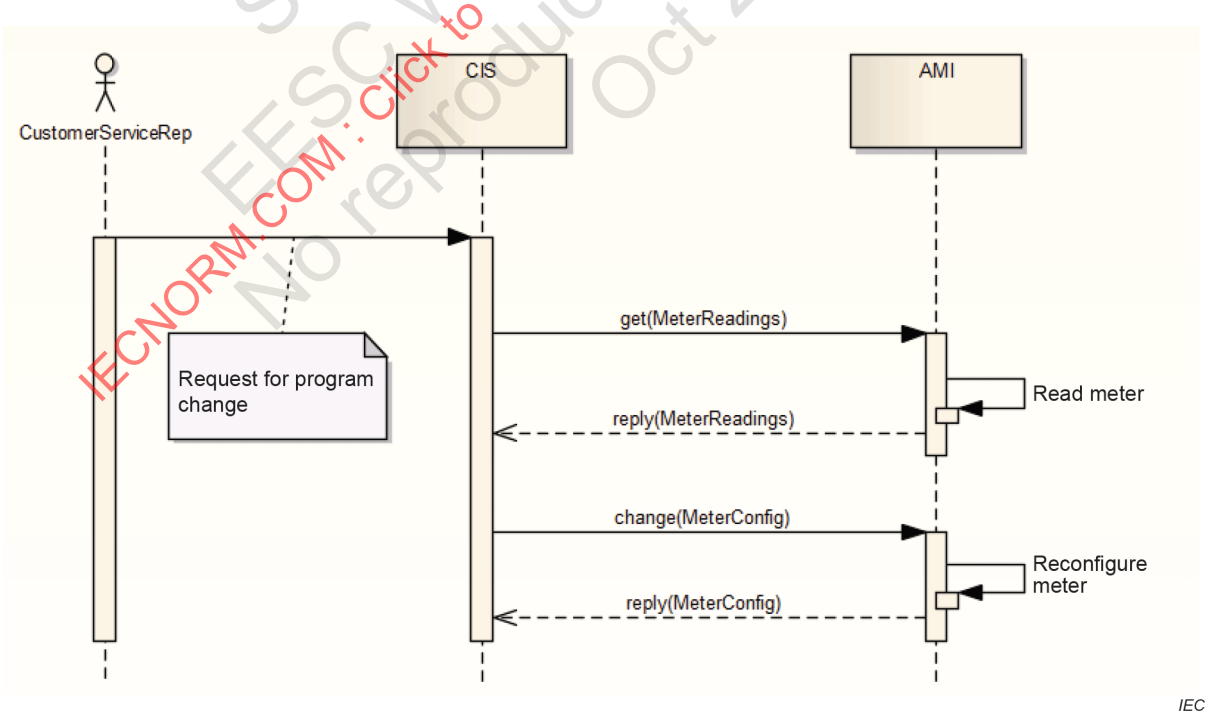


Figure 34 reproduced with the permission of UCAIug.

Figure 34 – Example message exchange for change of customer program w/o MDM

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESG WG on Smart Grids
No reproduction or circulation
Oct 2024

In other cases, a change to the customer program might not be accommodated with a meter reconfiguration. The program change may require a meter changeout (refer to 5.5 for more information on meter changeouts). Meter changeouts entail a different workflow than meter reconfigurations. This will be reflected in the message exchange between systems. An example exchange is depicted in Figure 35.

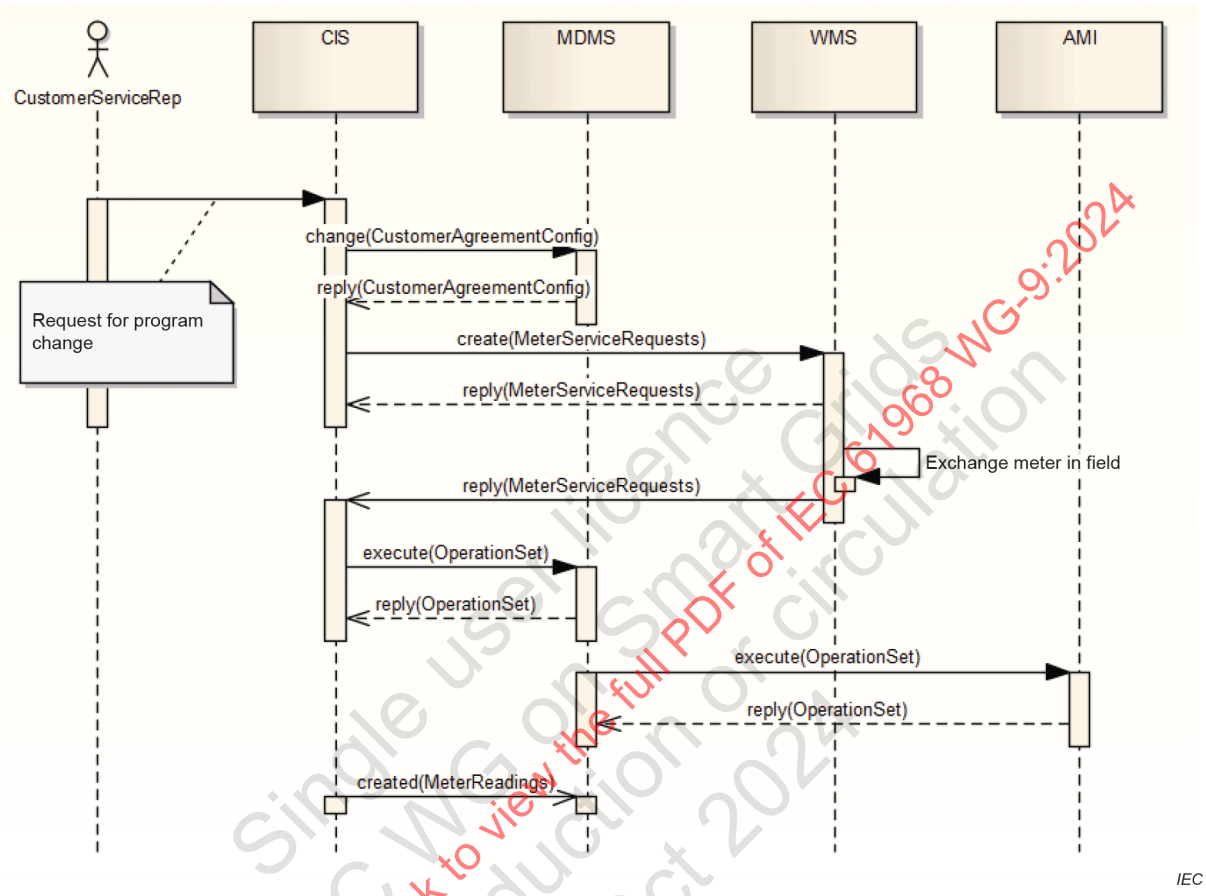


Figure 35 reproduced with the permission of UCAIug.

Figure 35 – Example for change of customer program with meter change out

See 5.6.2 on meter installation and removal for additional details on the MeterServiceRequest message.

5.4.2.4 Meter disconnect and reconnect

For a variety of reasons, such as non-payment, it may be necessary to disconnect or reconnect a customer. When disconnected, recorded usage should be zero and out of power complaints should be ignored. When it is not possible to perform a disconnect or reconnect remotely through an MS, a meter service request will typically be issued to perform the disconnect or reconnect manually. Example message exchanges for remote operation are depicted in Figure 36 and Figure 37.

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

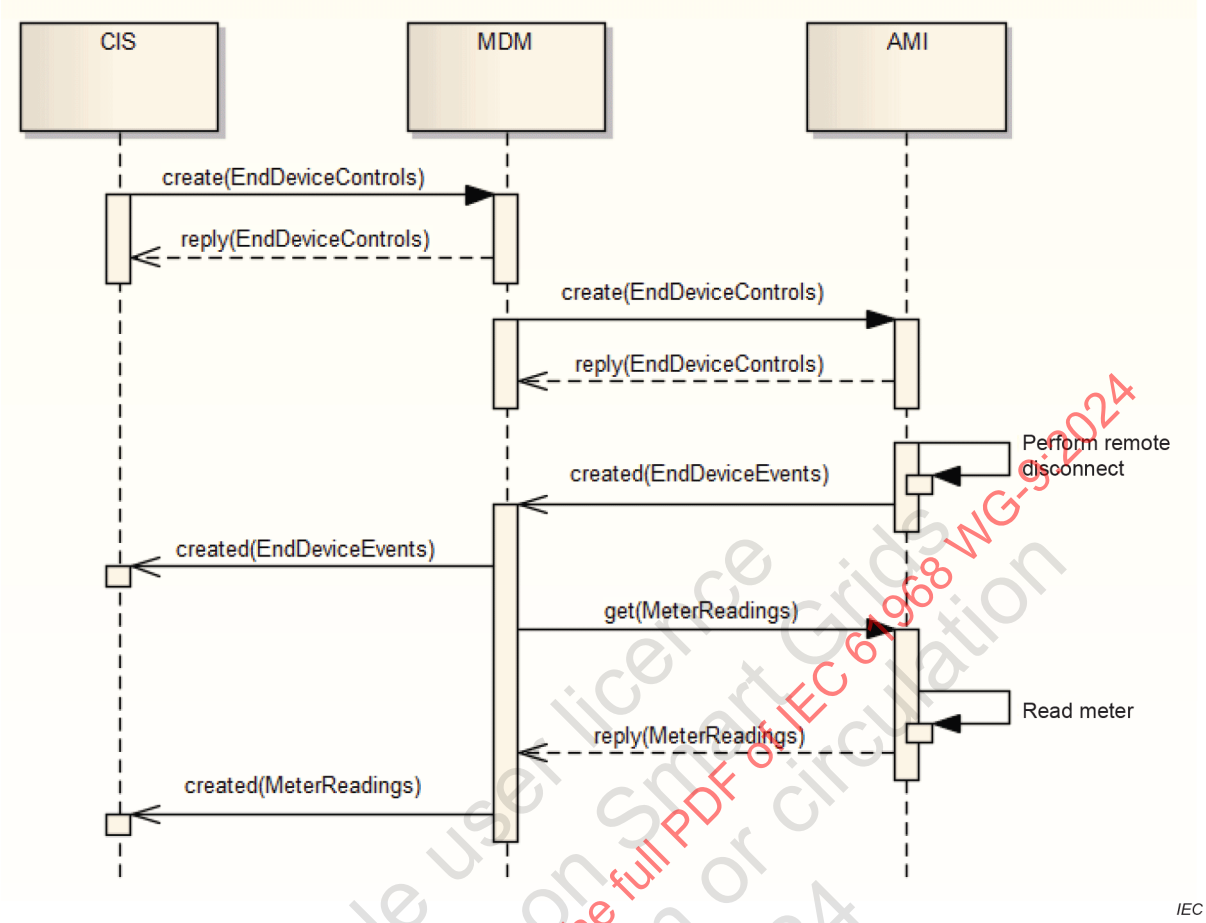


Figure 36 reproduced with the permission of UCAIug.

Figure 36 – Example message exchange for meter connect/disconnect

Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024
IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024

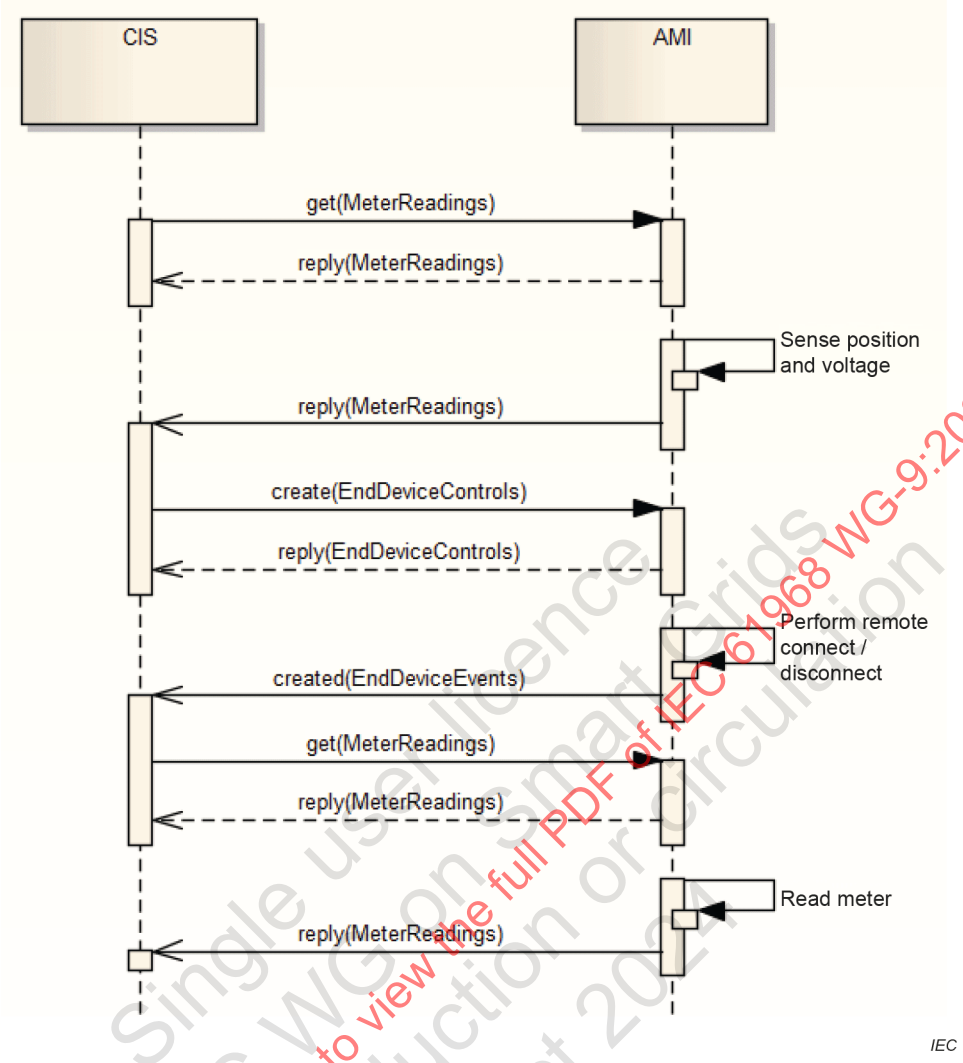


Figure 37 reproduced with the permission of UCAIug.

Figure 37 – Example of remote connect/disconnect directly between CIS and MS

5.4.2.5 Real-Time pricing

Real-time pricing signals and/or schedules can be sent to an end device via the MS. There are several ways this can be accomplished, such as:

- price signal issued in real-time identifying a price for a given time interval
- time of use (TOU) schedules published, which cause changes in the accumulation for each TOU Tier
- energy price schedules published in advance.

Often the EndDeviceGroup can be used to differentiate meters with different contracts or tariffs.

The example in Figure 38 shows a price signal being sent from network operations, to the MS. The MS then acts as a network service provider to communicate the price in real time to meters and other equipment.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEC SC WG on Smart Grids
No reproduction or circulation
Oct 2024

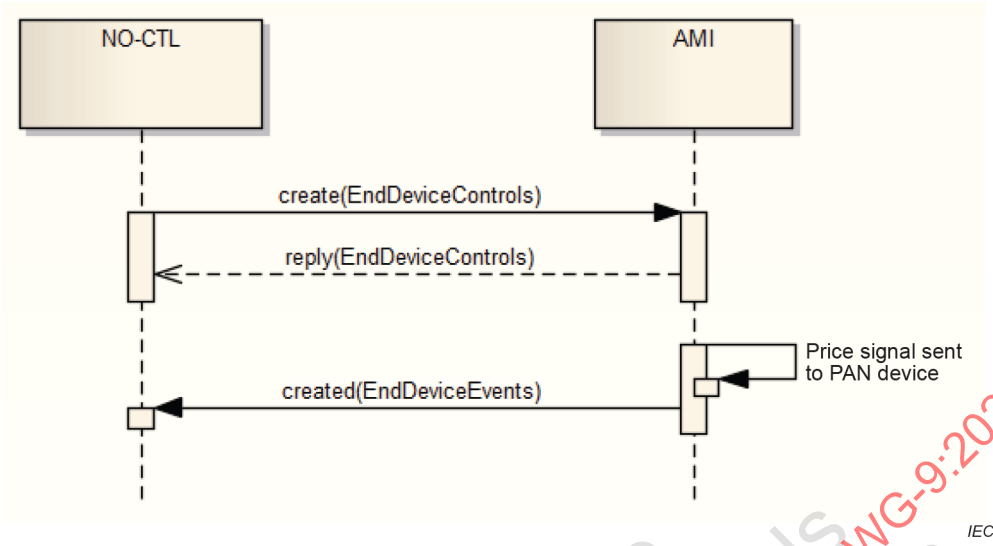


Figure 38 reproduced with the permission of UCAIug.

Figure 38 – Example message exchange for real-time price signal

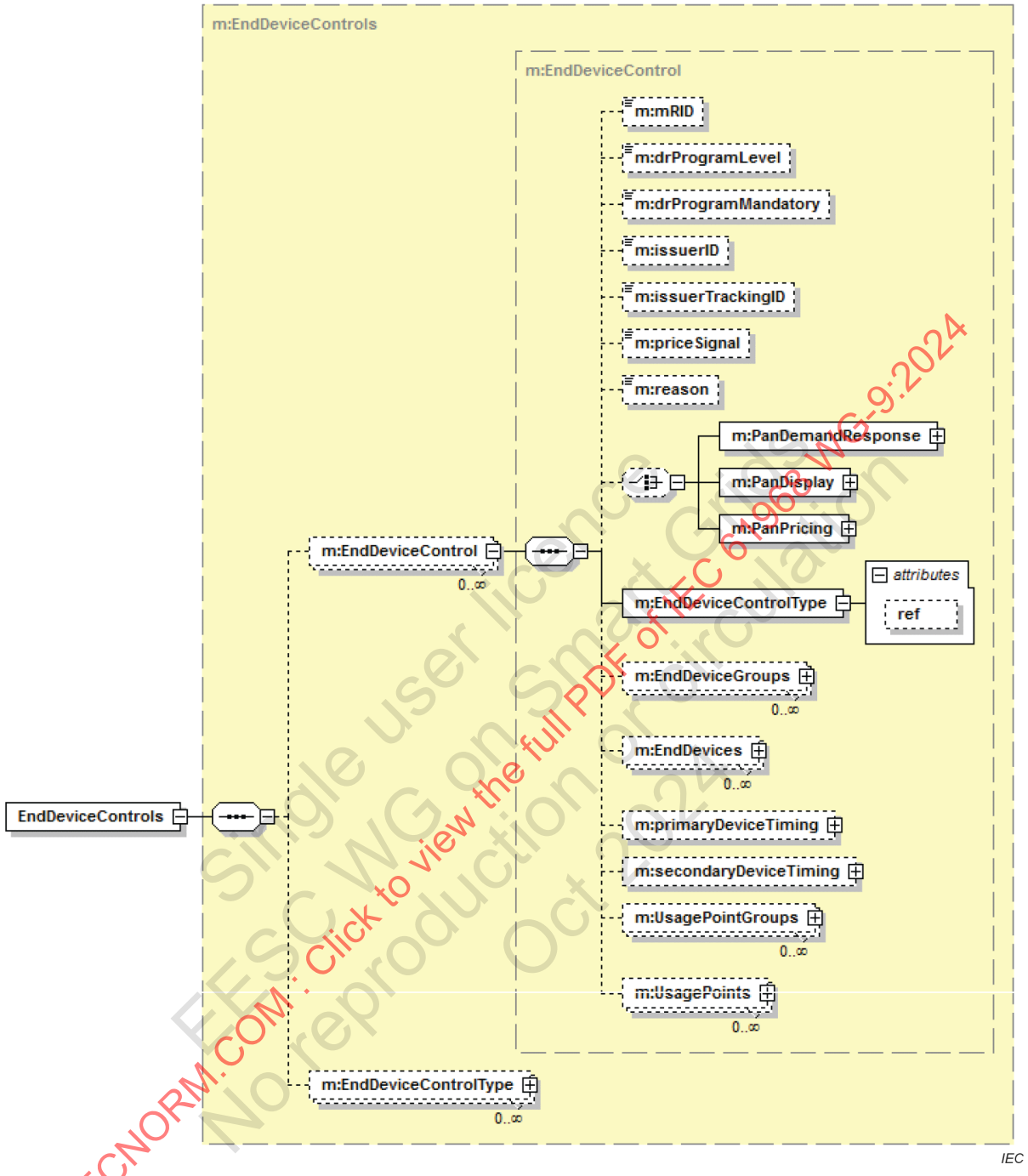
Price signals are implemented as a subtype of EndDeviceControl, where the price is a message parameter.

5.4.3 Message format

5.4.3.1 General

Figure 39 describes the structure of an EndDeviceControls message. The XML schema for the EndDeviceControls message is defined in Annex G.

Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024
IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024



IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
FESC WG on Smart Grids
No reproduction or circulation
Oct 2024

Figure 39 reproduced with the permission of UCAIug.

Figure 39 – End device controls message format

Within this message payload structure, specific meters may be addressed by EndDevice (e.g. meter) EndDeviceGroup, UsagePoint and/or UsagePointGroup. Aside from at least one address, the only required element is the EndDeviceControlType, which identifies the type of control to be performed. Examples of the different control types that could be used include, but are not limited to:

- load control signal
- price signal or schedule
- remote disconnect
- remote reconnect

- demand reset
- demand reduction signal
- sending a text message to a PAN device
- sending pricing signals to a PAN device
- sending load control / demand response events to a PAN device.

The following Subclauses 5.4.3.2, 5.4.3.3, 5.4.3.4 and 5.4.3.5 are representative XML examples for EndDeviceControls.

5.4.3.2 Example of a demand reset payload

Figure 40 is an example for a demand reset. Note that in this example there are two devices being addressed, each of these is in its own EndDevices element. One of them is addressed by mrID and the other is addressed by Names.

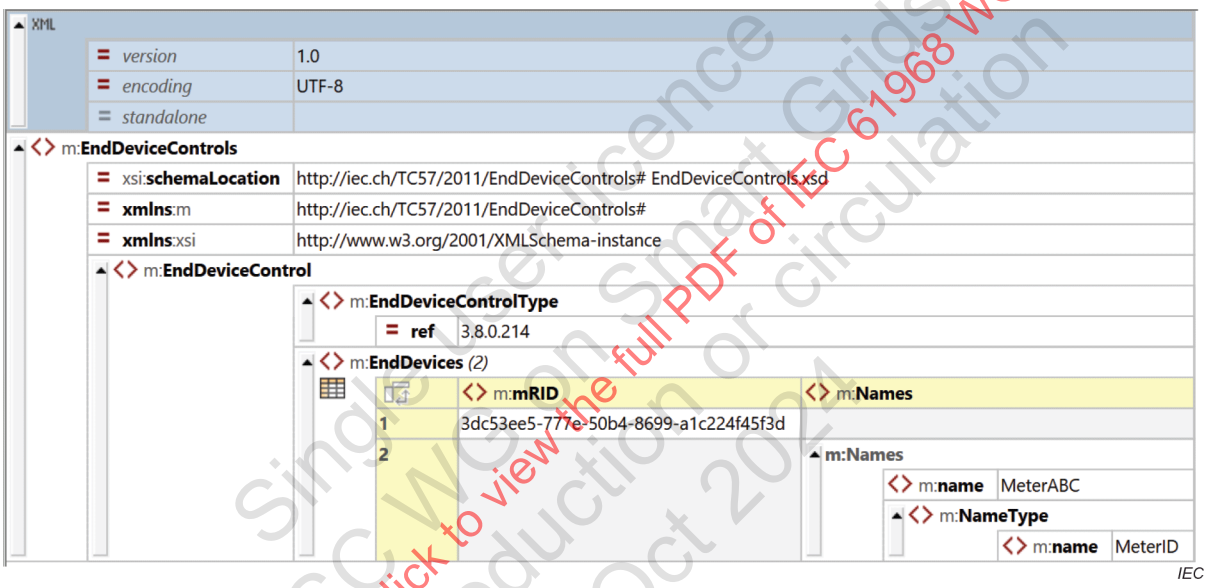


Figure 40 reproduced with the permission of UCAIug.

Figure 40 – EndDevice example

5.4.3.3 Example of a meter disconnect by group

Figure 41 is an example of a meter disconnect by group.

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence
EESG WG on Smart Grids
No reproduction or circulation
Oct 2024

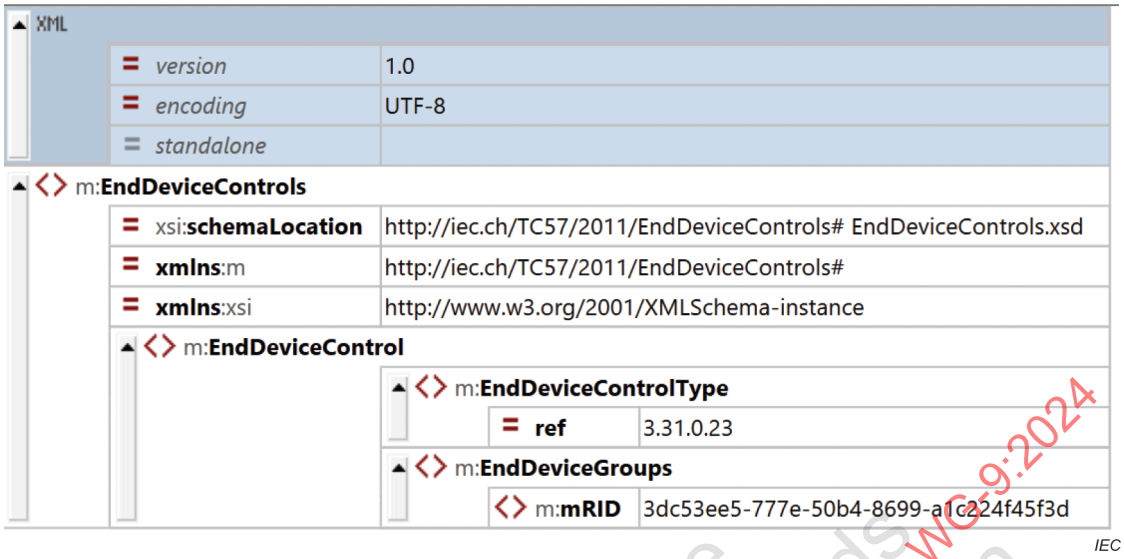


Figure 41 reproduced with the permission of UCAIug.

Figure 41 – EndDeviceControl example

5.4.3.4 Example of a scheduled disconnect by group

Figure 42 is an example of a scheduled disconnect by group.

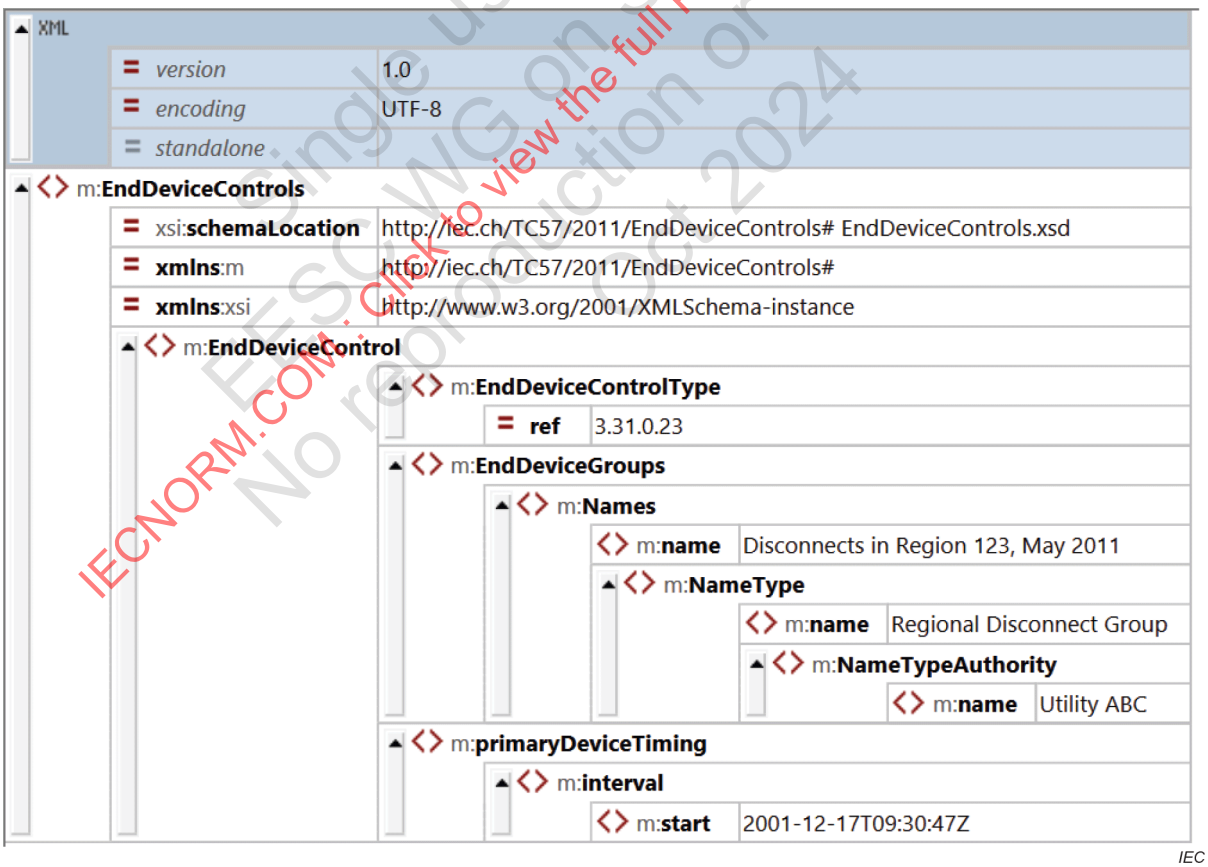


Figure 42 reproduced with the permission of UCAIug.

Figure 42 – EndDeviceControls disconnect by group example

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEC WG on Smart Grids
No reproduction or circulation
Oct 2024

5.4.3.5 Example of a meter connection by name

Figure 43 shows an example of a meter connection, where the the meter is specified by name.

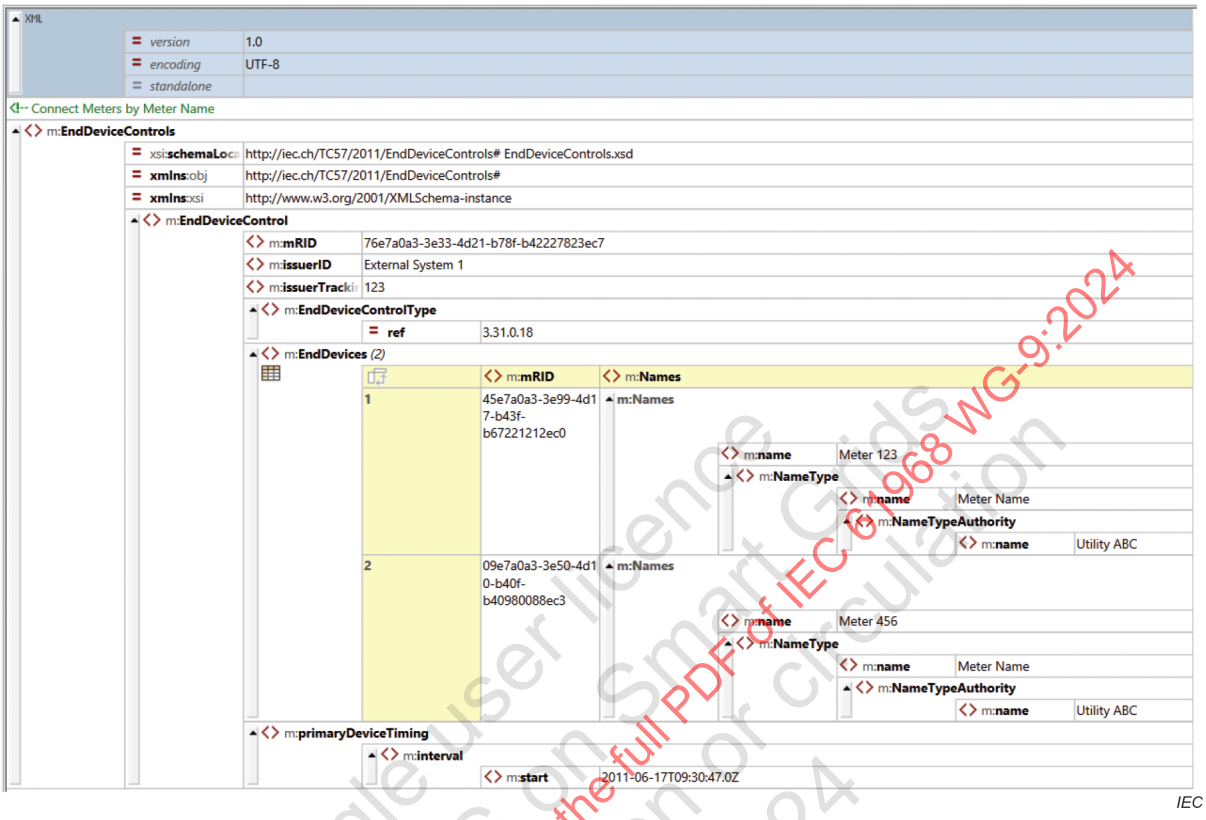


Figure 43 reproduced with the permission of UCAIug.

Figure 43 – EndDeviceControls meter connection example

5.5 Meter service requests

5.5.1 General

Meter service requests are a subclass of Work, where an EndDevice is involved. These are communicated using the ServiceRequest profile, and are defined in IEC 61968-8.

It may be necessary to install, remove or configure meters as a consequence of the registration of a new customer, removal of a customer or the switch of a customer from one supplier to another. These scenarios are discussed in IEC 61968-8. However, there may also be a need identified by the AMI system or MDM to change out an existing meter. This involves the removal of the old meter, installation of the new meter and configuration of the new meter as needed by the metering system.

EndDeviceEvents (as described in 5.2) can cause an evaluation to occur which results in a request for a meter change out. Meter events may be published from the MS or MDM. Figure 44 describes an example exchange where the MDM has identified a problem, and brought it to the attention of the WMS which decides to change out the meter.

Once again, the OperationSet steps are included to synchronize the revised Master Data (the configuration data for the new and old meters and the association changes with the UsagePoint) with the MDM System and the Metering System. See 5.8 and Annex I and Annex J for additional information related to Master Data Management.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024 WG-9
Single user licence FESCWG on Smart Grids No reproduction or circulation Oct 2024

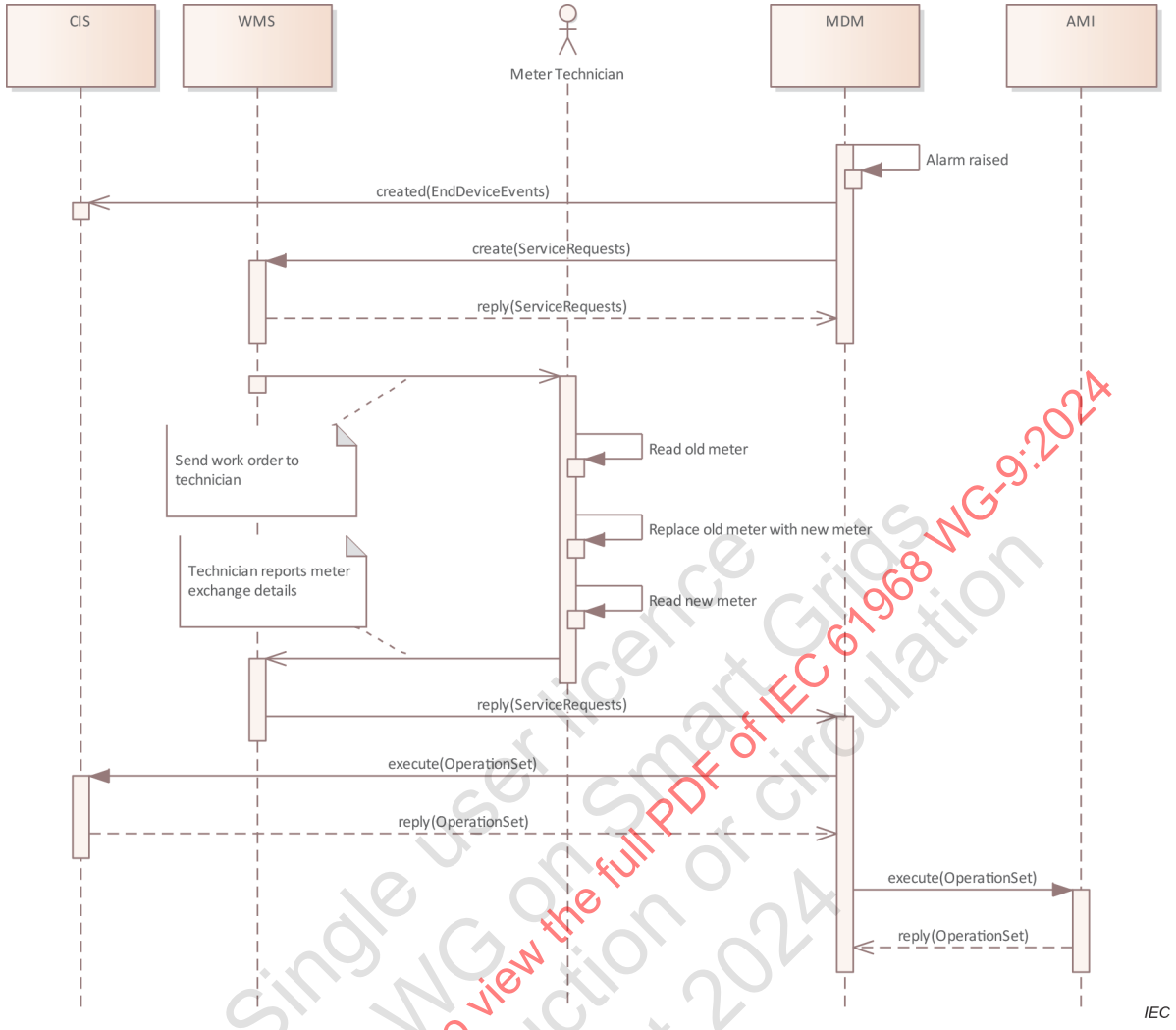


Figure 44 reproduced with the permission of UCAIug.

Figure 44 – Example end device event message exchange due to meter changeout

5.6 Metering system events

5.6.1 General

There are different levels of need within the system for different kinds of messages.

The metering system (*per se*) may develop problems within its infrastructure which require a work order to fix. The data requirements for communicating this event are similar to the requirements of EndDeviceEvent as described in 5.2. With an EndDeviceEvent, a simple error code can be used to report a problem. This mechanism works when the recipient is able to look-up and interpret the meaning of the code. However, when a more detailed description of the problem is required, a more elaborate schema shall be used. In some cases, the recipient is a human and requires a human-readable description of the problem, and the particular piece of equipment involved. When identifying the asset, it will probably be necessary to use vendor-specific terminology to describe the hardware.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESG WG on Smart Grids
No reproduction or circulation
Oct 2024

5.6.2 Applications – Firmware upgrade

For an automated Metering System capable of two-way communication, it may be possible to upgrade the firmware of MS infrastructure in the field, or in some systems the communication assets in the end devices. Changes to the metering system that materially affect its operation shall be communicated to all of the relevant stakeholders. An example of such a publication using an EndDeviceConfig message is depicted in Figure 45.

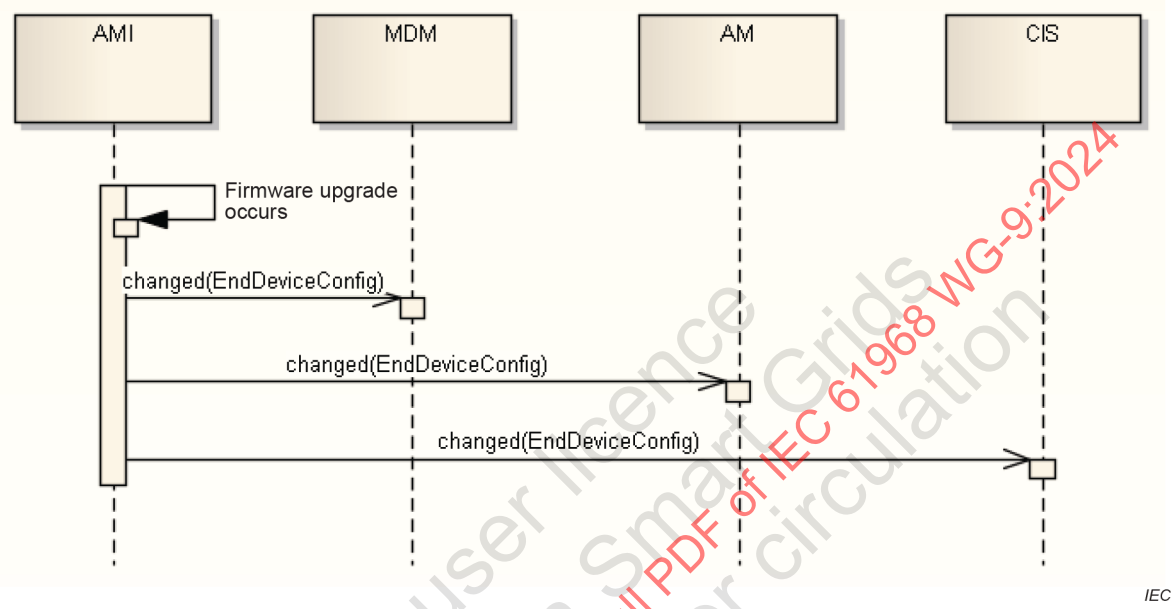


Figure 45 reproduced with the permission of UCAIug.

Figure 45 – Example firmware upgrade message exchange

The firmware upgrade may cause the EndDevice or CommEquipmentAsset to change in a number of ways, including device functional characteristics, firmware version and revision number, or configuration (expressed as a programId).

5.6.3 Message formats

Please refer to the EndDeviceConfig message format described in 5.8.3.

5.7 Premises area networks

5.7.1 General

The metering system has been expanded to include devices that have been deployed within homes and businesses that are managed using the metering infrastructure. Within this document, these devices exist within a premises area network (PAN). This is inclusive of the commonly used term home area network (HAN). The PAN/HAN devices themselves are a special type of EndDevice.

Given the evolving nature of the underlying devices and communication protocols, this document attempts to take a view that can be mapped as needed into a variety of device standards.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESG WG on Smart Grids
No reproduction or circulation
Oct 2024

5.7.2 Applications

5.7.2.1 General

The applications for PAN devices primarily include dynamic pricing, demand response and providing information to customers. There are many types of PAN devices, including smart thermostats, in home displays, relays, etc.

5.7.2.2 PAN device pairing and unpairing

The pairing of a PAN device with a meter is required before the PAN device can be sent commands by the Metering System.

PAN device pairing (and un-pairing) is performed using an EndDeviceControls message as shown in the example of Figure 46. The following special conventions relative to the EndDeviceControl message apply to pairing a PAN device with a meter:

- The appropriate EndDeviceControlType code for pairing a PAN device should be selected from Annex F.
- Two (and only two) EndDevices are identified by mRid or the Names class – one is the meter and the other is the PAN device. The isPan Boolean will be set to true for the PAN device and the install code and electronicAddress.macAddress are also normally required.
- Successful or unsuccessful results for the pairing operation are reported using EndDeviceEvents messages, with the appropriate EndDeviceEventType enumerations found in Table E.25. It is possible for more than one EndDeviceEvent to be reported as a result of the EndDeviceControl.

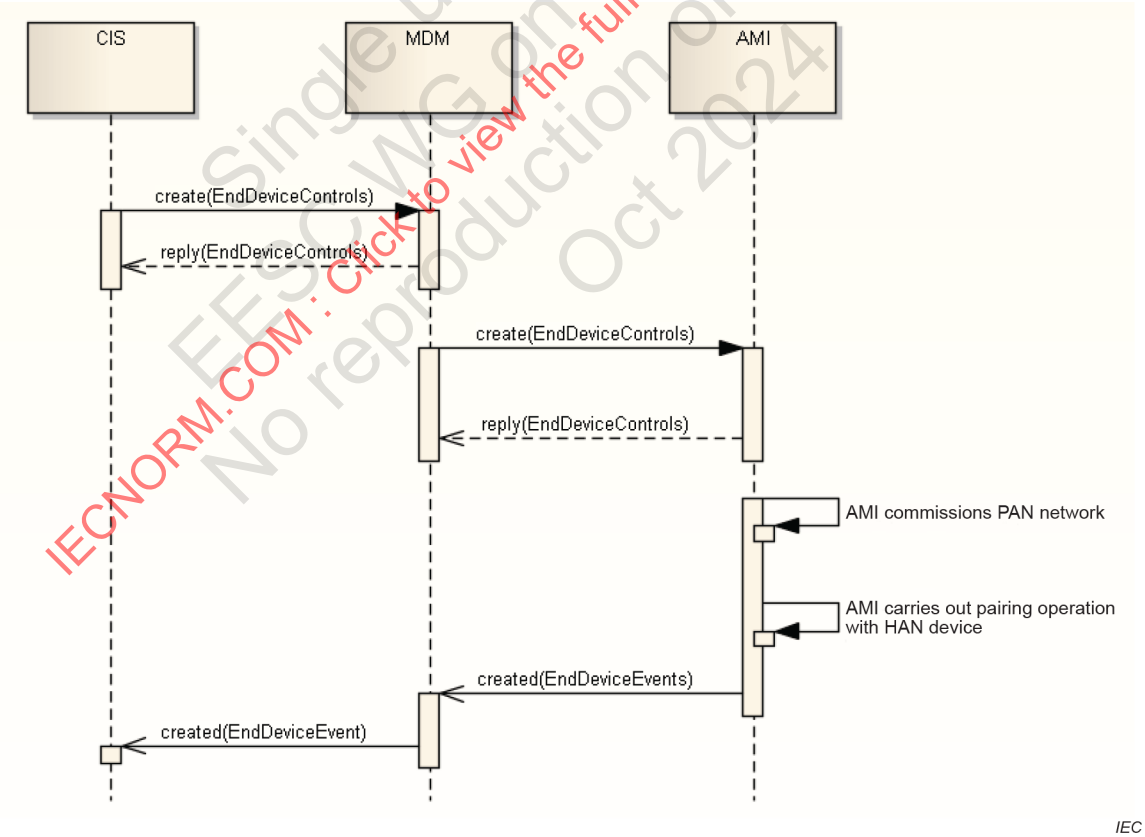


Figure 46 reproduced with the permission of UCAIug.

Figure 46 – Pairing of a PAN device

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence EESG WG on Smart Grids No reproduction or circulation Oct 2024

5.7.2.3 PAN Events

PAN device events are generated by a PAN device, where they are typically communicated through a meter or gateway to the metering system head end. The metering system head end will then publish the message to other enterprise applications that have subscribed. These events are conveyed using the EndDeviceEvents message. An example is shown in Figure 47.

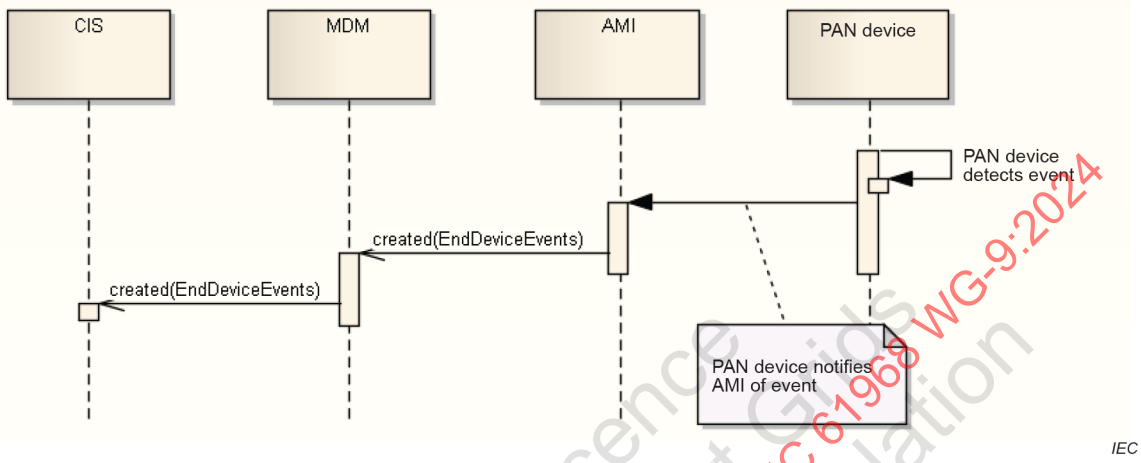


Figure 47 reproduced with the permission of UCAIug.

Figure 47 – PAN device events

5.7.2.4 PAN controls

Additional PAN device controls for purposes other than pairing may be initiated by an enterprise application such as a demand response management system to a metering system head end. These controls also use the EndDeviceControls message. Given that there are a variety of ways that the control can be addressed, there may be many target PAN devices. An example is shown in Figure 48.

EndDeviceControls messages intended for PAN devices will typically include one of the following special structures within the EndDeviceControl profile:

PanDemandResponse

PanDisplay

PanPricing

The appropriate EndDeviceControlType and EndDeviceEventType enumerations for these functions can be found in Annex E and Annex F.

Single user licence
EESC Version Smart Grids
No reproduction or circulation
Oct 2024
IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024

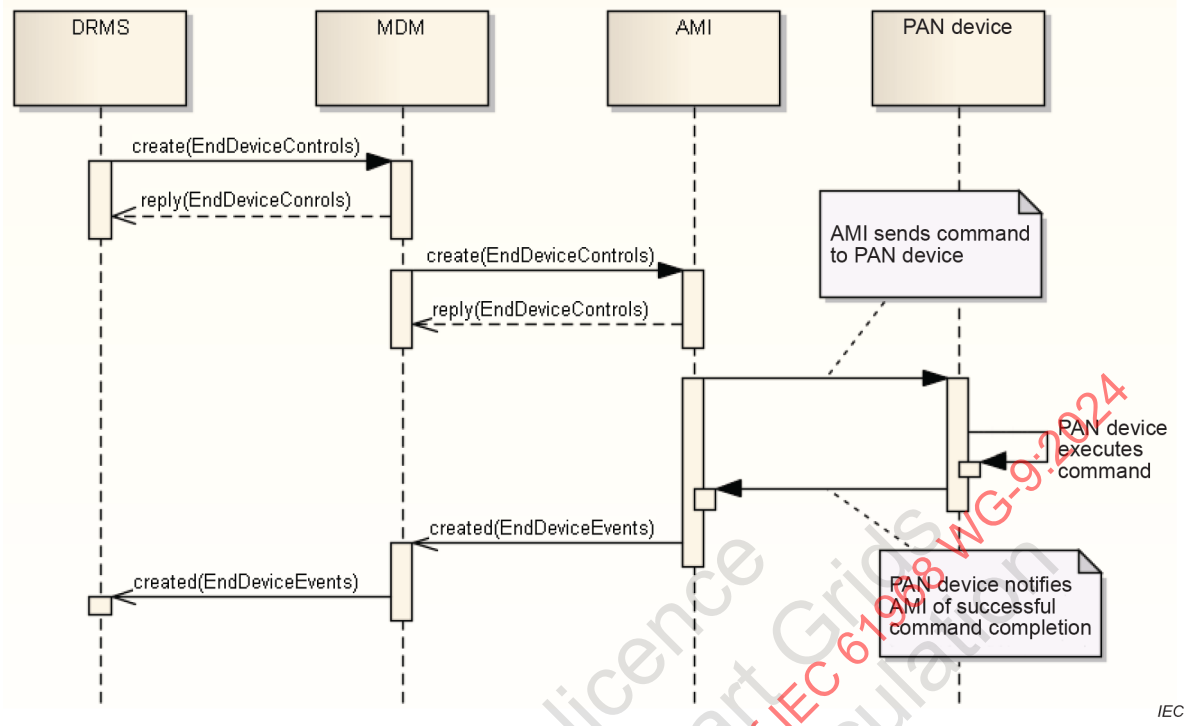


Figure 48 reproduced with the permission of UCAIug.

Figure 48 – PAN device controls

5.7.3 Message formats

There are no unique messages defined specifically for PAN devices. PAN devices are simply types of EndDevices.

5.8 Master data management messages

5.8.1 General

Enterprise systems exchanging messages in the Meter Reading and Control domain require a means of managing the non-transactional data that defines assets, other CIM objects and the relationships (or associations between them). Master Data Management (MDM) is the term used to describe the practice of creating, changing, and deleting these objects and relationships.

For IEC 61968-9 purposes, the CIM classes that fall within the scope of Master Data Management and the IEC 61968-9 profiles used to create/change/delete these objects (and their "configurations") are included in Table 4:

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEC/SC WG on Smart Grids
No reproduction or circulation
Oct 2024

Table 4 – IEC 61968-9 configuration profiles

CIM object	IEC 61968-9 profile
ComModule	ComModuleConfig
EndDevice	EndDeviceConfig
EndDeviceGroup	EndDeviceGroups
Meter	MeterConfig
TransformerTank	[a]
UsagePoint	UsagePointConfig
UsagePointGroup	UsagePointGroups
UsagePointLocation	UsagePointLocationConfig

[a] For IEC 61968-9 purposes, the TransformerTank object has applicability to use cases involving Outage Management by providing a linkage between the UsagePoint and a TransformerTank in the network model. The TransformerTank is technically outside the scope of IEC 61968-9, and there is no IEC 61968-9 profile for creation, modification or deletion of a TransformerTank. However, the TransformerTank can be referenced within other profiles including, but not necessarily limited to the UsagePointConfig, CustomerMeterDataSet, GetMeterReadings, and MasterDataLinkageConfig profiles.

ConfigurationEvents occur each time a create, change, update, or delete operation is performed using any of the "config" operations using the IEC 61968-9 profiles in Table 4 as well as any time that a MasterDataLinkageConfig transaction is executed to manage the relationships of MDM objects.

The ConfigurationEvent class in the CIM is associated with each of the CIM classes in the first column of Table 4 and is incorporated into each of the IEC 61968-9 Profiles in column 2 of that table. The function of the ConfigurationEvent class is to provide important business details about each "config" operation, including:

- the date and time at which the configuration or configuration change became effective or is to become effective,
- the entity performing the configuration operation, and
- free-form remarks providing additional business information related to the configuration event.

Refer to Annex J for detailed descriptions of Master Data Management Use Cases and sample XML messages that clarify the intended use of the messages in this subclause 5.8.

5.8.2 Applications

5.8.2.1 General

For the purposes of this standard, there are two methods used for managing the relationships between the CIM objects identified in 5.8.1. These are the MasterDataLinkage profile and, for a limited number of CIM objects, the relationships are explicitly managed using profiles identified in 5.8.1. The diagram in Figure 49 identifies the object relationships that are critical to master data management within the scope of this document and the specific method that is recommended to be used for managing each relationship.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence for EESC VMG on Smart Grids
No reproduction or circulation
Oct 2024

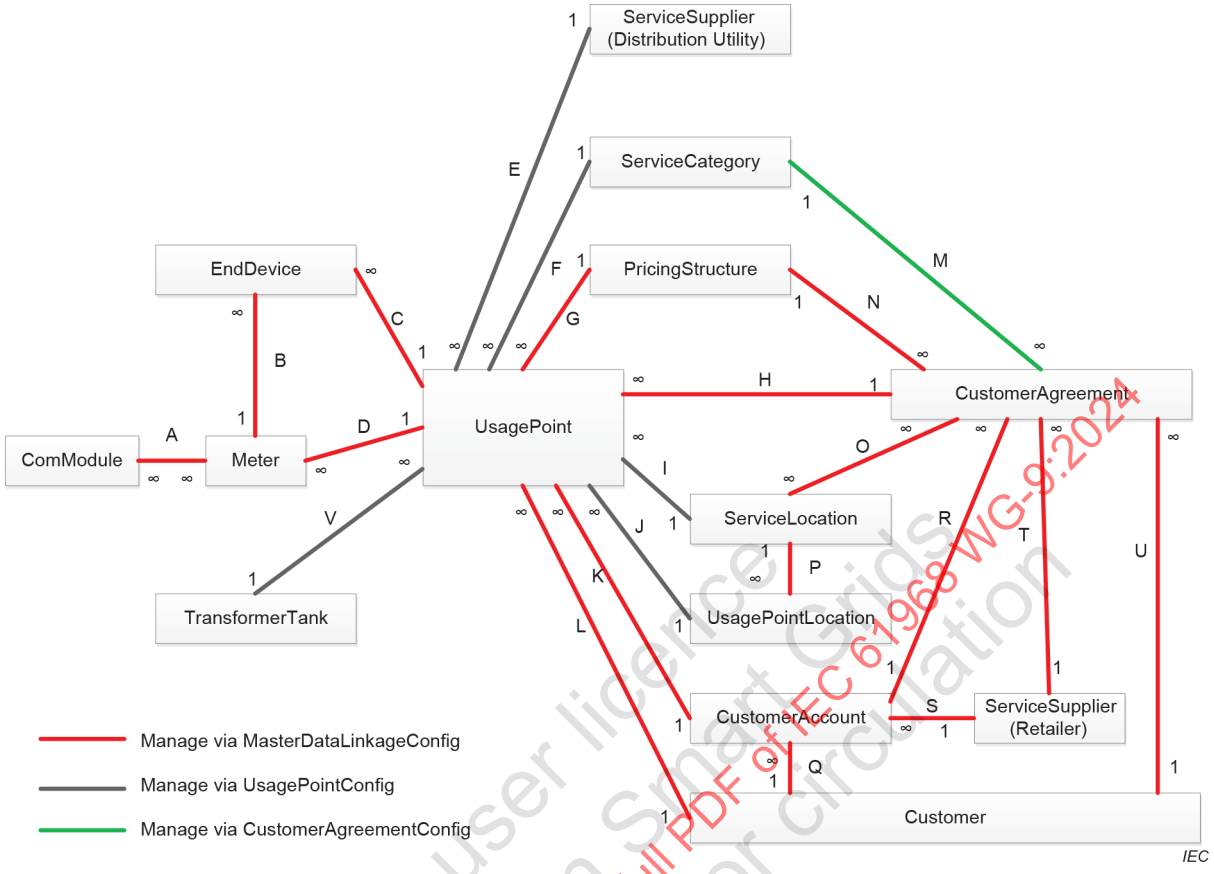


Figure 49 reproduced with the permission of UCAIug.

Figure 49 – Master data linkages

To fully comprehend Figure 49, it is necessary to understand that this document provides normative messages by which enterprise systems can exchange information; however there is no requirement that any given system implement an internal data model that is based upon or even consistent with the CIM. Accordingly, the above diagram presents the possibility of reflecting relationships in a variety of ways. For example, two systems may recognize the concepts of Customer, CustomerAccount and CustomerAgreement and choose to express the relationships between these entities and a UsagePoint by linking a Customer to a CustomerAccount (relationship Q), then linking the CustomerAccount to CustomerAgreement (relationship R) and finally linking the CustomerAgreement to the UsagePoint (relationship H). In this scenario, there may never be a need to utilize relationships K, L or U.

On the other hand, there may be two enterprise systems that do not materialize the concept of a CustomerAgreement in their internal data models. These systems may utilize messages that link a Customer to a CustomerAccount (relationship Q), and then link the CustomerAccount to the UsagePoint (relationship K). It is outside the scope of this document to be prescriptive on which of the relationships illustrated in Figure 49 are permissible or preferred. The MasterDataLinkageConfig profile may be used in a flexible manner to support the needs of any enterprise and its enterprise systems.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence for WG on Smart Grids
Not for distribution or circulation
Edition 2.1 2024

It is recommended that relationships E, F, I, J, M and V be managed by the "Config" profiles called out in the legend of the figure, rather than via the MasterDataLinkageConfig profile; however this is not a requirement and enterprises may choose to use the MasterDatalinkageConfig profile to manage these relationships as well. The reason for the recommendation that these specific relationships be handled by the identified profiles rather than the MasterDataLinkageConfig is twofold:

- these specific relationships seldom change, and
- these specific relationships are viewed by almost all enterprise systems in a consistent way.

The converse is also true. Enterprises may choose to manage relationships depicted as red lines as if they were depicted by black lines provided that the relationship is supported by the CIM and is reflected in the appropriate IEC 61968-9 profile.

Figure 49 is informative. It depicts the range of relationships expected between entities. Figure 53 takes a step toward an implementation by showing how XML might be organized. Further steps are illustrated at the link in Annex G for MasterDataLinkageConfig. Entities and relationships in Figure 53 may evolve over time as use of this document is extended to support new and revised business use cases.

5.8.2.2 Usage points

Information about the usage points may be configured into MS by means of a UsagePointConfig message payload.

An example of a message exchange is given in Figure 50 and the message format is given in 5.8.3.4.

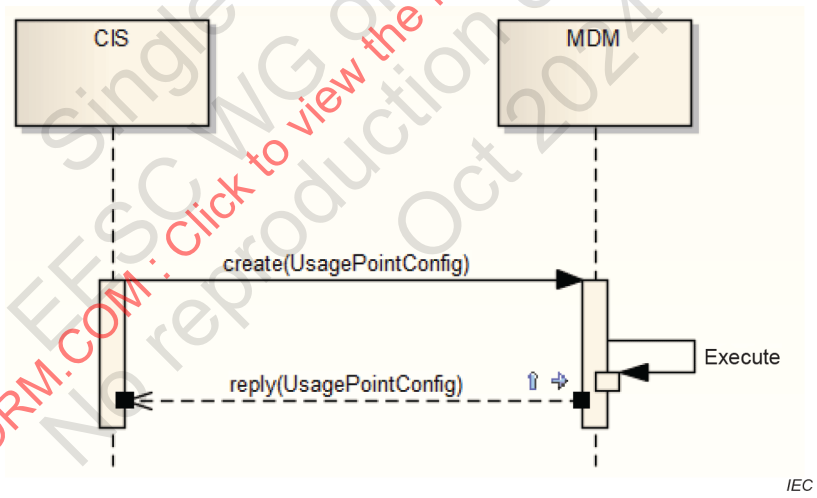


Figure 50 reproduced with the permission of UCAIug.

Figure 50 – Message exchange for transferring usage point information

5.8.2.3 Meters

Information about the meters in service may be configured into MS by means of MeterConfig message payload.

An example of a message exchange is given in Figure 51 and the message format is given in 5.8.3.7.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

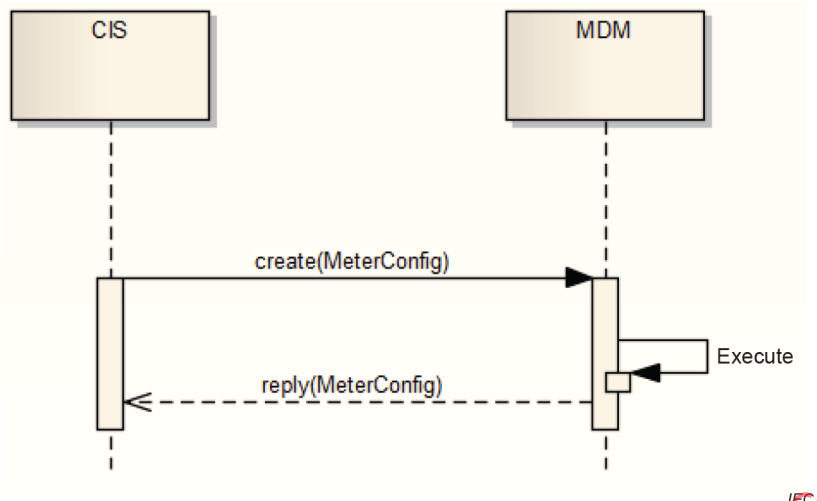


Figure 51 reproduced with the permission of UCAIug.

Figure 51 – Message exchange for transferring meter information

5.8.2.4 End devices

Information about end devices in service may be configured into MS by means of an EndDeviceConfig message payload.

An example of a message exchange is given in Figure 52 and the message format is given 5.8.3.6.

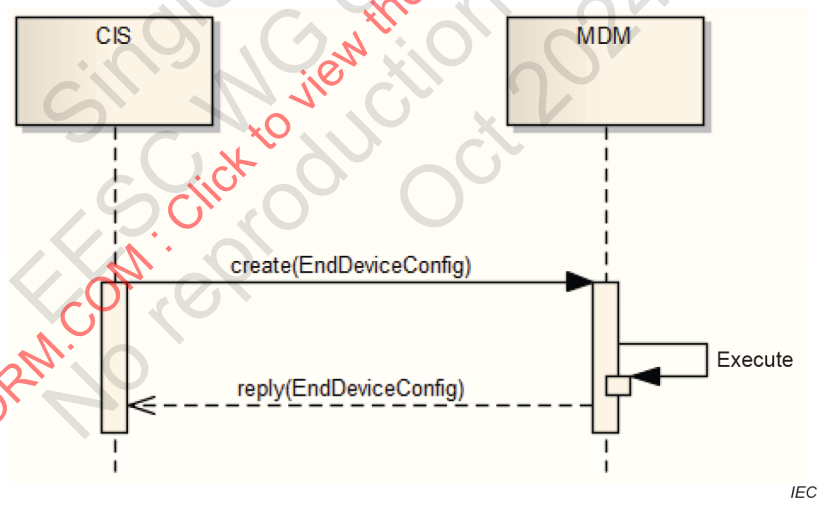


Figure 52 reproduced with the permission of UCAIug.

Figure 52 – Message exchange for transferring end device information

5.8.3 Message formats

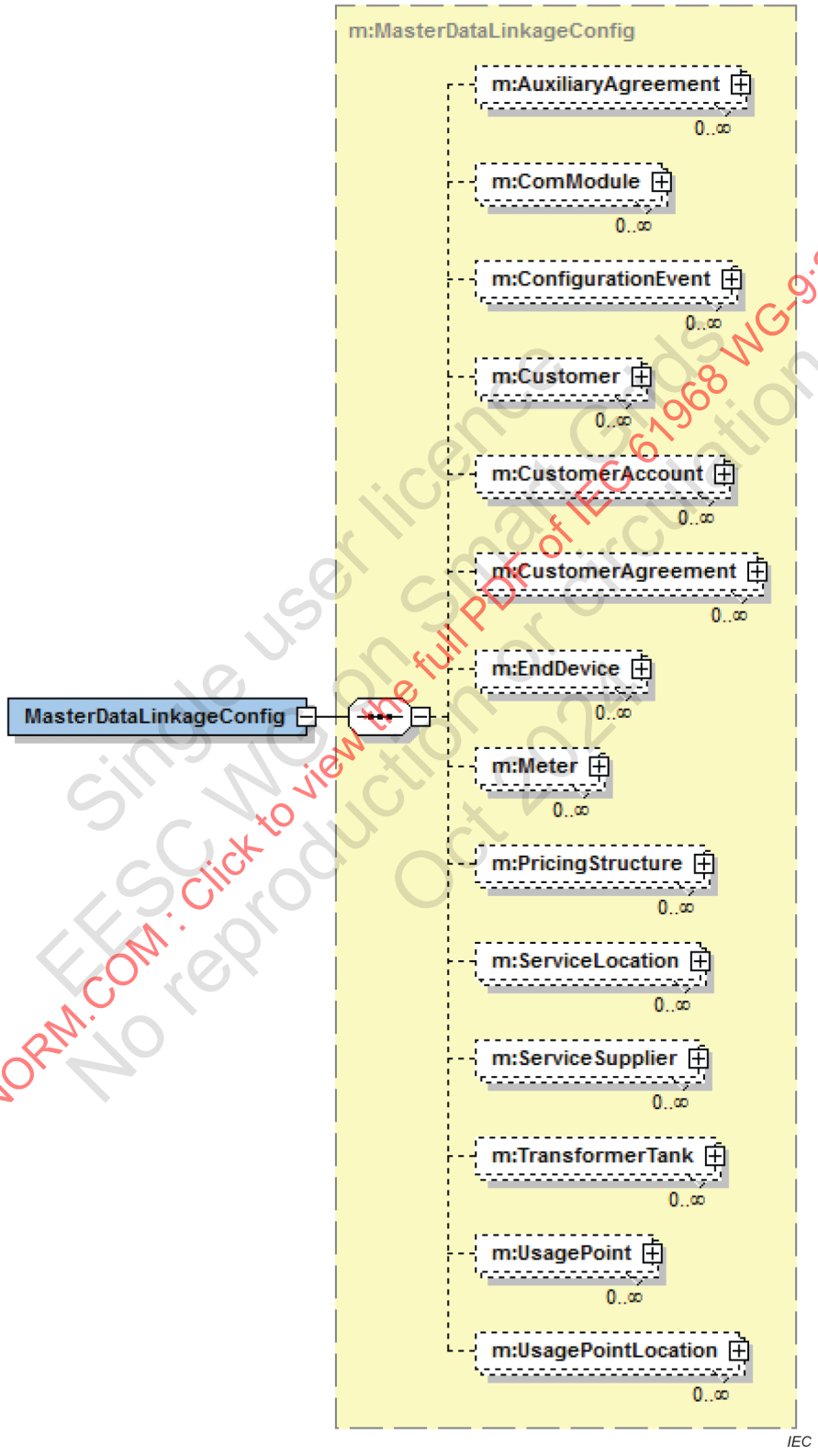
5.8.3.1 General

This subclause 5.8.3 describes the message formats for the MasterDataLinkageConfig and other Master Data Management "config" messages. The detailed specification for each class and attribute can be found in IEC 61968-11 and IEC 61970-301. The normative profiles for this edition of 61968-9 can be found in Annex G. As noted in Annex G these profiles can be serialized into XSDs, JSON schemas, as well as other serializations. The remainder of this document refers only to XSD serialization.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

5.8.3.2 MasterDataLinkageConfig

Figure 53 describes the top level structure of the Master Data Linkage Config message used to configure relationships between objects.



IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence on Smart Grids EESC WG Oct 2024
No reproduction or circulation

Figure 53 reproduced with the permission of UCAIug

Figure 53 – MasterDataLinkageConfig message format

An example of MasterDataLinkageConfig is shown below in Figure 54. This message illustrates the "non-in-line" method of establishing an association between two CIM objects – in this case between the Meter and the UsagePoint are associated with each other using a MasterDataLinkageConfig command. This is the normative way to reflect the installation of a Meter at a UsagePoint.

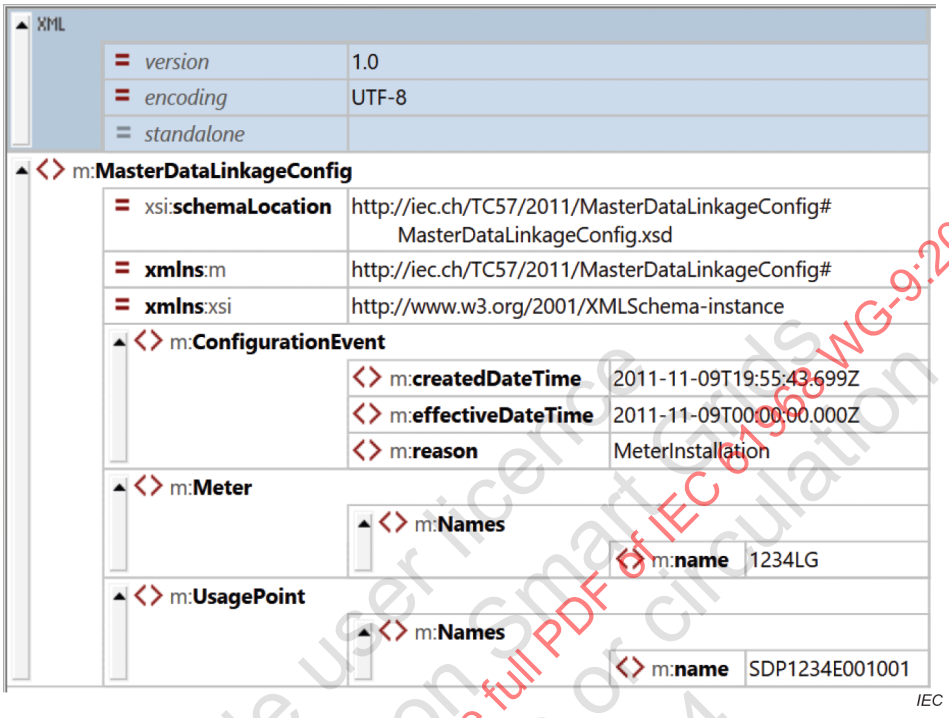


Figure 54 reproduced with the permission of UCAIug.

Figure 54 – MaterDataLinkageConfig example

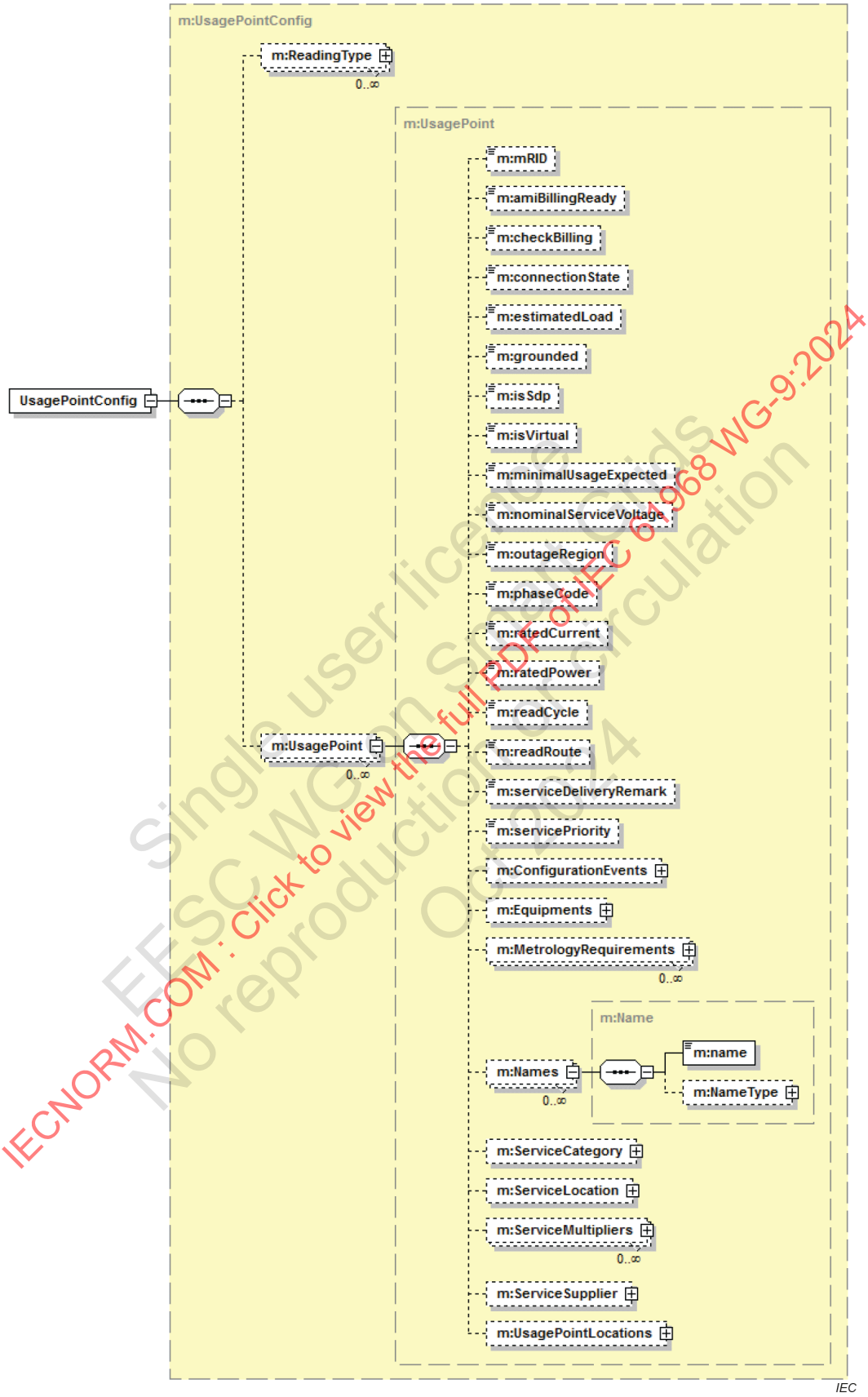
5.8.3.3 SupplierConfig

The ServiceSupplierConfig structure has been moved to IEC 61968-8:2023.

5.8.3.4 UsagePointConfig

The message structure in Figure 55 is used to configure usage points. This replaces the service delivery points message defined in IEC 61968-9:2009.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEEE WG on Smart Grids
No reproduction or circulation
Oct 2024



IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
EESC WG on Standards
Single user licence only
No reproduction or circulation
October 2024

Figure 55 reproduced with the permission of UCAIug.

Figure 55 – UsagePointConfig message format

An example of UsagePointConfig payload is shown in Figure 56.

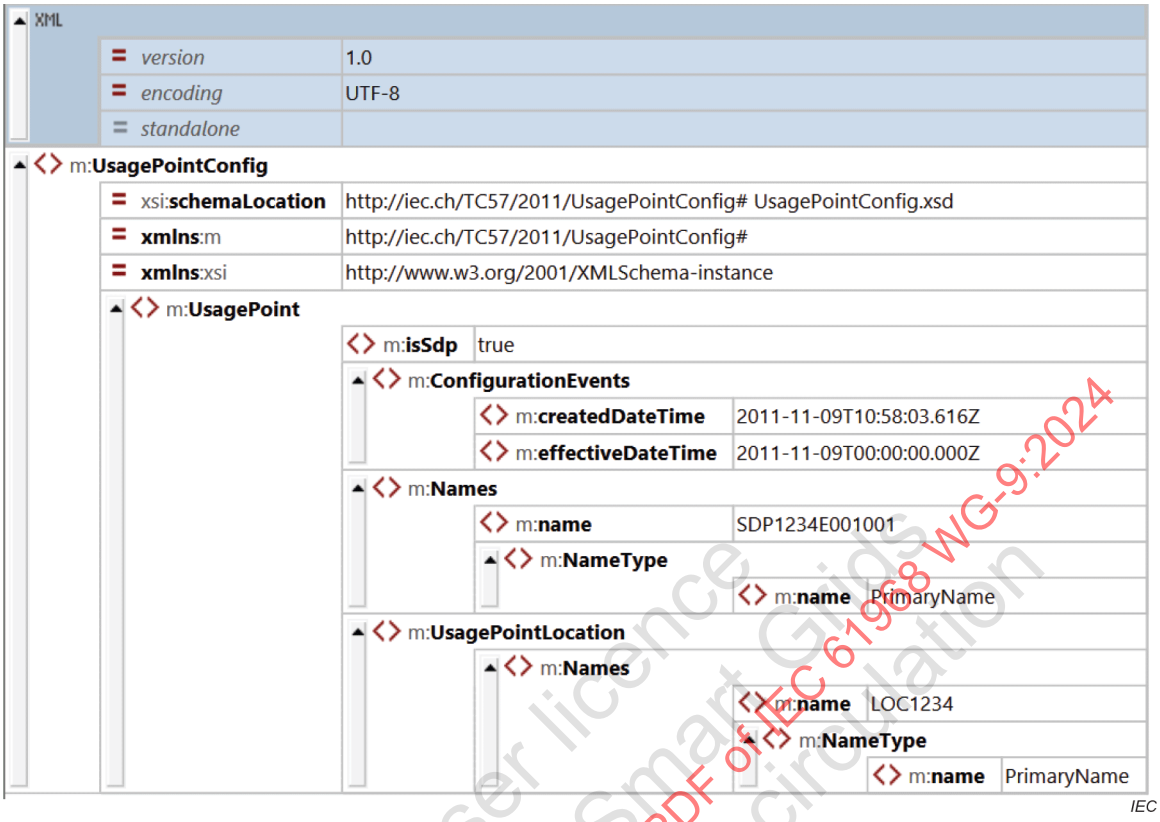


Figure 56 reproduced with the permission of UCAIug.

Figure 56 – UsagePointConfig example

5.8.3.5 UsagePointLocation

The diagram in Figure 57 describes the structure of the message used to define UsagePointLocations.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

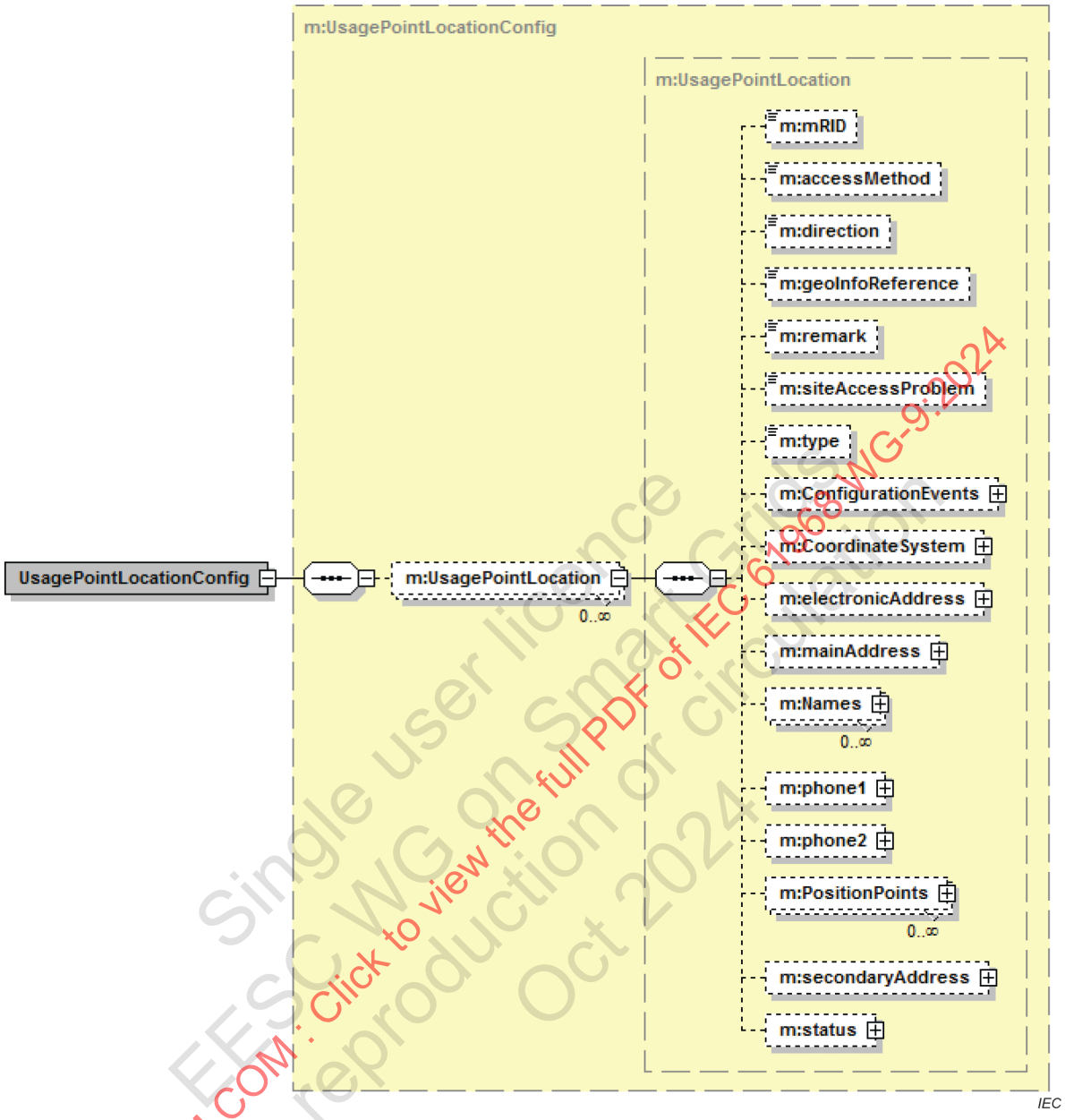


Figure 57 reproduced with the permission of UCAIug.

Figure 57 – UsagePointLocationConfig message format

An example payload of UsagePointLocationConfig is shown in Figure 58.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

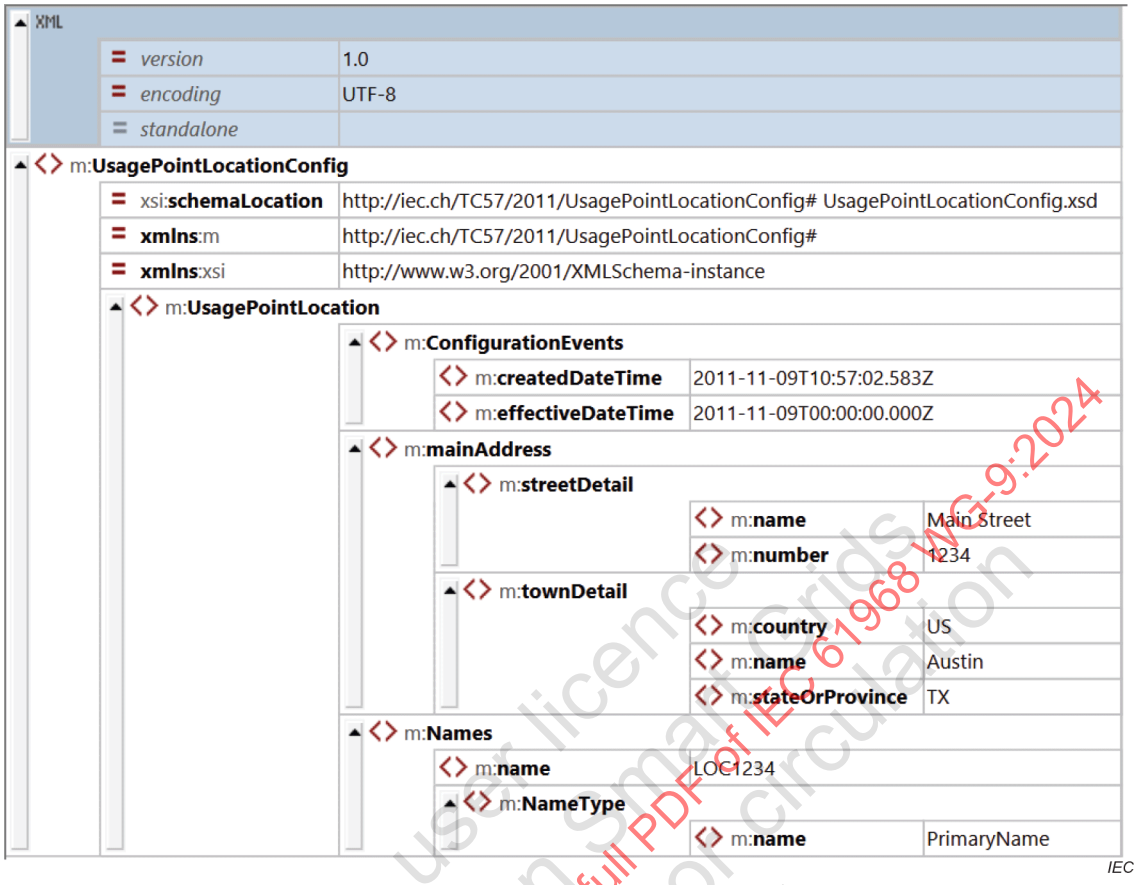


Figure 58 reproduced with the permission of UCAIug.

Figure 58 – UsagePointLocationConfig example

5.8.3.6 EndDeviceConfig

The diagram in Figure 59 describes the top level of the EndDeviceConfig message, which is used to provide for basic configuration of end devices.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESG WG on Smart Grids
No reproduction or circulation
Oct 2024

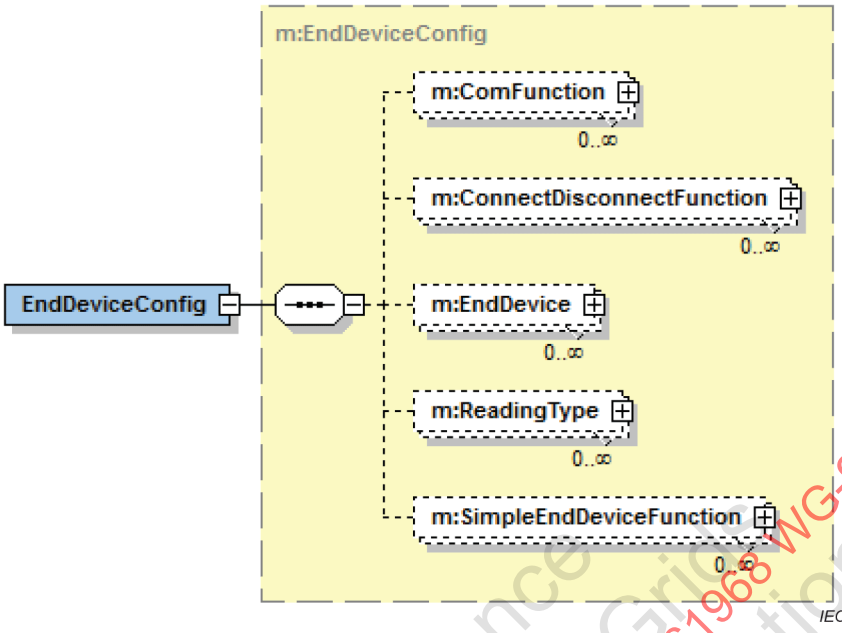


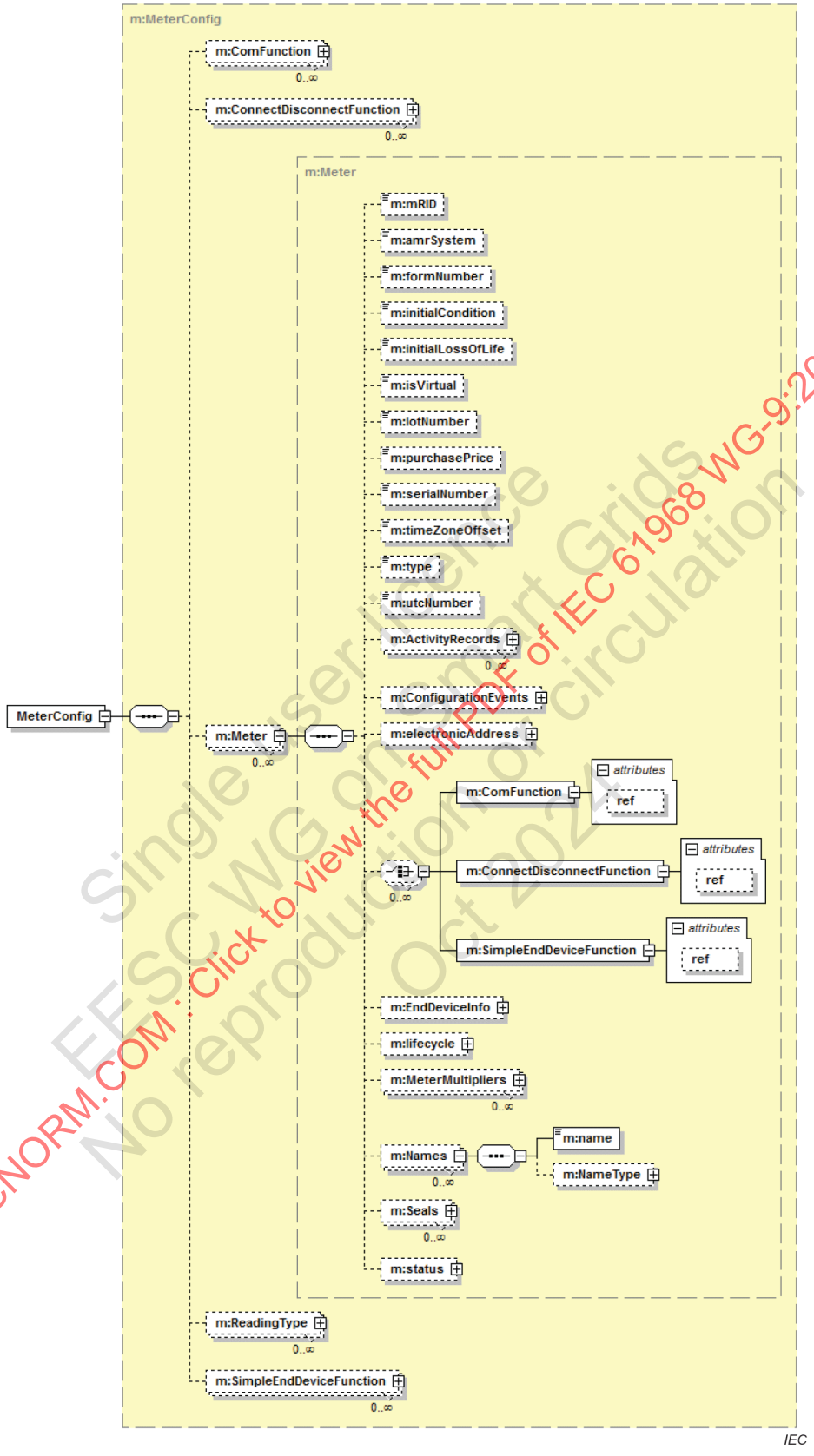
Figure 59 reproduced with the permission of UCAIug

Figure 59 – End device config message format

5.8.3.7 MeterConfig

The message structure in Figure 60 is used to configure meters, where it is possible to supply information more specific to meters.

Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024
IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024



IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

Figure 60 reproduced with the permission of the UCAIug.

Figure 60 – Meter configuration message

An example of a MeterConfig payload is shown in Figure 61.

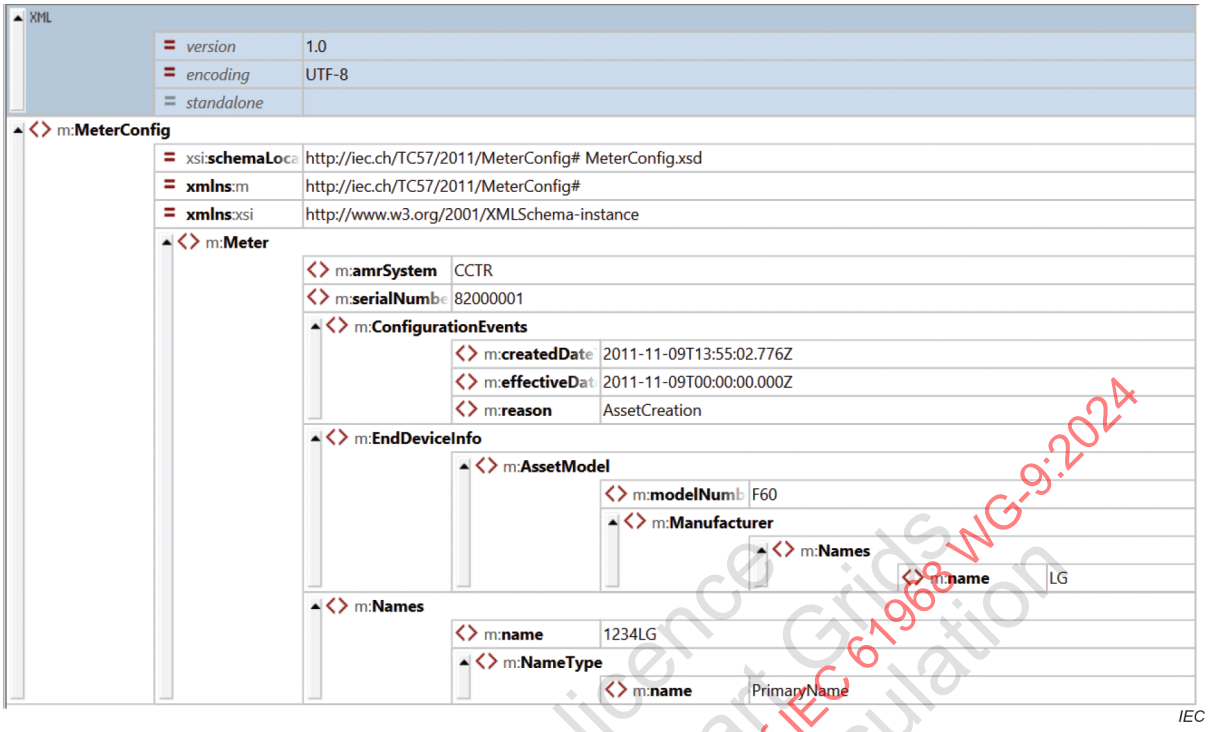


Figure 61 reproduced with the permission of UCAIug.

Figure 61 – MeterConfig example

5.8.3.8 ComModuleConfig

The diagram in Figure 62 provides the top level structure of the message used to configure communication modules.

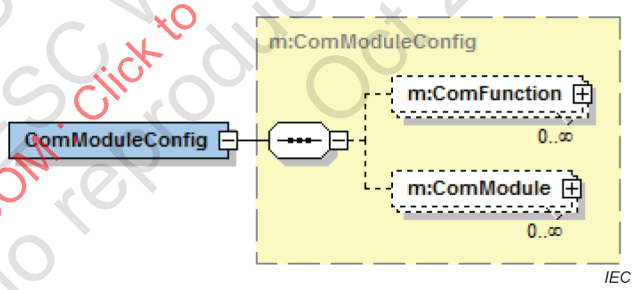


Figure 62 reproduced with the permission of the UCAIug.

Figure 62 – ComModuleConfig message format

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

Annex A
(informative)

Recommended use of message type verbs

A list of recommended verbs that are relevant to profiles discussed in this document is provided in Table A.1. Not all interfaces on all systems will support all verbs. These verbs originate in IEC 61968-100:2022. The use of IEC 61968-100 is recommended but not required. A system may support some combination of profiles and verbs that differ from the suggestions below.

Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024
IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024

Table A.1 – Recommended verb usage with related profiles

Owning 61968 Part	Profile / Noun	create	change	update	delete	get	reply	created	changed	updated	deleted	cancel	canceled	execute	executed
Part 8	AuxiliaryAgreement Config	X	X	X	X	X	X	X	X	X	X				
Part 9	ComModuleConfig	X	X	X	X	X	X	X	X	X	X				
Part 8	CustomerAccount Config	X	X	X	X	X	X	X	X	X	X				
Part 8	CustomerAgreement Config	X	X	X	X	X	X	X	X	X	X				
Part 8	CustomerConfig	X	X	X	X	X	X	X	X	X	X				
Part 9	CustomerMeterDataSet					X	X								
Part 9	EndDeviceConfig	X	X	X	X	X	X	X	X	X	X				
Part 9	EndDeviceControls	X					X	X				X	X		
Part 9	EndDeviceEvents	X				X	X	X							
Part 9	EndDeviceGroups	X	X	X	X	X	X	X	X	X	X				
Part 8	GetAuxiliaryAgreement Config					X	X								
Part 9	GetComModuleConfig					X	X								
Part 8	GetCustomerAccount Config					X	X								
Part 8	GetCustomer AgreementConfig					X	X								
Part 8	GetCustomerConfig					X	X								
Part 9	GetCustomer MeterDataSet					X	X								
Part 9	GetEndDeviceConfig					X	X								

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
IEC SC WG 9 Smart Grids
No reproduction or circulation
Oct 2024
Single user licence

Owning 61968 Part	Profile / Noun	create	change	update	delete	get	reply	created	changed	updated	deleted	cancel	canceled	execute	executed
Part 9	GetEndDeviceControls					X	X								
Part 9	GetEndDeviceEvents					X	X								
Part 9	GetEndDeviceGroups					X	X								
Part 9	GetMeterConfig					X	X								
Part 9	GetMeterReadings					X	X					X	X		
Part 9	GetMeterRead Schedule					X	X								
Part 8	GetMeterService Requests					X	X								
Part 8	GetPricingStructure Config					X	X								
Part 8	GetReceiptRecord					X	X								
Part 8	GetServiceCategory Config					X	X								
Part 8	GetServiceLocation Config					X	X								
Part 8	GetServiceSupplier Config					X	X								
Part 8	GetTransactionRecord					X	X								
Part 9	GetUsagePointConfig					X	X								
Part 9	GetUsagePointGroups					X	X								
Part 9	GetUsagePoint LocationConfig					X	X								
Part 100	LegacyObject IdentificationRevision Sets	X	X	X	X	X	X	X	X	X	X	X	X		

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
EESC WG of Smart Grids
No reproduction or circulation
Oct 2024
Single user licence

Owning 61968 Part	Profile / Noun	create	change	update	delete	get	reply	created	changed	updated	deleted	cancel	canceled	execute	executed
Part 9	MasterDataLinkage Config	X			X		X	X			X	X	X		
Part 9	MeterConfig	X	X	X	X	X	X	X	X	X	X				
Part 9	MeterReadings					X	X						X	X	
Part 9	MeterReadSchedules	X	X	X	X	X	X	X	X	X	X				
Part 8	MeterServiceRequests	X	X	X	X	X	X	X	X	X	X				
Part 100	OperationSets													X	X
Part 8	PricingStructureConfig	X	X	X	X	X	X	X	X	X	X				
Part 8	ReceiptRecord	X	X	X	X	X	X	X	X	X	X				
Part 8	ServiceCategoryConfig	X	X	X	X	X	X	X	X	X	X				
Part 8	ServiceLocationConfig	X	X	X	X	X	X	X	X	X	X				
Part 8	ServiceSupplierConfig	X	X	X	X	X	X	X	X	X	X				
Part 8	TransactionRecord	X	X	X	X	X	X	X	X	X	X				
Part 9	UsagePointConfig	X	X	X	X	X	X	X	X	X	X				
Part 9	UsagePointGroups	X	X	X	X	X	X	X	X	X	X				
Part 9	UsagePointLocation Config	X	X	X	X	X	X	X	X	X	X				

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
IEEE WG Online Smart Grids
Single user licence
No reproduction or circulation
Oct 2024

Annex B
(informative)

Reply error codes

The codes defined in IEC 61968-9:2013 (second edition) have been moved to and replaced by codes in IEC 61968-100:2022 (second edition). The reader is encouraged to refer to IEC 61968-100 and study the structure and new Reply Codes that have been developed. The new codes have generalized what one would have found in previous editions of IEC 61968-9. In the second edition of IEC 61968-9, there were many specific codes that called out specific failures. For example, the various IEC 61968-9:2013 codes such as "Mandatory Header elements missing," and "Mandatory Payload elements missing," are replaced by a more generic "Mandatory elements missing" code in IEC 61968-100. Furthermore, the IEC 61968-100 structure allows one to report (by <ObjectID>) exactly which elements have caused the problem. When using the "6.0" code in IEC 61968-100, the <reason> field should be used to denote an issue with the business rules. For example, there might be a business rule that states "Disconnect only allowed during business hours." This business rule violation could be provided as the "reason" for the failure.

IEC 61968-100:2022 (second edition) offers important improvements over the first edition, and the smaller set of Reply error codes presented there should lead to easier multi-part integrations.

Single user licence
EESC WG on Smart Grid
No reproduction or circulation
Oct 2024
IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024

Annex C
(normative)

Procedure for the generation of a ReadingType name

C.1 General

The ReadingType enumeration is an important identifier in MeterReading messages. This standard specifies a profile which will be considered normative. IEC 61968-9 was developed with several design principles in mind:

1) The messages should be simple and general purposed.
2) A "Readings" message should be able to carry any type of value that might be in a meter, e.g. Power, Energy, Relay actuation counts, Status information, and Currency. The Readings.ReadingType should be able to describe whatever the Readings.value is.
3) It is easier for a data consumer to throw away information it has but does not need, than it is for it to recreate information it needs but does not have.

This third principle implies that data producers should be as explicit as possible when publishing data. The data therefore should be entirely self-describing so that other consumers who access the data (perhaps when it is residing in a data warehouse) can determine for themselves the suitability for use of the data. This will help avoid the need for the data consumer to attempt to reconstruct any implicit agreements which were in place at the time of publication.

It is understood that there will be occasions in which a data consumer (making a request for information) might not know all of the specific details regarding what is being asked. For example, a requestor may wish to obtain the "voltage" at a given location. It may not know if the service is single-phase or poly-phase. It should be able to make the request with the knowledge it has, and the data producer attempt to fulfil it and in the response supply additional detail as appropriate. This may result in the ReadingType(s) used in the response to differ slightly from the ReadingType used in the request.

C.2 Understanding the important attributes of a data element name

C.2.1 General

Data elements can be described in terms of 18 key attributes (several of which are compound attributes.) Every attribute has the feature that a value of zero ("0") represents that it is not applicable to the description. The only exception to this rule is in the compound attributes. In this case dual zeros represent that the attribute is not applicable.

C.2.2 Attribute #1, macroPeriod

The macroPeriod describes an aspect of the data that reflects how it is viewed or captured over a long period of time. These are enumerated in Table C.1.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
FESC WG on Smart Grids
Single User Licence
No reproduction or circulation
Oct 2024

Table C.1 – Time-period of interest enumerations

Reprinted with the permission of UCAIug.

Code	Enumeration	Comments	Normative Status
0	none	Not Applicable	N
8	billingPeriod	Captured during the billing period starting at midnight of the first day of the billing period (as defined by the billing cycle day). If during the current billing period, it specifies a period from the start of the current billing period until "now".	N
11	daily	Daily Period starting at midnight. If for the current day, this specifies the time from midnight to "now".	N
13	monthly	Monthly period starting at midnight on the first day of the month. If within the current month, this specifies the period from the start of the month until "now."	N
22	seasonal	A season of time spanning multiple months. E.g. "Summer," "Spring," "Fall," and "Winter" based cycle. If within the current season, it specifies the period from the start of the current season until "now."	N
24	weekly	Weekly period starting at midnight on the first day of the week and ending the instant before midnight the last day of the week. If within the current week, it specifies the period from the start of the week until "now."	N
32	specifiedPeriod	For the period defined by the start and end of the TimePeriod element in the message.	N

C.2.3 Attribute #2, aggregate

C.2.3.1 General

The way in which a reading is viewed in the aggregate (compared to others) serves as the second attribute. Possible enumerations include those described in Table C.2. This attribute may be used to define a mathematical operation carried out over the period of interest defined by attribute #1.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEEE SMG on Smart Grids
No reproduction or circulation
Oct 2024

Table C.2 – Data qualifier enumerations

Reprinted with the permission of UCAIug.

Code	Enumeration	Comments	Normative Status
0	none	Not Applicable	N
2	average		N
4	excess	The value represents an amount over which a threshold was exceeded.	I
5	highThreshold	The value represents a programmed threshold.	I
7	lowThreshold	The value represents a programmed threshold.	I
8	maximum	The highest value observed	N
9	minimum	The smallest value observed	N
11	nominal		I
12	normal		I
16	secondMaximum	The second highest value observed	N
17	secondMinimum	The second smallest value observed	N
23	thirdMaximum	The third highest value observed	N
24	fourthMaximum	The fourth highest value observed	N
25	fifthMaximum	The fifth highest value observed	N
26	sum	The accumulated sum	N
27	high	Typically used to identify the high volume flow port of a compound water meter.	I
28	low	Typically used to identify the low volume flow port of a compound water meter.	I
29	Standard Deviation Population	The standard deviation of a population (indicated by lower case sigma)	N
30	Standard Deviation Sample	The standard deviation of a sample drawn from a population (usually indicated by a lower case 's'	N
N = Normative I = Informative D = Deprecated since last edition			

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
IEEE SA WG on Smart Grids
Single User licence
No reproduction or circulation
Oct 2024

C.2.4 Attribute #3, measuringPeriod

C.2.4.1 General

The measuringPeriod supplies an "adjective" to describe aspects of a "time period" with regard to the measurement. This attribute describes a "time attribute" which is inherent or fundamental to the reading value. The attribute refers to the way the value was originally measured and not to the frequency at which it is reported or presented. For example, an hourly interval of consumption data would have "hourly" as an attribute. However in the case of an hourly sampled voltage value the meterReadings schema would carry the "hourly" interval size information. Enumerated values include the values described in Table C.3. When compared to attribute #1, the measuringPeriod is a small interval of time which is characteristic of the way the reading was captured, while the macroPeriod is a long interval of time related to the way in which the reading is reported. Either of these attributes are invoked only as needed to describe the data. Many dial readings need only the accompanying timestamp to be meaningful.

Table C.3 – measuringPeriod enumerations

Reprinted with the permission of UCAIug.

Code	Enumeration	Comments	Normative Status
0	none	Not Applicable	N
1	tenMinute	10 min	N
2	fifteenMinute	15 min	N
3	oneMinute	1 min	N
4	twentyfourHour	24 min	N
5	thirtyMinute	30 min	N
6	fiveMinute	5 min	N
7	sixtyMinute	60 min	N
10	twoMinute	2 min	N
14	threeMinute	3 min	N
15	present	Within the present period of time	I
16	previous	Shifted within the previous monthly cycle and data set	I
31	twentyMinute	20 min interval	N
50	fixedBlock60Min	60 min Fixed Block	N
51	fixedBlock30Min	30 min Fixed Block	N
52	fixedBlock20Min	20 min Fixed Block	N
53	fixedBlock15Min	15 min Fixed Block	N
54	fixedBlock10Min	10 min Fixed Block	N
55	fixedBlock5Min	5 min Fixed Block	N
56	fixedBlock1Min	1 min Fixed Block	N
57	rollingBlock60MinIntvl30MinSubIntvl	60 min Rolling Block with 30-minute sub-intervals	N
58	rollingBlock60MinIntvl20MinSubIntvl	60 min Rolling Block with 20-minute sub-intervals	N
59	rollingBlock60MinIntvl15MinSubIntvl	60 min Rolling Block with 15-minute sub-intervals	N
60	rollingBlock60MinIntvl12MinSubIntvl	60 min Rolling Block with 12-minute sub-intervals	N
61	rollingBlock60MinIntvl10MinSubIntvl	60 min Rolling Block with 10-minute sub-intervals	N
62	rollingBlock60MinIntvl6MinSubIntvl	60 min Rolling Block with 6-minute sub-intervals	N
63	rollingBlock60MinIntvl5MinSubIntvl	60 min Rolling Block with 5-minute sub-intervals	N
64	rollingBlock60MinIntvl4MinSubIntvl	60 min Rolling Block with 4-minute sub-intervals	N
65	rollingBlock30MinIntvl15MinSubIntvl	30 min Rolling Block with 15-minute sub-intervals	N
66	rollingBlock30MinIntvl10MinSubIntvl	30 min Rolling Block with 10-minute sub-intervals	N
67	rollingBlock30MinIntvl6MinSubIntvl	30 min Rolling Block with 6-minute sub-intervals	N
68	rollingBlock30MinIntvl5MinSubIntvl	30 min Rolling Block with 5-minute sub-intervals	N
69	rollingBlock30MinIntvl3MinSubIntvl	30 min Rolling Block with 3-minute sub-intervals	N
70	rollingBlock30MinIntvl2MinSubIntvl	30 min Rolling Block with 2-minute sub-intervals	N
71	rollingBlock15MinIntvl5MinSubIntvl	15 min Rolling Block with 5-minute sub-intervals	N
72	rollingBlock15MinIntvl3MinSubIntvl	15 min Rolling Block with 3-minute sub-intervals	N
73	rollingBlock15MinIntvl1MinSubIntvl	15 min Rolling Block with 1-minute sub-intervals	N
74	rollingBlock10MinIntvl5MinSubIntvl	10 min Rolling Block with 5-minute sub-intervals	N
75	rollingBlock10MinIntvl2MinSubIntvl	10 min Rolling Block with 2-minute sub-intervals	N
76	rollingBlock10MinIntvl1MinSubIntvl	10 min Rolling Block with 1-minute sub-intervals	N

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEC/TC 57/WG 14 Smart Grids
Not for resale or circulation
© IEC 2024

Code	Enumeration	Comments	Normative Status
77	rollingBlock5MinIntvl1MinSubIntvl	5 min Rolling Block with 1-minute sub-intervals	N
78	twelveMinute	12 min	N
79	twoHour	2 h	N
80	fourHour	4 h	N
81	sixHour	6 h	N
82	twelveHour	12 h	N
83	threeHour	3 h	N
100	specifiedInterval	The interval length is described in attribute #10 in seconds. Attribute #11 should be "1" for whole seconds.	N
101	specifiedFixedBlock	The fixed block duration is described in attribute #10 in seconds. Attribute #11 should be "1" for whole seconds.	N
102	specifiedRollingBlock	The rolling block size is described by attribute #10 in seconds, and the sub-interval size by attribute #11 in seconds.	N
N = Normative I = Informative D = Deprecated since last edition			

It is common for meters to report demand in a form that is measured over the course of a portion of an hour. In Enterprise Applications however, it is commonly understood that demand (which has a unit of measure of "kW" or "kVAr") has been normalized to 1 h. The Metering System shall perform this transformation before publication and use by the other systems. The scalar used is chosen based on the block size (not any sub-interval size). These scalars are listed in Table C.4.

Table C.4 – Demand normalization scalars

Reprinted with the permission of UCAIug.

Demand block size	Normalization scalar
1 h	1
30 min	2
20 min	3
15 min	4
10 min	6
1 min	60

For example, before normalization, "15minuteFixedBlock" data might be said to have units of "kilo quarter-watt-hours" (kWh). After normalization, the unit of measure would become "kilo-watt-hours." Since "kilo quarter-watt-hours" is not a usable unit of measure, systems that find the need to communicate raw data in this form should use a unit of measure such as "count" and the PendingCalculation element to carry the scalar (or multiplier) needed and the resulting unit of measure when applied,

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESG WG21 Smart Grids
No reproduction or circulation
Oct 2024

C.2.4.2 Common usages

Interval data is commonly found in 60 min, 30 min, and 15 min sizes. Larger sizes such as 24 h and smaller sizes down to 1 min are also possible but are less common. Users of the standard should leverage existing interval enumerations where they exist, but if the needed interval size does "not exist, a "specifiedInterval" may be used. This allows the enumeration itself to imbed the size of the interval in the enumeration. Similarly, uncommon fixed block and rolling block sizes may be specified.

IEC 61968-9:2009 offered the terms "Shifted," "Present," and "Previous" as adjectives that might be used to describe the state of the meter. While this works well for publishing data from a Metering System, it may be difficult to use between other enterprise applications. It seems that while "present" and "previous" are important attributues of the data while it is at the meter, the further one gets away from the meter, the less important these attributes become. With this edition of IEC 61968-9 we propose that the timespan over which the data is recorded be relied upon to determine if a value belongs to the "present" billing period or the "previous" billing period rather than the enumerations "present" or "previous." Furthermore, the rules used to compute demand are quite important. A single "Daily" demand is usually not adequate to compute a customer's bill. A complete collection of "Daily" demands or a single "Billing" demand are usually required. A distinction in the Daily/Billing/Seasonal observation period should be made in the ReadingType. In all cases, the timestamp associated with the maximum demand could be used to resolve which day, month, or season a "daily," "billing," or "seasonal" demand fell into.

In a utility where multiple techniques for capturing demand exist, it becomes important to communicate between systems the definition by which demand data is captured. Enumerations are provided in this edition which enable the data producer to be as specific as it knows how in describing the type of demand data being passed.

C.2.5 Attribute #4, accumulation

C.2.5.1 General

The "accumulation" attribute indicates how the value is represented to accumulate over time. Enumerated values include those described in Table C.5.

One benefit to explicitly declaring the accumulation behaviour as part of the readingType in an exchange between a MS and MDM is to help the MDM ensure that appropriate validation rules are applied to the data supplied by the MS.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence only, copying and networking prohibited.
IEC CSC WG on Smart Grid Use Cases
No reproduction or circulation
Oct 2024

Table C.5 – Accumulation behaviour enumerations

Reprinted with the permission of UCAIug.

Code	Enumeration	Comments	Normative status
0	none	Not Applicable, or implied by the unit of measure.	N
1	bulkQuantity	A value from a register which represents the bulk quantity of a commodity. This quantity is computed as the integral of the commodity usage rate. This value is typically used as the basis for the dial reading at the meter, and as a result, will roll over upon reaching a maximum dial value. NOTE 1 With the metering system, the roll-over behaviour typically implies a roll-under behavior so that the value presented is always a positive value (e.g. unsigned integer or positive decimal.) However, when communicating data between enterprise applications a negative value might occur in a case such as net metering. NOTE 2 A BulkQuantity refers primarily to the dial reading and not the consumption over a specific period of time.	N
2	continuousCumulative	The sum of the previous billing period values and the present period value. NOTE "ContinuousCumulative" is commonly used in conjunction with "demand." The "ContinuousCumulative Demand" would be the cumulative sum of the previous billing period maximum demand values (as occurring with each demand reset) summed with the present period maximum demand value (which has yet to be reset.)	N
3	cumulative	The sum of the previous billing period values. NOTE "Cumulative" is commonly used in conjunction with "demand." Each demand reset causes the maximum demand value for the present billing period (since the last demand reset) to accumulate as an accumulative total of all maximum demands. So instead of "zeroing" the demand register, a demand reset has the affect of adding the present maximum demand to this accumulating total.	N
4	deltaData	The difference between the value at the end of the prescribed interval and the beginning of the interval. This is used for incremental interval data. NOTE 3 One common application would be for load profile data, another use might be to report the number of events within an interval (such as the number of equipment energizations within the specified period of time.)	N
6	indicating	As if a needle is swung out on the meter face to a value to indicate the current value. (NOTE An "indicating" value is typically measured over hundreds of milliseconds or greater, or may imply a "pusher" mechanism to capture a value. Compare this to "instantaneous" which is measured over a shorter period of time.)	N
9	summation	A form of accumulation which is selective with respect to time. NOTE 4 "Summation" could be considered a specialization of "Bulk Quantity" according to the rules of inheritance where "Summation" selectively accumulates pulses over a timing pattern, and "BulkQuantity" accumulates pulses all of the time.	I
10	timeDelay	A form of computation which introduces a time delay characteristic to the data value	I

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single User License
EESC Working Draft Guide
No reproduction or distribution

Code	Enumeration	Comments	Normative status
12	instantaneous	Typically measured over the fastest period of time allowed by the definition of the metric (usually milliseconds or tens of milliseconds.) (NOTE "Instantaneous" was moved to attribute #4 in 61968-9Ed2 from attribute #1 in 61968-9:2009.)	N
13	latchingQuantity	When this description is applied to a metered value, it implies that the value is a time-independent cumulative quantity much a BulkQuantity, except that it latches upon the maximum value upon reaching that value. Any additional accumulation (positive or negative) is discarded until a reset occurs. NOTE 5 A LatchingQuantity may also occur in the downward direction – upon reaching a minimum value. The terms "maximum" or "minimum" will usually be included as an attribute when this type of accumulation behaviour is present. When this description is applied to an encoded value (UOM= "Code"), it implies that the value has one or more bits which are latching. The condition that caused the bit to be set may have long since evaporated. In either case, the timestamp that accompanies the value may not coincide with the moment the value was initially set. In both cases a system will need to perform an operation to clear the latched value.	N
14	boundedQuantity	A time-independent cumulative quantity much a BulkQuantity or a LatchingQuantity, except that the accumulation stops at the maximum or minimum values. When the maximum is reached, any additional positive accumulation is discarded, but negative accumulation may be accepted (thus lowering the counter.) Likewise, when the negative bound is reached, any additional negative accumulation is discarded, but positive accumulation is accepted (thus increasing the counter.)	N
N = Normative I = Informative D = Deprecated since last edition			

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IESC WG Smart Grids
No reproduction or circulation
Oct 2024

C.2.5.2 Types of IntervalReadings

In IEC 619689:2009, it was said IntervalReadings might be expressed in a number of styles qualfied by attribute #2 (i.e. "Incremental," "Relative," or "Absolute") and also described "RecordedData" and "DeltaData".

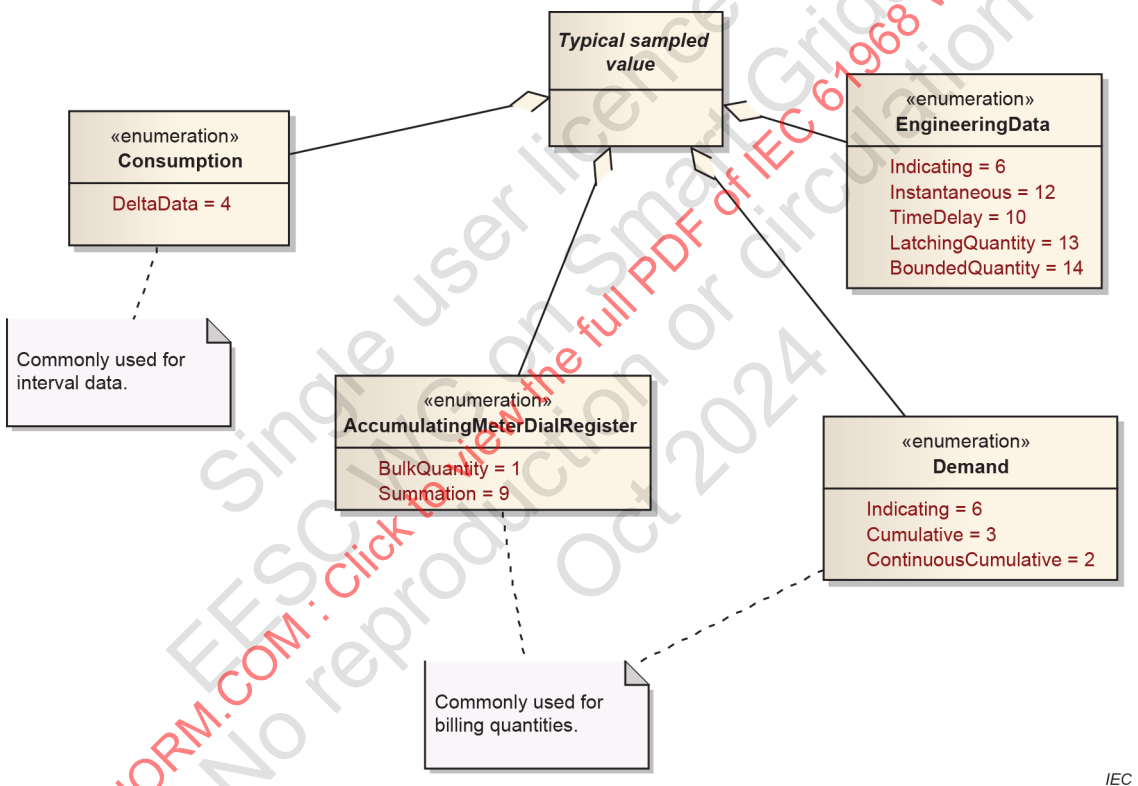
In this edition of IEC 61968-9 we have made an effort to simplify the presentation of data. A sampled value which would have been called an "absolute interval" reading in IEC 61968-9:2009 may be presented without the word "absolute." Indeed such readings may be published in the MeterReading.Readings portion of the message as ordinary readings rather than in the MeterReading.IntervalBlock.IntervalReadings portion of the message. The concept of "Relative IntervalData" is no longer found in the enumerations because the concept is supported in the message schema as a form of "pending" data scalars.

C.2.5.3 Common usages

The attributes described in Table C.5 are customarily used in particular ways to describe energy and demand values. These customs are described in Table C.6 and shown in Figure C.1.

Table C.6 – Customary accumulation behaviour enumerations

Metrology data type	Common usages
Energy (Measured by simple counting and displayed to the user on the face of the meter.)	BulkQuantity
Demand (Ordinarily measured by integrating a power value over a specific period of time.)	Indicating, Cumulative, ContinuousCumulative
Power (Ordinarily measured in real time in solid-state meters.)	Instantaneous, TimeDelay
Time Of Use (TOU) Energy data (Measured by accumulating values in assorted registers depending on the time of day and day of the week.)	Summation
Time Of Use (TOU) Demand data (Derived by integrating energy values over a specified demand interval, with additional dependencies on the TOU calendar.)	Indicating, Cumulative, or ContinuousCumulative
Counters	BulkQuantity, LatchingQuantity



IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

Reproduced with the permission of UCAIug.

Figure C.1 – Typical enumerations for accumulation behaviourAttribute #5, flowDirection

C.2.6.1 General

Anything involving current might have a flow direction. Flow direction is very important, but when it is unknown, it should remain unspecified. Possible enumerations include those described in Table C.7.

The "flow direction" encompasses the electrical concept of four quadrant metering as well as the needs of various regional tariffs to describe how energy is billed.

It should be recognized that different parts of the world operate according to different frames of reference for their tariff practices. Most regions define power delivery according to a Producer"s Reference Frame. Power is generated by the utility, flows through the utility grid, through the

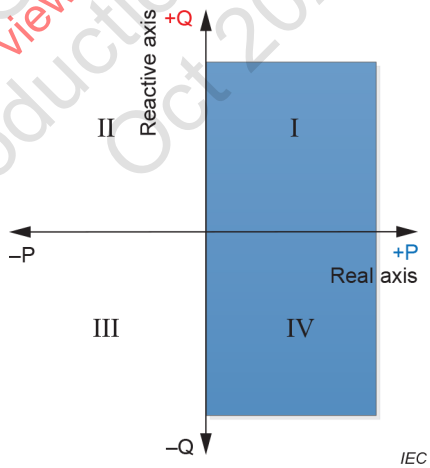
meter, and into the customer"s wiring. The meter captures the energy sold to the customer. Some regions however take a customer-centric view. A Consumer Reference Frame says that power may be purchased by a consumer from the grid. Any forward flow through the meter registers the energy purchased by the consumer.

This standard attempts to circumnavigate the frame-of-reference issue by recognizing that these two views are equivalent. The energy bought is the energy sold. The "forward" flow from the meter's "source" side to the meter's "load" side (or equivalent terminology such as "V+" and a "V–") creates a measurement that can be used for either tariff definition. This standard will leverage the numeric code for a given semantic concept to be "normative," while the text used to name the concept is considered "informative."

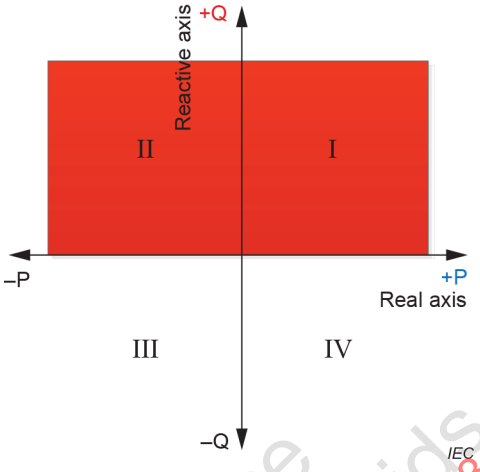
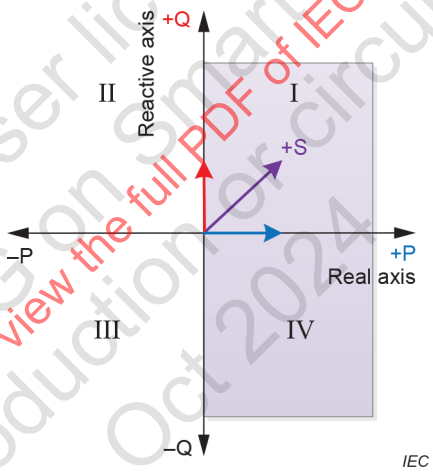
A second reason to keep the textual descriptions informative is due to the genuine language differences among the various participating countries in the IEC.

Table C.7 – Direction of flow enumeration

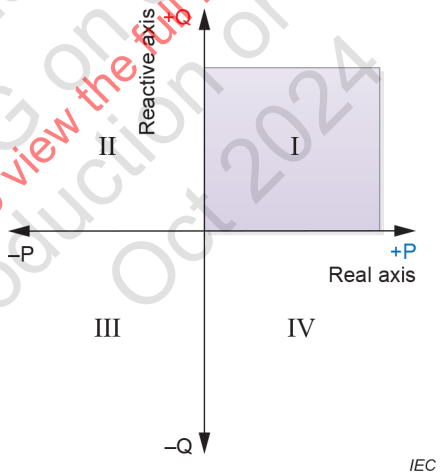
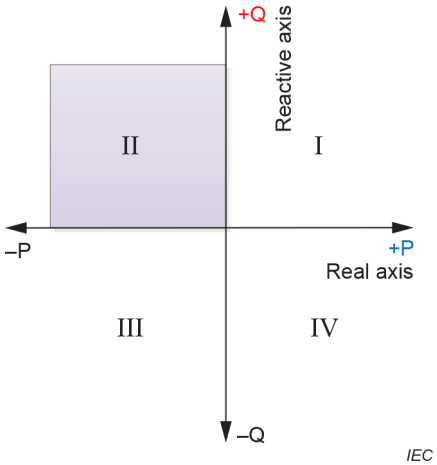
Reprinted with the permission of UCAIug.

Code	Enumeration Name (informative)	Comments	Normative status of code
0	none	Not Applicable (N/A)	N
1	forward	Also known as "Delivered," or "Imported" as defined in IEC TS 61968-2. Forward Active Energy is a positive kWh value as one would naturally expect to find as energy is supplied by the utility and consumed at the service. Forward Active Energy is accumulated in a single phase service by observing the power flow (+P) in quadrants I and IV.  Forward Reactive Energy is a positive VArh value as one would naturally expect to find in the presence of inductive loading. Forward Reactive Energy is accumulated in a single phase service by observing the power flow (+Q) in quadrants I and II.	N

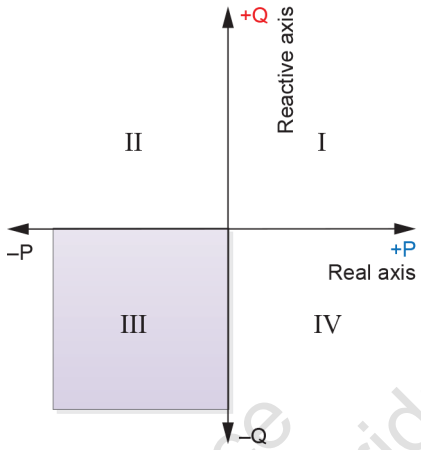
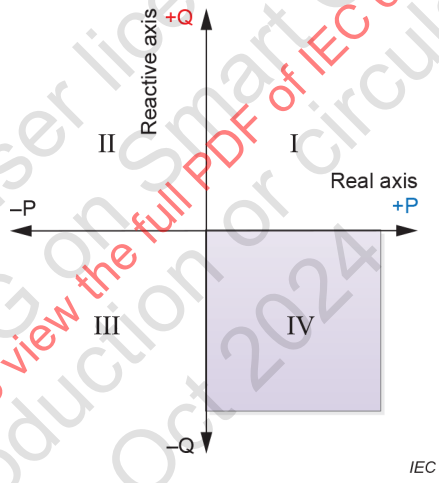
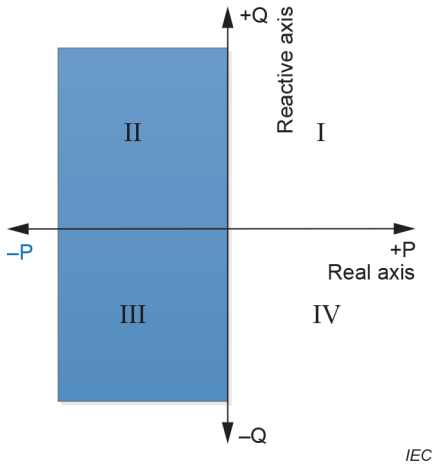
IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single User Licence
EESG WG Smart Grids
No reproduction or circulation
Oct 2024

Code	Enumeration Name (informative)	Comments	Normative status of code
		 Forward Apparent Energy is a positive VAh value much like Forward Active Energy. It is accumulated in a single phase service by observing the power flow (S = P + jQ) in quadrants I and IV.  In polyphase metering, the forward energy register is incremented when the sum of the phase energies is greater than zero: $Energy_A + Energy_B + Energy_C > 0$	
2	lagging	Typically used to describe that a power factor is lagging the reference value (or to say that the current is lagging the voltage.) NOTE 1 When used to describe power factor, the term "Lagging" implies that the PF is negative. The term "lagging" in this case takes the place of the negative sign. If a signed PF value is to be passed by the data producer, then the direction of flow enumeration zero (none) should be used in order to avoid the possibility of creating an expression that employs a double negative. The data consumer should be able to tell from the sign of the data if the PF is leading or lagging. This principle is analogous to the concept that "Reverse" energy is an implied negative value, and to publish a negative reverse value would be ambiguous. NOTE 2 Lagging power factors typically indicate inductive loading.	N

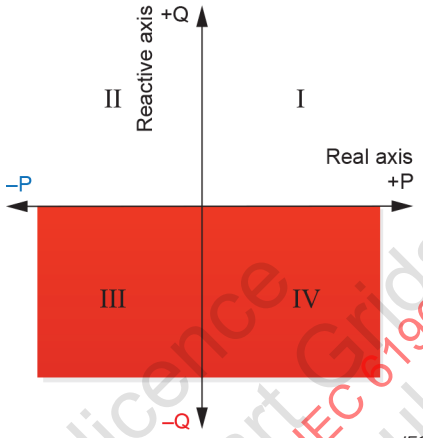
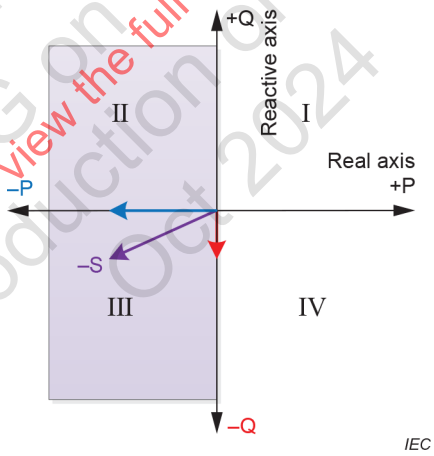
IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESG WG on Smart Grids
No reproduction or circulation
Oct 2024

Code	Enumeration Name (informative)	Comments	Normative status of code
3	leading	Typically used to describe that a power factor is leading the reference value (or to say that the current is leading the voltage.) NOTE 3 Leading power factors typically indicate capacitive loading.	N
4	net	Defined as |Forward| – |Reverse|, See IEC TS 61968-2. NOTE 4 In some systems, the value passed as a "net" value could become negative. In other systems the value passed as a "net" value is always a positive number, and rolls-over and rolls-under as needed.	N
5	q1plusQ2	Reactive positive quadrants.	I
7	q1plusQ3	Quadrants 1 and 3	I
8	q1plusQ4	Quadrants 1 and 4 usually represent forward active energy	I
9	q1minusQ4	Q1 minus Q4	I
10	q2plusQ3	Quadrants 2 and 3 usually represent reverse active energy	I
11	q2plusQ4	Quadrants 2 and 4	I
12	q2minusQ3	Q2 minus Q3	I
13	q3plusQ4	Reactive negative quadrants.	I
14	q3minusQ2	Q3 minus Q2	I
15	quadrant1	Q1 only  	I
16	quadrant2	Q2 only  	I

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESG WG on Smart Grids
No reproduction or circulation
Oct 2024

Code	Enumeration Name (informative)	Comments	Normative status of code
17	quadrant3	Q3 only 	I
18	quadrant4	Q4 only 	I
19	reverse	Reverse Active Energy is equivalent to "Received," or "Exported" as defined in IEC TS 61968-2. Reverse Active Energy is a positive kWh value as one would expect to find when energy is produced and backfed by the service onto the utility network. Reverse Active Energy is accumulated in a single phase service by observing the power flow (-P) in quadrants II and III. 	N

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

Code	Enumeration Name (informative)	Comments	Normative status of code
		Reverse Reactive Energy is a positive VArh value as one would expect to find in the presence of capacitive loading and a leading Power Factor. Reverse Reactive Energy is accumulated in a single phase service by observing the power flow (-Q) in quadrants III and IV.  Reverse Apparent Energy is a positive VAh value much as reverse active energy. It is accumulated in a single phase service by observing the power flow (S = P + jQ) in quadrants II and III.  In polyphase metering, the reverse energy register is incremented when the sum of the phase energies is less than zero: $Energy_A + Energy_B + Energy_C < 0$ NOTE 5 The value passed as a reverse value is always a positive value. It is understood by the label "reverse" that it represents negative flow.	
20	total	|Forward| + |Reverse|, See IEC TS 61968-2. The sum of the commodity in all quadrants Q1+Q2+Q3+Q4. In polyphase metering, the total energy register is incremented when the absolute value of the sum of the phase energies is greater than zero: $\lvert Energy_A + Energy_B + Energy_C \rvert > 0$	N

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

Code	Enumeration Name (informative)	Comments	Normative status of code
21	totalByPhase	In polyphase metering, the total by phase energy register is incremented when the sum of the absolute values of the phase energies is greater than zero: $\lvert Energy_A \rvert + \lvert Energy_B \rvert + \lvert Energy_C \rvert > 0$ In single phase metering, the formulas for "Total" and "Total by phase" collapse to the same expression. For communication purposes however, the "Total" enumeration should be used with single phase meter data.	N
N = Normative I = Informative D = Deprecated since last edition			

C.2.6.2 Common usages

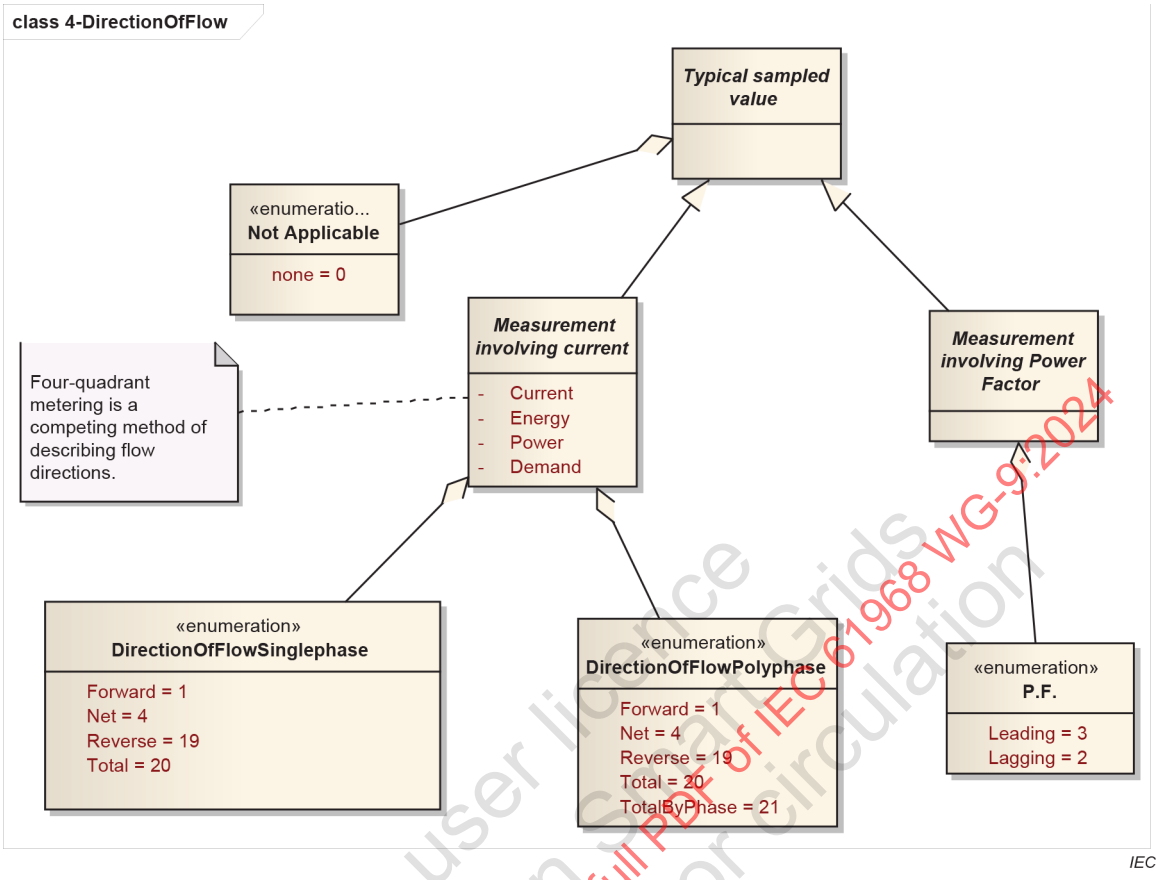
The terminology used to specify the flow direction for reactive energy and reactive power is varies considerably by vendor. Table C.8 describes a number of equivalent flow directions by power (or energy) type, and recommends a preferred flow direction enumeration for communication, as shown in Figure C.2.

Table C.8 – DirectionOfFlow enumeration equivalencies

Reprinted with the permission of UCAIug.

Type of energy or power	Unit Of Measure	Equivalent flow directions commonly used in industry	Preferred flow direction for messaging
Active or Real	W or Wh	Forward, Delivered, Positive, Q1+Q4	Forward
		Reverse, Received, Negative, Q2+Q3	Reverse
		Net, Q1+Q4-(Q2+Q3)	Net
		Total, Q1+Q2+Q3+Q4	Total
Reactive	VAr or VArh	Forward, Delivered, Positive, Lagging, Q1+Q2	Forward
		Reverse, Received, Negative, Leading, Q3+Q4	Reverse
		Net, Q1+Q2-(Q3+Q4)	Net
		Total, Q1+Q2+Q3+Q4	Total
Apparent	VA or VAh	Forward, Delivered	Forward
		Reverse, Received	Reverse
		Net	Net
		Total	Total

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESG WG on Smart Grids
Not for distribution or circulation
Oct 2024



Reproduced with the permission of UCAIug.

Figure C.2 – Typical enumerations for direction of flow

C.2.7 Attribute #6, commodity

In this standard, the commodity which is being measured has been isolated to become an attribute by itself. It is enumerated in Table C.9.

Table C.9 – Commodity

Reprinted with the permission of UCAIug.

Code	Enumeration	Comments	Normative status
0	none	Not Applicable	N
1	electricity SecondaryMetered	All types of metered quantities. This type of reading comes from the meter and represents a "secondary" metered value.	N
2	electricity PrimaryMetered	It is possible for a meter to be outfitted with an external VT and/or CT. The meter might not be aware of these devices, and the display not compensate for their presence. Ultimately, when these scalars are applied, the value that represents the service value is called the "primary metered" value. The "index" in sub-category 3 mirrors those of sub-category 0.	N
3	communication	A measurement of the communication infrastructure itself.	N
4	air		N
5	insulativeGas	(SF_6 is found separately below.)	N
6	insulativeOil	Typically mineral oil	N

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
EESG WG on Smart Grids
Single user licence
No reproduction or circulation
Oct 2024

Code	Enumeration	Comments	Normative status
7	naturalGas	Naturally occurring hydrocarbon gas	N
8	propane	C_3H_8	N
9	potableWater	Drinkable water	N
10	steam	Water in steam form, usually used for heating.	N
11	wasteWater	(Sewerage)	N
12	heatingFluid	This fluid is likely in liquid form. It is not necessarily water or water based. The warm fluid returns cooler than when it was sent. The heat conveyed may be metered.	N
13	coolingFluid	The cool fluid returns warmer than when it was sent. The heat conveyed may be metered.	N
14	nonpotableWater	Reclaimed water – possibly used for irrigation but not sufficiently treated to be considered safe for drinking. Moisture in oil	N
15	nox	Nitrous Oxides, NO_X	N
16	so2	Sulfur Dioxide, SO_2	N
17	ch4	Methane, CH_4	N
18	co2	Carbon Dioxide, CO_2	N
19	carbon	C	I
20	hch	Hexachlorocyclohexane, HCH	N
21	pfc	Perfluorocarbons, PFC	N
22	sf6	Sulfurhexafluoride, SF_6	N
23	tvLicence	Television	N
24	internet	Internet service	N
25	refuse	Trash	N
26	h2	Hydrogen, H_2	N
27	c2h2	Acetylene, C_2H_2	N
28	c2h4	Ethylene, C_2H_4	N
29	c2h6	Ethane, C_2H_6	N
30	co	Carbon monoxide, CO	N
31	o2	Oxygen, O_2	N
32	dissolvedCombustibleGas	Dissolved Combustible Gas (A combination of combustible gasses such as H_2, CH_4, C_2H_2, C_2H_4, C_2H_6, and/or CO in some mixture.)	N
33	co2e	Carbon Dioxide CO_2 Equivalent	N
34	lead	Lead, Pb	N
35	mercury	Mercury, Hg	N
36	ozone	Ozone, O_3	N
37	pm10	Particulate matter whose maximum size is 10 μm.	N
38	pm25	Particulate matter whose maximum size is 2,5 μm.	N
39	sox	Sulfur Oxides, SO_X	N
40	weather	Weather or meteorological conditions.	N

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single User Licence
IEC WG 9 Smart Grids
No reproduction or circulation
Oct 2024

Code	Enumeration	Comments	Normative status
41	device	Condition of the meter or end device itself. For example, this enumeration might be used in combination with an enumeration for temperature to represent the internal temperature of a meter.	N
42	pole	The power pole as an end device	I
43	conductor	A wire as an end device	I
44	acceleration	A measurement of acceleration	I
45	tilt	A measurement of tilt	I
46	magneticField	A measurement of the magnetic field	I
50	Gas	Generic commodity for gas. Note that there are specific commodities for natural gas and propane.	N
60	Water	Generic commodity for water. Note that there are specific commodities for waste water and potable water.	N
N = Normative I = Informative D = Deprecated since last edition			

C.2.8 Attribute #7, measurementKind

The "measurementKind" helps identify "what" is being measured. It further refines the commodity to provide a reading category. This attribute works in conjunction with the units attribute in creative ways to provide detail to the unit of measure. For example, "Energy" with a unit of measure of "kWh" indicates to the user that active energy is being measured, "Energy" with "kVAh" indicates apparent energy, and "Energy" with "kVArh" indicates reactive energy. "Power" can be combined in a similar way with various power units of measure. Distortion power ("DistortionVoltAmperes") with "kVA" is different from "Power" with "kVA". More information can be found by studying the examples at the end of this annex. Measurement kinds are enumerated in Table C.10.

Table C.10 – measurementKind Index

Reprinted with the permission of UCAIug.

Code	Enumeration	Comments	Normative Status
0	none	Not Applicable	N
2	apparentPowerFactor		D
3	currency	funds	N
4	current	The flow of electrons	N
5	currentAngle	A phase current zerocross timing measurement releative to a reference voltage zerocross	N
6	currentImbalance	A measurement of the departure of a phase current relative to the average current of all phases	N
7	date	A measurement of the date and/or time in a clock, or a time stamp indicating when data was captured, when a maximum or minimum occurred, or to commemorate some other important aspect of a measurement	N

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IESC WG 16 Smart Grids
No reproduction or circulation
Oct 2024

Code	Enumeration	Comments	Normative Status
8	demand	The measurement of maximum power flow which is computed as energy usage over time, the dimensions of which are defined by a tariff	N
9	distance	A linear distance or range radius	N
10	distortionVoltAmperes	A measurement in which a V^2 I^2 term has both real and reactive components removed leaving only distortion. For example, distortion VAh = Sqrt($(V^2h)(I^2h) – (Wh)^2 – (VArh)^2$)	N
11	energization	Pertaining to the presence of voltage	N
12	energy	Scalar quantity which may be increased or decreased in a system when it receives or produces work, respectively	N
13	energizationLoadSide	Measuring the presence or absence of voltage on the load side of an electricity meter	N
14	fan	A forced air moving device	N
15	frequency	Reciprocal of the period	N
17	ieee1366ASAI	A measurement of IEEE-1366 Average Service Availability Index	N
18	ieee1366ASIDI	A measurement of the IEEE-1366 Average Service Interruptio Duration Index	N
19	ieee1366ASIFI	A measurement of the IEEE-1366 Average Service Interruption Frequency Index	N
20	ieee1366CAIDI	A measurement of the IEEE-1366 Customer averate interruption duration index	N
21	ieee1366CAIFI	A measurement of the IEEE-1366 Customer average interruption frequency index	N
22	ieee1366CEMIn	A measurement of the IEEE-1366 Customers Experiencing Multiple Interruptions	N
23	ieee1366CEMSMIn	A measurement of the IEEE-1366 Customers Experiencing Multiple Sustained and Momentary Interruptions	N
24	ieee1366CTAIDI	A measurement of the IEEE-1366 Customer Total Average Interruption Duration Index	N
25	ieee1366MAIFI	A measurement of the IEEE-1366 Momentary Average Interruption Frequency Index	N
26	ieee1366MAIFIe	A measurement of the IEEE-1366 Momentary Average event Interruption Frequency Index	N
27	ieee1366SAIDI	IEEE-1366 System Average Interruption Duration Index	N
28	ieee1366SAIFI	IEEE-1366 System Average Interruption Frequency Index	N
31	lineLosses	An energy, power, voltage, or current loss attributed to transmission or distribution line impedance	N

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG on smart grids
No reproduction or circulation
Oct 2024

Code	Enumeration	Comments	Normative Status
32	losses	A quantity lost due to "technical" reasons (such as line loss) or "non-technical" reasons (such as theft.)	N
33	negativeSequence	A quantity that has a rotation sequence which is opposite to that of the power system	N
34	phasorPowerFactor	The ratio of real energy (usually net Wh) to phasor apparent energy (kVAh)	N
35	phasorReactivePower		D
36	positiveSequence	A quantity that has a rotation sequence in agreement with that of the power system	N
37	power	The derivative of energy with respect to time, where the energy is being transferred or transformed.	N
38	powerFactor	The ratio of real energy (usually net kWh) to apparent energy (kVAh)	N
40	quantityPower	A power measurement of Qh, where Qh is defined to be half of the sum of the Wh measurements on each phase plus the squareroot of 3 over two times the sum of the VArh measurements on each phase.	N
41	sag	A temporary dip in the supply voltage below the nominal value	N
42	swell	A temporary rise of the supply voltage over the nominal value	N
43	switchPosition	A physical or logical switch position status which includes "opened" and "closed", but for some products may also include "armed," or other states that indicate a temporary state due to some condition.	N
44	tapPosition	Tap changer position	I
45	tariffRate	An energy price defined in a contract. The rate might be a price for energy, for power (usually expressed as a demand value), or some other measurement. The rate might be currency based, or as a code, or as a component of a larger tariff description.	N
46	temperature	A quantity proportional to the energy of a system	N
47	totalHarmonicDistortion	The ratio of the sum of the harmonics to the fundamental. (THD may measure either voltage or current, and may isolated to a given phase)	N
48	transformerLosses	A measurement of the energy or power loss in a transformer due to inefficiency	N
49	unipedeVoltageDip10to15	A voltage dip classification per EN50160 or a similar national standard measuring the number of dips in the 10 % to 15 % range	N
50	unipedeVoltageDip15to30	A voltage dip classification per EN50160 or a similar national standard measuring the number of dips in the 15 % to 30 % range	N

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence only, copying and networking prohibited.
IEC CEO WG on smart grids
No reproduction or distribution

Code	Enumeration	Comments	Normative Status
51	unipedeVoltageDip30to60	A voltage dip classification per EN50160 or a similar national standard measuring the number of dips in the 30 % to 60 % range	N
52	unipedeVoltageDip60to90	A voltage dip classification per EN50160 or a similar national standard measuring the number of dips in the 60 % to 90 % range	N
53	unipedeVoltageDip90to100	A voltage dip classification per EN50160 or a similar national standard measuring the number of dips in the 90 % to 100 % range	N
54	Voltage (rms)	The difference in electric potential between two points	N
55	voltageAngle	A phase voltage zerocross timing measurement releative to a reference voltage zerocross	N
56	voltageExcursion	A measurement of the departure of the voltage from the nominal voltage	N
57	voltageImbalance	A measurement of the departure of a phase voltage relative to the average voltage of all phases.	N
58	volume	fluid volume	N
59	zeroFlowDuration	The amount of time that current flow drops to a zero level or level below the ability of the sensor to sense	N
60	zeroSequence	The zero sequence current is the vector sum of the phase currents	N
64	distortionPowerFactor	The ratio of the distortion VAh to the apparent VAh	N
81	frequencyExcursion	A measurement of the departure of the frequency from the nominal frequency	N
90	applicationContext	Information that describes the logical context in which a request, measurement, or command is made.	I
91	apTitle	An application name which is making or has made a request	I
92	assetNumber	An asset identifier	I
93	bandwidth	A measurement of dataflow	I
94	batteryVoltage	Battery voltage	N
95	broadcastAddress	A message target address implying all endpoint units within range of a particular sender	I
96	deviceAddressType1	Endpoint target address Type1	I
97	deviceAddressType2	Endpoint target address Type2	I
98	deviceAddressType3	Endpoint target address Type3	I
99	deviceAddressType4	Endpoint target address Type4	I
100	deviceClass	A unique identifier for the Endpoint's configuration	I
101	electronicSerialNumber	A device serial number	I
102	endDeviceID	A unique identifier of the endDevice – the device providing measurements or under control of the network	I
103	groupAddressType1	Group target address Type1	I
104	groupAddressType2	Group target address Type2	I

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEESC WG on smart grids
No reproduction or circulation
Oct 2024

Code	Enumeration	Comments	Normative Status
105	groupAddressType3	Group target address Type3	I
106	groupAddressType4	Group target address Type4	I
107	ipAddress	An IP address for the endpoint	I
108	macAddress	A MAC address for the endpoint	I
109	mfgAssignedConfigurationID	The configuration given to a device at time of manufacture	I
110	mfgAssignedPhysicalSerialNumber	The serial number assigned to a device at time of manufacture	I
111	mfgAssignedProductNumber	The product number assigned to a device at time of manufacture	I
112	mfgAssignedUniqueCommunicationAddress	A communication address assigned to a device at time of manufacture	I
113	multiCastAddress	A message target address implying a large group of endpoint units within range of a particular sender	I
114	oneWayAddress	A communication address of a network endpoint used in one-way communication	I
115	signalStrength	A measurement of RF signal strength	I
116	twoWayAddress	A communication address used for bidirectional communication	I
117	signaltoNoiseRatio	A measurement of received (RF) signal strength divided by the (RF) noise floor	I
118	alarm	A measurement releated to an alarm	I
119	batteryCarryover	An estimate of the battery ridethrough capacity	I
120	dataOverflowAlarm	An indication of or measurement of a loss of data	I
121	demandLimit	A threshold setting that determines the trip point that if exceeded would trigger a demand limiting action or alarm	N
122	demandReset	A count of the number of times demand has been reset (remotely, locally, and/or automatically.)	N
123	diagnostic	A measurement releated to equipment diagnostics	I
124	emergencyLimit	A setting that indicates an emergency limit	I
125	encoderTamper	An indication of tampering with a meter encoder	I
126	ieee1366MomentaryInterruption	IEEE-1366 Momentary Interruption count	N
127	ieee1366MomentaryInterruptionEvent	IEEE-1366 Momentary Interruption event count	N
128	ieee1366SustainedInterruption	IEEE-1366 Sustained Interruption duration	N
129	interruptionBehaviour	A measurement related to power interruptions (NOTE often an interruption count or duration.)	I
130	inversionTamper	A measurement related to inversion tamper (NOTE typically a count of inversions)	I

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence only, copying and networking prohibited.
IEC TESC WG on smart cities
No reproduction or circulation
Oct 2024

Code	Enumeration	Comments	Normative Status
131	loadInterrupt	A measurement related to load interruption (NOTE typically a load interruption count or measurement of duration)	I
132	loadShed	A measurement related to load shed (NOTE typically a load shed count or load shed duration)	I
133	maintenance	A measurement related to the pending maintenance of equipment	I
134	physicalTamper	A measurement related to physical tampering (NOTE typically a tamper count)	I
135	powerLossTamper	Tamper indicated while power was out	I
136	powerOutage	A measurement related to power outages (NOTE typically a status)	I
137	powerQuality	A measurement related to power quality	I
138	powerRestoration	A measurement related to power restoration (NOTE typically a status)	I
139	programmed	A measurement related to device programming (NOTE typically a status measurement)	I
140	pushbutton	A measurement related to pushbutton (NOTE typically a status or count)	N
141	relayActivation	A measurement related to relay activations	N
142	relayCycle	A measurement related to relay cycling (NOTE 1 one open and one closure together is one cycle, NOTE 2 Usually expressed as a count)	N
143	removalTamper	An indication of equipment tampering that shows equipment was moved or opened	I
144	reprogrammingTamper	An indication of equipment tampering that shows equipment has been reprogrammed	I
145	reverseRotationTamper	An indication of tampering as evidenced by reverse power flow	I
146	switchArmed	A measurement of the switch arm condition	I
147	switchDisabled	A measurement of the switch enablement status	I
148	tamper	An indication of equipment tampering	I
149	watchdogTimeout	A reset triggered by a hardware "watchdog" circuit	I
150	billLastPeriod	Customer's bill for the previous billing period Expressed as currency.	N
151	billToDate	Customer's bill, as known thus far within the present billing period. Expressed as currency.	N
152	billCarryover	Customer's bill, part of a previous obligation carried over from a previous billing period. Expressed as currency.	N
153	connectionFee	Monthly fee for connection to commodity.	I
154	audibleVolume	Sound	I
155	volumetricFlow	A fluid flow rate	I

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESG WG on smart grids
No reproduction or distribution

Code	Enumeration	Comments	Normative Status
156	relativeHumidity	Most common usage is in expressing weather or meteorological conditions	N
157	skyCover	Degree of sky cover. Used in expressing weather or meteorological conditions.	N
158	voltage	Unspecified	I
159	dcVoltage		I
160	acVoltagePeak	$Vp=\sqrt{2} \times Vrms$	I
161	acVoltagePeakToPeak	$Vpp=2 \times Vp$	I
162	pressure	Force over area	I
163	density		I
164	energyDensity		I
165	dateOfLastDemandReset		I
166	arithmeticApparentEnergy	The arithmetic sum of the per element VAh quantities, where each element apparent VAh uantity is calculated each momentary interval as: $sqrt(V^2h_x)(I^2h_x)$, where x= each element A, B, C, and V^2h_x and I^2h_x are fundamental plus harmonics values.	I
167	arithmeticApparentPower	The rate of arithmetic Apparent Energy	I
168	arithmeticApparentDemand		I
169	phasorApparentEnergy	$Sqrt((Wh_x)^2+(VArh_x)^2)$ where x each element A,B,C and VArh is measured with IEEE VArs	I
170	phasorApparentPower	The rate of phasor apparent energy	I
171	phasorApparentDemand		I
172	distortionApparentEnergy	distortion VAh_x = $Sqrt((V^2h_x)(I^2h_x) – (Wh_x)^2 – (VArh_x)^2)$, where x= each element A, B, or C and $V2h_x$, $I2h_x$, Wh_x, and $varh_x$ are fundamental plus harmonic values	I
173	distortionApparentPower	The rate of distortion apparent energy	I
174	distortionApparentDemand	Distoration apparent energy passed through a demand function	I
175	totalHarmonicDistortionDemand	THD treated as a demand	I
176	tddDemand	Total Demand Distortion treated as a demand	I
177	totalDemandDistortion	(RMS of harmonic content of current) / (maximum installation current)	I
178	distortionPowerFactorDemand	distortionPF treated as a demand value	I
179	fuzzyEnergy	Fuzzyvarh = $sqrt((varh)^2 + (distortion VAh)^2)$, where varh is a fundamental plus harmonics value	I
180	fuzzyPower	The rate of fuzzy energy	I
181	fuzzyDemand	Fuzzy energy as a demand	I
183	batteryChargeMoved	Charge used or added	I
184	batteryChargeStored	Charge present	I
188	quadrant	One of four quadrants relative to the reference axis	I

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEC WG on Smart Grids
No reproduction or circulation
Oct 2024

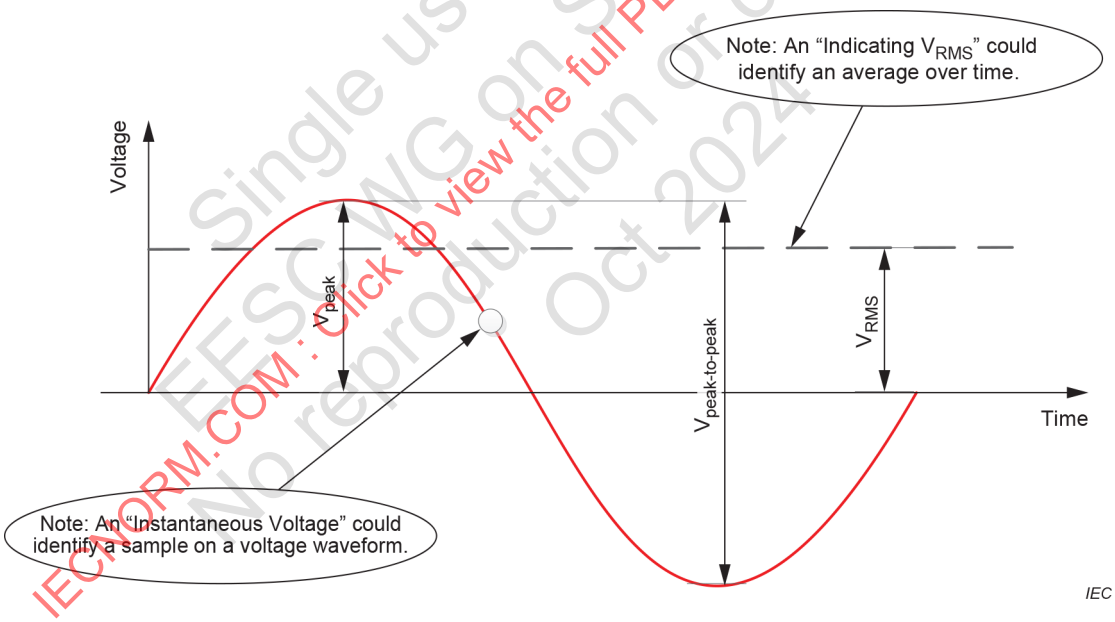
Code	Enumeration	Comments	Normative Status
189	processorReset	The type of reset	I
190	xAxis	Measurement along the x axis relative to the reference axis	I
191	yAxis	Measurement along the y axis	I
192	zAxis	Measurement along the z axis	I
193	XYPlane	Measurement in the XY Plane	I
194	YZPlane	Measurement in the YZ Plane	I
195	XZPlane	Measurement in the XZ Plane	I

N = Normative

I = Informative

D = Deprecated since last edition

NOTE In this edition of IEC 61968-9 additional distinction has been made with respect to the voltage frame of reference. The original enumeration for "voltage" is now explicitly used to identify $Volts_{RMS}$. This is because the most common type of measurement passed between systems is a $Volts_{RMS}$ value. However, it is not the only way to measure a voltage. New enumerations have been created to also identify Volts-peak, Volts-peak-to-peak, Volts DC, and unspecified voltage waveforms. A number of voltage measurements are defined in Figure C.3. When combined with the accumulation attribute it is possible to show an "indicating $Volts_{RMS}$" which is measured over the course of many cycles, an "instantaneous $Volts_{RMS}$" which is measured over a single cycle, or an "instantaneous voltage" which is a single point sample on the waveform captured in an instant of time.



Reproduced with the permission of UCAIug.

Figure C.3 – Voltage measurements

C.2.9 Attribute #8, interharmonicNumerator

See C.2.10.

C.2.10 Attribute #9, interharmonicDenominator

Interharmonics are represented as a rational number with a numerator and a denominator. Harmonics are represented using the same mechanism, and identified by having a denominator of "1."

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence EESC WG on Smart Grids No reproduction or circulation Oct 2024

This is represented formulaically as:

$$\text{Interharmonic} = \frac{\text{InterharmonicNumerator}}{\text{InterharmonicDenominator}}$$

and

$$\text{Harmonic} = \text{InterharmonicNumerator}$$

where the InterharmonicDenominator equals "1".

The harmonic or interharmonic enumeration is determined by a compound element:

<interharmonic>::= <interharmonicNumerator> <interharmonicDenominator>

The normative interharmonic numerator and denominators are defined in Table C.11. Additional values may be freely created using this approach and would be considered "informative" rather than "normative" values.

Table C.11 – Harmonic and Interharmonic enumerations

Reprinted with the permission of UCAIug.

Interharmonic Numerator	Interharmonic Denominator	Enumeration	Comments	Normative Status
0	0	none	Not Applicable	N
1	2	interharmonic1/2	Interharmonic of ½	N
1	1	fundamental	fundamental	N
2	1	harmonic2	second harmonic	N
3	1	harmonic3	third harmonic	N
4	1	harmonic4	fourth harmonic	N
5	1	harmonic5	fifth harmonic	N
6	1	harmonic6	sixth harmonic	N
7	1	harmonic7	seventh harmonic	N
N = Normative I = Informative D = Deprecated since last edition				

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence EESC/WG on Smart Grids
No reproduction or circulation Oct 2024

C.2.11 Attribute #10, argumentNumerator

See C.2.12.

C.2.12 Attribute #11, argumentDenominator

The argument elements are used to introduce numbers into the unit of measure description where they are needed. The definition supports a rational number with a numerator and a denominator. Most arguments used in practice however will be integers. Integers will all have a "1" as their denominator.

$$\text{argument} = \frac{\text{numerator}}{\text{denominator}}$$

The argument enumeration is determined by a compound element:

<argument>::= <numerator> <denominator>

The normative numerator and denominators are defined in Table C.12. Additional values may be freely created using this approach. For test purposes, values not shown in the table would be considered "informative" rather than "normative" values.

Table C.12 – Argument enumerations

Reprinted with the permission of UCAIug.

Numerator	Denominator	Enumeration	Comments	Normative Status
0	0	none	Not Applicable	N
1	2	n½	One-half	I
0	1	n0	"Zero" (for systems that use zero based numbering schemes)	N
1	1	n1	"One," where the measure needs an argument such as CEMI(n=1)	N
2	1	n2	"Two" where the measure needs an argument such as CEMI(n=2)	N
3	1	n3	"Three" where the measure needs an argument such as CEMI(n=3)	N
4	1	n4	"Four" where the measure needs an argument such as CEMI(n=4)	N
5	1	n5	"Five" where the measure needs an argument	N
6	1	n6	Six	N
7	1	n7	Seven	N
8	1	n8	Eight	N
9	1	n9	Nine	N
10	1	n10	Ten	N
15	1	n15	Fifteen	N
30	1	n30	Thirty	N
45	1	n45	Fourtyfive	N
60	1	n60	Sixty	N
120	1	n120	2 × 60 = 120	N
155	1	n155	One hundred fifty five	N
240	1	n240	4 × 60 = 240	N
305	1	n305	Three hundred and five.	N
360	1	n360	6 × 60 = 360	N
480	1	n480	8 × 60 = 480	N
720	1	n720	12 × 60 = 720	N
720	60	n720/60	12 × 60/1 × 60	N
720	120	n720/120	12 × 60/2 × 60	N
720	180	n720/180	12 × 60/3 × 60	N
720	240	n720/240	12 × 60/4 × 60	N
720	360	n720/360	12 × 60/6 × 60	N

N = Normative

I = Informative

D = Deprecated since last edition

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence only, copying and networking prohibited
EESG WG 19 Smart Grids
No reproduction or circulation
Oct 2024

C.2.13 Attribute #12, tou

The Time Of Use (TOU) element is used to describe any attribution of the value to a specific TOU bucket. The TOU enumerations are defined in Table C.13.

Table C.13 – Time Of Use Enumerations

Reprinted with the permission of UCAIug.

Code	Enumeration	Comments	Normative Status
0	none	Not Applicable	N
1	touA	Usage in the first defined TOU bucket	N
2	touB	Usage in the second defined TOU bucket	N
3	touC	Usage in the third defined TOU bucket	N
4	touD	Usage in the fourth defined TOU bucket	N
5	touE	Usage in the fifth defined TOU bucket	N
6	touF	Usage in the sixth defined TOU bucket	N
7	touG	Etc.	I
N = Normative I = Informative D = Deprecated since last edition			

C.2.14 Attribute #13, cpp

The Critical Peak Period (CPP) element is used to describe any attribution of the value to a specific CPP bucket. Even though CPP is usually considered a specialized form of TOU, it is separated from TOU enumerations to facilitate modelling. The CPP enumerations are defined in Table C.14.

Table C.14 – Critical Peak Period Enumerations

Reprinted with the permission of UCAIug.

Code	Enumeration	Comments	Normative Status
0	none	Not Applicable	N
1	cppA	Consumption associated with critical peak period A	N
2	cppB	Consumption associated with critical peak period B	N
3	cppC	Consumption associated with critical peak period C	N
4	cppD	Consumption associated with critical peak period D	N
5	cppE	Consumption associated with critical peak period E	N
6	cppF	Consumption associated with critical peak period F	N
7	cppG	Etc.	I
N = Normative I = Informative D = Deprecated since last edition			

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEC SC WG on Smart Grids
No reproduction or circulation
Oct 2024

C.2.15 Attribute #14, consumptionTier

Consumption tier pricing refers to the method of billing in which a certain "block" of energy is purchased (or sold) at one price, after which the next block of energy is purchased at another price, and so on, all throughout a defined period. At the start of the defined period, consumption is initially zero, and any usage is measured against ConsumptionTier1. If this block of energy is consumed before the end of the period, energy consumption moves to be reconed against ConsumptionTier2. If this block of energy is consumed before the end of the period, energy consumption moves to ConsumptionTier3, and so on. At the end of the defined period the consumption accumulator is reset, and usage within ConsumptionTier1 restarts.

This is in contrast to the common "flat rate" for power, in which all purchases are at a given rate. When flat-rate pricing is used, a consumptionTier of "not applicable" should be specified.

Enumerations for Consumption Tiers are defined in Table C.15.

Table C.15 – Consumption Tier Enumerations

Reprinted with the permission of UCAIug.

Code	Enumeration	Comments	Normative Status
0	none	Not applicable	N
1	consumptionTier1	Usage in the first defined consumption bucket	N
2	consumptionTier2	Usage in the second defined consumption bucket	N
3	consumptionTier3	Usage in the third defined consumption bucket	N
4	consumptionTier4	Usage in the fourth defined consumption bucket	N
5	consumptionTier5	Usage in the fifth defined consumption bucket	N
6	consumptionTier6	Usage in the sixth defined consumption bucket	N
7	consumptionTier7	Additional consumption tiers may be created as necessary.	I
N = Normative I = Informative D = Deprecated since last edition			

TOU or CPP pricing may be used in conjunction with consumption tier pricing. The examples provided in Table C.16 may be useful:

Table C.16 – Example Combinations of TOU and Consumption Tier Enumerations

Reprinted with the permission of UCAIug.

Tou Code	Consumption Tier Code	Comments
1	0	TOU Period A with flat rate pricing
1	1	TOU Period A with Consumption Tier 1
1	2	TOU Period A with Consumption Tier 2
1	3	TOU Period A with Consumption Tier 3
2	1	TOU Period B with Consumption Tier 1
2	2	TOU Period B with Consumption Tier 2
2	3	TOU Period B with Consumption Tier 3
3	1	TOU Period C with Consumption Tier 1
3	2	TOU Period C with Consumption Tier 2
3	3	TOU Period C with Consumption Tier 3

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single User Licence
EESC WG 01 Smart Grids
No reproduction or circulation
Oct 2024

C.2.16 Attribute #15, phases

The metering phase enumerations are described in Table C.17.

Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024
IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024

Table C.17 – Phase enumerations

Reprinted with the permission of UCAIug.

		Position	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Code	Enumeration	Comments	Networked	Open	High leg	Delta	Wye	S_1	S_2	A_1	B_1	C_1	N_1	A_2	B_2	C_2	N_2	Normative Status
0	none	Not applicable to any phase	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	N
16	phaseN	Neutral	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	N
17	phaseNtoGnd	Neutral to ground	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	N
32	phaseC	Phase C	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	N
33	phaseCtoN	Phase C to Neutral	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	N
40	phaseCtoAv	Phase C current or voltage relative to Phase A voltage	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	N
41	phaseCAtoN	CA to Neutral	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	N
64	phaseB	Phase B	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	N
65	phaseBtoN	Phase B to Neutral	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	N
66	phaseBtoC	Phase B to C	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	N
72	phaseBtoAv	Phase B current or voltage relative to Phase A voltage	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	N
97	phaseBCtoN	BC to Neutral	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	N
128	phaseA	Phase A	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	N
129	phaseAtoN	Phase A to Neutral	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	N
132	phaseAtoB	Phase A to B	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	N
136	phaseAtoAv	Phase A current relative to Phase A voltage	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	N
193	phaseABtoN	AB to Neutral	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	N
224	phasesABC	Involving all phases	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	N
225	phaseABCtoN	ABC to Neutral	0	0	0	0	0	0	0	1	1	1	0	0	0	0	1	N
256	s2	Phase S2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	N
257	s2N	Phase S2 to Neutral	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	N

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
EESOWG copyright 2024
No reproduction or distribution permitted
Oct 2024
Single user licence only, copying and networking prohibited

		Position	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Code	Enumeration	Comments	Networked	Open	High leg	Delta	Wye	S_1	S_2	A_1	B_1	C_1	N_1	A_2	B_2	C_2	N_2	Normative Status
512	s1	Phase S1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	N
513	s1N	Phase S1 to Neutral	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	N
768	s12	Phase S1 to S2	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	N
769	s12N	Phase S1, S2 to Neutral	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	N
1248	threeWireWye	3W Wye	0	0	0	0	1	0	0	1	1	1	0	0	0	0	0	N
1249	fourWireWye	4W Wye	0	0	0	0	1	0	0	1	1	1	0	0	0	0	1	N
2272	threeWireDelta	3W Delta	0	0	0	1	0	0	0	1	1	1	0	0	0	0	0	N
2273	fourWireDelta	4W Delta	0	0	0	1	0	0	0	1	1	1	0	0	0	0	1	N
6369	fourWireHLDelta	4W High-leg Delta	0	0	1	1	0	0	0	1	1	1	0	0	0	0	1	N
10465	fourWireOpenDelta	4W Open Delta	0	1	0	1	0	0	0	1	1	1	0	0	0	0	1	N
17153	networked	Networked meter	1	0	0	0	0	1	1	0	0	0	0	0	0	0	1	N

NOTE 1 The code values were computed by:

$$\text{Code} = \text{Networked} \times 2^{14} + \text{Open} \times 2^{13} + \text{HighLeg} \times 2^{12} + \text{Delta} \times 2^{11} + \text{Wye} \times 2^{10} + S_1 \times 2^9 + S_2 \times 2^8 + A_1 \times 2^7 + B_1 \times 2^6 + C_1 \times 2^5 + N_1 \times 2^4 + A_2 \times 2^3 + B_2 \times 2^2 + C_1 \times 2^1 + N_2$$

NOTE 2 Directional vectors (such as V_{AB} vs. V_{BA}) are created in the phase code by invoking the involved phase (left to right in the matrix) in the order in which they are to be described in the enumeration (left to right as one reads).

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
EESC WG of Smart Grids
Single user licence
No reproduction or circulation
Oct 2024

When current is measured, it is often simple a single phase conductor indicated such as:

- A
- B
- C
- N

The Neutral-to-ground "phase" can be used to indicate current flowing from the neutral wire to ground. In this case select both N_1 and N_2. When only neutral is selected choose N_1. In all other cases when referencing neutral select N_2. The main goal is readability. These rules should provide the necessary readability.

When voltage is measured, it may contain a simple description of the phase conductor, or if measured relative to something else, an indication of the measurement being "line-to-neutral" or "line-to-line" measured. Common voltage measurements include:

- A
- B
- C
- AN
- BN
- CN
- AB
- BC
- CA
- ABC

When phase angles are measured, it is usually relative to a fixed reference such as voltage phase A. The word "angle" has already been described in a previous field. This field may therefore contain an angle designation such as:

- $A_{current}A_{volts}$
- $B_{current}A_{volts}$
- $C_{current}A_{volts}$

Where the first phase listed is understood to describe the current or voltage phase being measured, and the second phase (the "A") describes what it is being measured against (voltage phase A). Since the fact that the measurement is an angle can be determined from the context (provided by the unit of measure), and the point of reference is always the second phase, there is no need to provide additional indications within the phase lettering. This allows the same code (such as "Phase-CA") to often be used as a line-to-line voltage descriptor, a voltage phase-angle descriptor, as well as a current phase-angle descriptor.

Residential or other two-phase secondary voltages may be identified as "S1" or "S2". These labels may be used when the "ABC" names of the phase(s) that feed the service are unknown or unimportant.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESG WG on Smart Grids
No reproduction or circulation
Oct 2024

The various polyphase network wirings may be identified as:

- Wye
- Delta
- High-leg delta
- Open delta
- Networked

The use of 3 wires or 4 wires may be determined by simply counting the number of phases (including neutral) involved in the service.

C.2.17 Attribute #16, multiplier

The ReadingType encoding offers a field to describe a power-of-ten multiplier against the data value. This is not quite the same as the customary SI-prefix, though in many cases it creates the same result. The user will have to decide what the appropriate displayable symbol is based on the dimensions of the unit of measure. The multiplier enumerations are described in Table C.18 for units of measure that have a single dimension (e.g. "V" not "V^2"). The index value represents the power of ten.

Table C.18 – Power of ten enumerations

Code	Displayable symbol for single-dimensioned UOM	Comments	Normative status
–24	y	yocto = $\times 10^{-24}$	N
–21	z	zepto = $\times 10^{-21}$	N
–18	a	atto = $\times 10^{-18}$	N
–15	f	femto = $\times 10^{-15}$	N
–12	p	pico = $\times 10^{-12}$	N
–9	n	nano = $\times 10^{-9}$	N
–6	μ	micro = $\times 10^{-6}$	N
–3	m	milli= $\times 10^{-3}$	N
–2	c	centi = $\times 10^{-2}$	N
–1	d	deci = $\times 10^{-1}$	N
0		Not applicable or "×1"	N
1	da	deca = $\times 10^{1}$	N
2	h	hecto = $\times 10^{2}$	N
3	k	kilo = $\times 10^{3}$	N
6	M	Mega = $\times 10^{6}$	N
9	G	Giga = $\times 10^{9}$	N
12	T	Tera = $\times 10^{12}$	N
15	P	Peta = $\times 10^{15}$	N
18	E	Exa = $\times 10^{18}$	N
21	Z	Zetta = $\times 10^{21}$	N
24	Y	Yotta = $\times 10^{24}$	N
N = Normative I = Informative D = Deprecated since last edition			

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence to FESC Wuxi Grid Smart Group
No reproduction or circulation
Oct 2024

It should be remembered that this power-of-ten multiplier does not work the same way as the SI prefix. The SI prefix is considered to be part of the unit of measure. A power-of-ten multiplier is not part of the unit of measure. When an SI-Prefix is used, it is understood that "10^{-3}" is represented as "milli", and a mm^3 is the same as $(mm)^3$ which is the same as $(0{,}001\ m)^3$ or $10^{-9}\ m^3$. This is not the same result as $0{,}001 \times m^3$ (which is what a power-of-ten multiplier yields.).

Rules for the use of SI prefixes may be found in IEC 60050-112:2010, 02-03.

When the unit of measure being described is a ratio which is rendered as a dimensionless quantity (such as a concentration), it is sometimes customary to display a symbol other than the standard metric prefix symbol. The modern convention however is to use the SI-prefix symbols infront of the dimensionless ratio being described. For example, a ppm concentration by volume ("ppmv") should instead be described as "µL/L". A few historical dimensionless scalars are provided in Table C.19 for reference.

Table C.19 – Historical concentration multiplier enumerations

Reprinted with the permission of UCAIug.

Code	Displayable Symbol	Comments	Normative Status
0	PU	per unit = ×1 = 10^0	I
–2	%	percent = ×0,01 = $\times 10^{-2}$	I
–3	‰	permille = ×0,001 = $\times 10^{-3}$	I
–6	ppm	parts per million, ×0,000 001 = $\times 10^{-6}$	I
–9	ppb	parts per billion, ×0,000 000 001 = $\times 10^{-9}$	I
N = Normative I = Informative D = Deprecated since last edition			

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IECSC WG 21 Smart Grids
No reproduction or circulation
Oct 2024

C.2.18 Attribute #17, unit

Table C.20, Table C.21, Table C.22, Table C.23, Table C.24, Table C.25, Table C.26 and Table C.27 describe the unit of measure enumerations. They are organized by their relationships to the SI units of measure. SI-units are the preferred unit of measure, but as an international standard, it is understood that other units of measure shall also be supported in some regions. Definitions for common units of measure such as "voltage," current," and other quantities may be found freely online at the IEC Electropedia website.

In these tables, the "code" column is a unique value. The "normative status" indicates if the "code" is normative or informative. The "quantity" column indicates the category of measure. The "unit name" suppolies the official name for the unit, and possibly comments regarding its use or relationship to other units. The "symbol" column indicates in most cases the official displayable symbol for the unit. Where there were cases for conflict because different measurement systems have been combined, preference is given to the SI unit of measure. (This happened in the case of rad (rd) and rod (rd).) The "enumeration" column creates a unique string which could be used by CIM modelers to capture a string value for the unit. The enumeration was created based on the following rules:

- A lower camel-case transformation of the symbol column is attempted. All spaces are removed from the symbol to create the enumeration.
- The symbol set is restricted to alpha-numeric characters.
- The symbols "-", "(", and ")" are removed.
- The symbol "/" is replaced by the string "Per".

- The symbol "°" is replaced by the string "Deg".
- Other special symbols such as "¤", "'", "μ" and "ℏ" are replaced with alternative alpha text strings.
- Digits are not allowed as the first character in the enumeration.
- Text that is superscripted or subscripted is used as normal text in the enumeration (if conflicts are avoidable).
- If two different symbols would result in the same enumeration (due to capitalization rules) then one of them is changed (with preference being given to the base SI units). Exceptions were created for the symbols "A", "B", "G", "H", "ℏ", "M", "m_e", "S", and "T".

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

Table C.20 – Base SI units of measure

Reprinted with the permission of UCAIug.

Code	Quantity	Unit name (and comments)	Symbol	Enumeration	Normative Status
2	Length	metre	m	m	N
3	Mass	gram	g	g	N
5	Current	ampere	A	a	N
6	Temperature	Kelvin	K	degK	I
7	Amount of substance	mole	mol	mol	I
8	Luminous intensity	candela	cd	cd	I
27	Time	second	s	s	N

N = Normative

I = Informative

D = Deprecated since last edition

NOTE The British spelling "metre" and American spelling "meter" are equivalent.

Table C.21 – Derived SI units of measure with special names

Reprinted with the permission of UCAIug.

Code	Quantity	Unit name (and comments)	Displayable Symbol	Enumeration	Normative Status
10	Plane angle	Radian (m/m)	rad	rad	N
11	Solid angle	Steradian (m^2/m^2)	sr	sr	I
21	Absorbed dose	Gray (J/kg)	Gy	gy	I
22	Radioactivity	Becquerel (1/s)	Bq	bq	I
23	Temperature	degrees Celsius	°C	degC	N
24	Dose equivalent	Sievert (J/kg)	Sv	sv	I
25	Electric capacitance	Farad (C/V)	F	f	N
26	Electric charge	Coulomb (Amp second)	C	c	I

EESC WG on Smart Grids
No reproduction or circulation
Oct 2024
Single user licence
IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024

Code	Quantity	Unit name (and comments)	Displayable Symbol	Enumeration	Normative Status
28	Electric inductance	Henry (Wb/A)	H	h	N
29	Electric potential	Volt (W/A)	V	v	N
30	Electric resistance	Ohm (V/A)	Ω	ohm	N
31	Energy joule	(N·m = C·V = W·s)	J	j	N
32	Force newton	(kg m/s^2)	N	n	N
33	Frequency	Cycles per second or (1/s)	Hz	hz	N
34	Illuminance lux	(lm/m^2)	lx	lx	I
35	Luminous flux	lumen (cd sr)	lm	lm	I
36	Magnetic flux	Weber (V s)	Wb	wb	I
37	Magnetic flux density	Tesla (Wb/m^2)	T	t	I
38	Real power	Watt. By definition, one Watt equals oneJoule per second. Electrical power may have real and reactive components. The real portion of electrical power (I^{2}R) or VIcosθ, is expressed in Watts. (See also apparent power and reactive power.)	W	w	N
39	Pressure	Pascal (N/m^2) NOTE the absolute or relative measurement of pressure is implied with this entry. See below for more explicit forms.	Pa	pa	N
53	Electric Conductance	Siemens (A / V = 1 / Ω)	S	siemens	N
155	Pressure	Pascal, absolute pressure	PaA	paA	N
140	Pressure	Pascal, gauge pressure	PaG	paG	N
158	Catalytic activity	katal = mol / s	kat	kat	I

N = Normative

I = Informative

D = Deprecated since last edition

NOTE The British spelling "litre" and American spelling "liter" are equivalent.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
EESC WG Smart Grids
No reproduction or circulation
Oct 2024
Single user licence

Table C.22 – Derived SI Units of Measure without Special Names

Reprinted with the permission of UCAIug.

Code	Quantity	Unit name (and comments)	Displayable Symbol	Enumeration	Normative Status
4	Rotational speed	rotations per second NOTE Compare to cycles per second, Hz	rev/s	revPerS	I
41	Area	square metre	m^2	m2	N
42	Volume	cubic metre	m^3	m3	N
43	Velocity	metre per second (m/s)	m/s	mPerS	N
44	Acceleration	metre per second squared	m/s^2	mPerS2	I
45	Volumetric flow rate	cubic metres per second	m^3/s	m3PerS	N
46	Fuel efficiency	metre / cubic metre	m/m^3	mPerM3	I
47	Moment of mass	kilogram metre (kg·m) (first moment of mass) NOTE 1 Users shall supply the "k" prefix to obtain "kg m".	g m	gM	I
48	Density	gram/cubic metre NOTE 2 Users shall supply the prefix multiplier "k" to form kg/m^3	g/m^3	gPerM3	I
49	Viscosity	metre squared / second	m^2/s	m2PerS	I
50	Thermal conductivity	Watt/metre Kelvin	W/(m K)	wPerMK	I
51	Heat capacity	Joule/Kelvin	J/K	jPerK	I
54	Angular velocity	radians per second	rad/s	radPerS	I
61	Apparent power	Volt Ampere (See also real power and reactive power.)	VA	vA	N
63	Reactive power	Volt Ampere reactive. The "reactive" or "imaginary" component of electrical power (VISinθ). (See also real power and apparent power). NOTE 3 Different meter designs use different methods to arrive at their results. Some meters may compute reactive power as an arithmetic value, while others compute the value vectorially. The data consumer should determine the method in use and the suitability of the measurement for the intended purpose.	VAr	vAr	N
66	Volt seconds	Volt seconds (Ws/A)	Vs	vS	N
67	Volts squared	Volt squared (W^2/A^2)	V^2	v2	N

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024
Single user licence

Code	Quantity	Unit name (and comments)	Displayable Symbol	Enumeration	Normative Status
68	Amp seconds	Amp seconds	As	aS	N
69	Amps squared	Amp squared	A^2	a2	N
70	Amps squared time	square Amp second	A^2s	a2S	I
71	Apparent energy	Volt Ampere hours	VAh	vAH	N
72	Real energy	Watt hours	Wh	wH	N
73	Reactive energy	Volt Ampere reactive hours	VArh	vArH	N
74	Magnetic flux	Volt per Hertz	V/Hz	vPerHz	I
75	Rate of change of frequency	Hertz per second	Hz/s	hzPerS	I
78	Moment of mass	kg m^2 (Second moment of mass, commonly called the moment of interia) NOTE 4 Users shall supply the "k" prefix to obtain "kg m^2".	gm^2	gM2	I
81	Ramp rate	Watt per second	W/s	wPerS	I
82	Volumetric flow rate	litre per second	L/s	lPerS	I
100	Quantity power	Q	Q	q	I
101	Quantity energy	Qh	Qh	qh	I
102	resistivity	Ohm metre, ρ (rho)	Ωm	ohmM	I
103	A/m	magnetic field strength, Ampere per metre	A/m	aPerM	I
104	volt-squared hour	Volt-squared-hours	V^2h	v2H	I
105	ampere-squared hour	Ampere-squared hour	A^2h	a2H	I
106	Ampere-hours	Ampere-hours	Ah	aH	I
107	Wh/m^3	energy per volume	Wh/m^3	wHPerM3	I
108	Timestamp	time and date per ISO 8601 format	timeStamp	timeStamp	N
115	Kh-Wh	active energy metering constant	Wh/rev	wHPerRev	N
116	Kh-VArh	reactive energy metering constant	VArh/rev	vArHPerRev	N
117	Kh-Vah	apparent energy metering constant	VAh/rev	vAHPerRev	N
125	Volumetric flow rate	cubic metre per hour	m^3/h	m3PerH	N
126	Volumetric flow rate	compensated cubic metre per hour	m^3 $_{(compensated)}/h$	m3CompensatedPerH	N

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
EESC WG Open Smart Grids
No reproduction or circulation
Oct 2024
Single user licence

Code	Quantity	Unit name (and comments)	Displayable Symbol	Enumeration	Normative Status
127	Volumetric flow rate	uncompensated cubic metre per hour	$m^3{}_{(uncompensated)}/h$	m3UncompensatedPerH	N
137	Volumetric flow rate	litre per hour	L/h	lPerH	N
139	Volumetric flow rate	litre (uncompensated) per hour	$L_{(uncompensated)}/h$	lUncompensatedPerH	N
138	Volumetric flow rate	litre (compensated) per hour	$L_{(compensated)}/h$	lCompensatedPerH	N
161	Quantity power	Q measured at 45º	Q_{45}	q45	I
162	Quantity power	Q measured at 60º	Q_{60}	q60	I
163	Quantity energy	Qh measured at 45º	$Q_{45}h$	q45H	I
164	Quantity energy	Qh measured at 60º	$Q_{60}h$	q60H	I
165	Specific energy	Joule / kg	J/kg	jPerKg	I
166	Volume	cubic metre, with the value uncompensated for weather effects.	$m^3{}_{(uncompensated)}$	m3Uncompensated	N
167	Volume	cubic metre, with the value compensated for weather effects.	$m^3{}_{(compensated)}$	m3Compensated	N
173	Wavenumber	reciprocal metre, $\sigma, \tilde{\nu}$ (1/m)	M^{-1}	m1	I
174	Specific volume	cubic metre per kilogram, v	m^3/kg	m3PerKg	I
175	Dynamic viscosity	Pascal second	Pa s	paS	I
176	Moment of force	Newton metre	N m	nM	I
177	Surface tension	Newton per metre	N/m	nPerM	I
178	Angular acceleration	radian per second squared	rad/s^2	radPerS2	I
179	Heat flux density, irradiance	Watt per square metre	W/m^2	wPerM2	I
180	Specific heat capacity, specific entropy	Joule per kilogram kelvin	J/(kg K)	jPerKgK	I
181	energy density	Joule per cubic metre	J/m^3	jPerM3	I
182	electric field strength	Volt per metre	V/m	vPerM	I
183	electric charge density	Coulomb per cubic metre	C/m^3	cPerM3	I
184	surface charge density	Coulomb per square metre	C/m^2	cPerM2	I

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG Smart Grids
No reproduction or circulation
Oct 2024

Code	Quantity	Unit name (and comments)	Displayable Symbol	Enumeration	Normative Status
185	permittivity	Farad per metre	F/m	fPerM	I
186	permeability	Henry per metre	H/m	hPerM	I
187	molar energy	Joule per mole	J/mol	jPerMol	I
188	molar entropy, molar heat capacity	Joule per mole kelvin	J/(mol K)	jPerMolK	I
189	exposure (x rays)	Coulomb per kilogram	C/kg	cPerKg	I
190	absorbed dose rate	Gray per second	Gy/s	gyPerS	I
191	radiant intensity	Watt per steradian	W/sr	wPerSr	I
192	radiance	Watt per square metre steradian	$W/(m^2 sr)$	wPerM2Sr	I
193	catalytic activity concentration	katal per cubic metre	kat/m^3	katPerM3	I
280	Volt-hour	Volt hours	Vh	vH	N
N = Normative I = Informative D = Deprecated since last edition					

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
EESC WG or Smart Grids
No reproduction or circulation
Oct 2024
Single user licence

Table C.23 – Non-SI Units of Measure accepted for use with the International System of Units

Reprinted with the permission of UCAIug.

Code	Quantity	Unit name (and comments)	Symbol	Enumeration	Normative Status
159	Time	minute = 60 s	min	min	I
160	Time	hour = 60 min = 3 600 s	h	hr	I
195	Time	day = 24 h = 86 400 s	d	d	I
9	Plane angle	degree	°	deg	N
196	Plane angle	minute	'	angleMin	I
197	Plane angle	second	"	angleSec	I
198	Area	hectare	ha	ha	I
134	Volume	litre = dm^3 = m^3/1 000	L	l	N
199	mass	"tonne" or "metric ton" (1 000 kg = 1 Mg)	t	tonne	I

N = Normative

I = Informative

D = Deprecated since last edition

NOTE The British spelling "litre" and American spelling "liter" are equivalent.

IECNORM.COM : Click to view the full PDF of IEC 61968 WG 9:2024
EESC WG on Smart Grids
Oct 2024
No reproduction or circulation
Single user licence

Table C.24 – Dimensionless and Concentration Units of Measure

Reprinted with the permission of UCAIug.

Code	Quantity	Unit name (and comments)	Symbol	Enumeration	Normative Status
0	N/A	none (not applicable)		none	N
65	Power factor	dimensionless $\cos\theta = \frac{P}{\lvert S\rvert}$ NOTE 1 This definition of power factor only holds for balanced systems. See the alternative definition under code 153. NOTE 2 Beware of differing sign conventions in use between the IEC and EEI. It is assumed that the data consumer understands the type of meter in use and the sign convention in use by the utility.	cosθ	cosTheta	N
79	Logrithmic ratio	Bel NOTE 3 Users shall combine this unit with the multiplier prefix "d" to form decibels (dB)	B	bel	I
109	State	status, where: "1" = "true", "live", "on", "high", "set"; "0" = "false", "dead", "off", "low", "cleared" NOTE 4 A Boolean value is preferred but other values may be supported	status	status	N
111	Amount of substance	Counter value	count	count	N
113	Logrithmic ratio of signal strength	Bel-mW, normalized to 1mW. NOTE to form "dBm" combine "Bm" with multiplier "d".	Bm	bm	N
114	Application Value	Encoded value	code	code	N
118	EndDeviceEvent	Value to be interpreted as a EndDeviceEventCode	meCode	meCode	N
143	Concentration	The ratio of the volume of a solute divided by the volume of the solution. NOTE 5 Users may need use a prefix such a "μ" to express a quantitye such as "μL/L"	L/L	lPerL	N
144	Concentration	The ratio of the mass of a solute divided by the mass of the solution. NOTE 6 Users may need use a prefix such a "μ" to express a quantity such as "μg/g"	g/g	gPerG	N
145	Concentration	The amount of substance concentration, (c), the amount of solvent in moles divided by the volume of solution in m^3.	mol/m^3	molPerM3	I
146	Concentration	Molar fraction (χ), the ratio of the molar amount of a solute divided by the molar amount of the solution.	mol/mol	molPerMol	I

EEI WG Single user licence
Member reproduction or email Grids
Oct 2024 circulation
IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024

Code	Quantity	Unit name (and comments)	Symbol	Enumeration	Normative Status
147	Concentration	Molality, the amount of solute in moles and the amount of solvent in kilograms.	mol/kg	molPerKg	I
148	Length	Ratio of length	m/m	mPerM	I
149	Time	Ratio of time NOTE 7 Users may need to supply a prefix such as "μ" to show rates such as "μs/s"	s/s	sPerS	N
150	Frequency	Rate of frequency change NOTE 8 Users may need to supply a prefix such as "m" to show rates such as "mHz/Hz"	Hz/Hz	hzPerHz	N
151	Voltage	Ratio of voltages NOTE 9 Users may need to supply a prefix such as "m" to show rates such as "mV/V"	V/V	vPerV	N
152	Current	Ratio of Amperages NOTE 10 Users may need to supply a prefix such as "m" to show rates such as "mA/A"	A/A	aPerA	I
153	Power factor	PF, the ratio of the active power to the apparent power. NOTE 11 The sign convention used for power factor will differ between IEC meters and EEI (ANSI) meters. It is assumed that the data consumers understand the type of meter being used and agree on the sign convention in use at any given utility.	W/VA	wPerVA	I
154	Amount of rotation	Revolutions	rev	rev	I
168	Signal Strength	Ratio of power NOTE 12 Users may need to supply a prefix such as "m" to show rates such as "mW/W"	W/W	wPerW	I
170	Refractive Index	n	*n*	refractiveIndexN	I
171	Relative Permeability	μ_r	μ_r	relativePermeabilityMur	I
172	Logarithmic ratio	Neper	Np	np	I
281	Humidity	Relative humidity espressed as the ratio of partial pressure of water vapor in the air-water mixture to the saturated vapor pressure of water at the prescribed temperature.	φ	realtiveHumidity	N
282	Sky Cover	Ratio of covered sky to total sky.	skyCover	skyCover	N

N = Normative

I = Informative

D = Deprecated since last edition

IECNORM.COM : Click to view the full PDF of IEC 61968 WG 9:2024
Single user licence
EEGC WG Smart Grids
No reproduction or circulation
Oct 2024

Table C.25 – Non-SI units whose values in SI units shall be obtained experimentally

Reprinted with the permission of UCAIug.

Code	Quantity	Unit name (and comments)	Symbol	Enumeration	Normative Status
200	energy	electronvolt (1 eV = 1,602 176 × 10^{-19} J)	eV	eV	I
201	mass	dalton (1 Da = 1,660 538 × 10^{-27} kg)	Da	da	I
202	mass	unified atomic mass unit (1 u = 1 Da)	u	u	I
203	length	astronomical unit (1ua = 1,495 978 × 10^{11} m)	ua	ua	I
204	speed	natural unit of speed (speed of light in a vacuum) = 299 792 458 m/s	c_0	c0	I
205	action	natural unit of action (reduced planck constant) = 1,054 571 × 10^{-34}J s	$\hbar$	nuH	I
206	mass	natural unit of mass (electron mass) = 9,109 382 × 10^{-31} kg	m_e	nuMe	I
207	time	natural unit of time	$\hbar/(m_e c_0^2)$	nuHPerNuMeC02	I
208	charge	atomic units of charge (elementary charge) = 1,602 176 × 10^{-19} C	e	auE	I
209	mass	atomic units of mass (electron mass) = 9,109 382 × 10^{-31} kg	m_e	auMe	I
210	action	atomic unit of action (reduced planck constant) = 1,054 571 × 10^{-34} J s	$\hbar$	auH	I
211	length	atomic unit of length, bohr (Bohr radius) = 0,529 177 × 10^{-10} m	a_0	auA0	I
212	energy	atomic unit of energy, hartree = 4,359 744	E_h	auEh	I
213	time	atomic unit of time	$\hbar/E_h$	auHPerAuEh	I

N = Normative

I = Informative

D = Deprecated since last edition

Single user licence
EEBus WG or Smart Grids
No reproduction or circulation
Oct 2024
IECNORM.COM : Click to view the full PDF of IEC 61968 WG9:2024

Table C.26 – Other Non-SI Units of Measure

Reprinted with the permission of UCAIug.

Code	Quantity	Unit name (and comments)	Symbol	Enumeration	Normative Status
76	Number of characters	characters	char	char	N
77	Data rate	characters per second	char/s	charPerSec	I
80	Monetary unit	Generic money NOTE Specific monetary units are identified the currency class	¤	money	I
119	Volume	cubic foot	ft^3	ft3	N
120	Volume	cubic foot compensated for weather	ft^3 (compensated)	ft3Compensated	N
121	Volume	cubic foot uncompensated for weather	ft^3 (uncompensated)	ft3Uncompensated	N
122	Volumetric flow rate	cubic foot per hour	ft^3/h	ft3PerH	N
123	Volumetric flow rate	compensated cubic feet per hour	ft^3 (compensated)/h	ft3CompensatedPerH	N
124	Volumetric flow rate	uncompensated cubic feet per hour	ft^3 (uncompensated)/h	ft3UncompensatedPerH	N
128	Volume	US gallon (1 gal = 231 in^3 = 128 fl oz.)	US gal	uSGal	N
129	Volumetric flow rate	US gallon per hour	US gal/h	uSGalPerH	N
130	Volume	Imperial gallon	imp gal	impGal	N
131	Volumetric flow rate	Imperial gallon per hour	imp gal/h	impGalPerH	N
132	Energy	British Thermal Unit	BTU	btu	N
133	Power	BTU per hour	BTU/h	btuPerH	N
141	Pressure	Pound per square inch, absolute	psiA	psiA	I
142	Pressure	Pound per square inch, gauge	psiG	psiG	I
156	Volume	Litre, with the value uncompensated for weather effects	$L_{(uncompensated)}$	lUncompensated	N
157	Volume	Litre, with the value compensated for weather effects	$L_{(compensated)}$	lCompensated	N
169	Energy	Therm	therm	therm	N
214	Pressure	bar (1 bar = 100 kPa)	bar	bar	I
215	Pressure	millimeter of mercury (1 mmHg ≈ 133,3 Pa)	mmHg	mmHg	I

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence
EESC WG or Smart Grids
No reproduction or circulation
Oct 2024

Code	Quantity	Unit name (and comments)	Symbol	Enumeration	Normative Status
216	Length	ångström (1Å = 10^{-10} m)	Å	angstrom	I
217	Length	nautical mile (1 M = 1852 m)	M	nmi	I
218	Area	barn (1 b = 100 fm^2 = 10^{-28} m^2)	b	barn	I
219	Speed	knot (1 kn = 1852/3600) m/s	kn	kn	I
220	Activity	curie (1 Ci = 3,7 × 10^{10} Bq)	Ci	ci	I
221	exposure	roentgen (1 R = 2,58 × 10^{-4} C/kg)	R	r	I
222	absorbed dose	rad (1 rd = 1 cGy)	rd	doseRad	I
223	dose equivalent	rem (1 rem = 10^{-2} Sv)	rem	rem	I
224	length	inch	in	in	I
225	length	foot (1 ft = 12 in)	ft	ft	I
226	length	rod (1 rod = 16,5 ft)	rod	rod	I
227	length	furlong (1 fur = 660 ft)	fur	fur	I
228	length	mile (1 statute mile = 8 fur = 80 chains = 320 rods = 5280 feet)	mi	mi	I
229	area	square foot (1 ft^2 = 144 in^2)	ft^2	ft2	I
230	area	square yard (1 yd^2 = 9 ft^2)	yd^2	yd2	I
231	area	square rod (1 rod^2 = 272,25 ft^2)	rod^2	rod2	I
232	area	acre (1 acre = 160 rd^2 = 43 560 ft^2)	acre	acre	I
233	area	square mile (1 mi^2 = 640 acres)	mi^2	mi2	I
234	area	section of land (1 mi^2 = 1 section of land)	section of land	sectionOfLand	I
235	area	township (1 township = 6 miles square)	township	township	I
237	Volume	cubic yard (1 yd^3 = 27 ft^3)	yd^3	yd3	I
238	length	link (1 li = 0,66 ft)	li	li	I
239	length	chain (1 ch = 100 links = 4 rods = 66 ft)	ch	ch	I
240	Volume	US liquid pint (1 pt = 28,875 in^3 = 128 fl dr)	US liq pt	uSLiqPt	I
241	Volume	US liquid quart (1 qt = 2 pt)	US liq qt	uSLiqQt	I
242	Volume	Apothecaries fluid dram	fl dr ap	flDrAp	I
243	Volume	Apothecaries fluid ounce (1 fl oz ap = 8 fl dr ap)	fl oz ap	flOzAp	I

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
IEC WG Oct 2024
No reproduction or circulation
Single user licence
Smart Grids

Code	Quantity	Unit name (and comments)	Symbol	Enumeration	Normative Status
244	Volume	US dry pint (1 pt = 67,2 in^3)	US dry pt	usDryPt	I
245	Volume	US dry quart (1 qt = 2 pints)	US dry qt	usDryQt	I
246	Volume	US peck (1 pk = 8 qt)	US pk	usPk	I
247	Volume	US bushel (1 bu = 4 pk)	US bu	usBu	I
248	Mass	grain (1 grain = 1/7000 avdp lb) NOTE The "grain" is the same in the avoirdupois, troy, and apothecaries units of mass.	gr	gr	I
249	Mass	Avoirdupois dram (1 Avdp dr = 27-11/32 gr) NOTE The abbreviation "dr" may be used if there is no chance of confusing the avoirdupois dram with the troy or apothecaries dram.	avdp dr	avdpDr	I
250	Mass	Avoirdupois ounce (1 Avdp oz = 16 Avdp dr) NOTE The abbreviation "oz" may be used if there is no chance of confusing the avoirdupois ounce with the troy or apothecaries ounce.	avdp oz	avdpOz	I
251	Mass	Avoirdupois pound (1 lb = 16 oz) NOTE Although the term "pound" is commonly used in many countries simply as "pound (lb)", the historical term "avoirdupois" is added to provide context and distinguish it in this setting from the troy and apothecaries systems of measure which use the same names. The abbreviation "lb" may be used instead of "avdp lb" if no confusion is possible with the pound named in these other systems.	avdp lb	avdpLb	I
252	Mass	Avoirdupois hundredweight (1 cwt = 100 lbs)	short cwt	shortCwt	I
253	Mass	Avoirdupois ton (1 short ton = 2000 lbs)	short ton	shortTon	I
254	Mass	Avoirdupois gross or long hundredweight (1 long cwt = 112 lbs)	long cwt	longCwt	I
255	Mass	Avoirdupois gross or long ton (1 long ton = 20 long cwt)	long ton	longTon	I
256	Mass	Troy pennyweight (1 dwt = 24 grains)	dwt	dwt	I
257	Mass	Troy ounce (1 oz t = 20 dwt)	oz t	ozT	I
258	Mass	Troy pound (1 lb t = 12 oz t)	lb t	lbT	I
259	Mass	Apothecaries scruple (1 s ap = 20 grains)	s ap	sAp	I

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
ESCC WG 9 Smart Grids
Reproduction Oct 2024
No circulation

Code	Quantity	Unit name (and comments)	Symbol	Enumeration	Normative Status
260	Mass	Apothecaries dram (1 dr ap = 3 s ap)	dr ap	drAp	I
261	Mass	Apothecaries ounce (1 oz ap = 8 dr ap)	oz ap	ozAp	I
262	Mass	Apothecaries pound (1 lp ap = 12 oz ap)	lb ap	lbAp	I
263	Fuel economy	mile per imperial gallon	mpg (Imp)	mpgImp	I
264	Fuel economy	mile per US gallon	mpg (US)	mpgUS	I
265	Fuel economy	mile per US gallon equivalent	MPGe (US)	mPGeUS	I
266	Fuel economy	litre per 100 km	l/(100 km)	lPer100km	I
267	Fuel economy	killowatt-hour per mile (NOTE users shall supply the "k" prefix to create "kWh/mi")	Wh/mi	wHPerMi	I
268	Fuel economy	kilowatt-hour per 100 mile (NOTE users shall supply the "k" prefix to create "kWh/(100 mi)")	Wh/(100 mi)	wHPer100Mi	I
279	Temperature	degrees Fahrenheit	°F	degF	I
284	Volume	Cubic inches	in^3	in3	I

N = Normative

I = Informative

D = Deprecated since last edition

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
EESG WG on Smart Grids
Single user licence
No reproduction or circulation
Oct 2024

Table C.27 – Non-SI Units Associated with the CGS and the CGS-Gaussian System of Units

Reprinted with the permission of UCAIug.

Code	Quantity	Unit name (and comments)	Symbol	Enumeration	Normative Status
269	Energy	erg (1 erg = 10^{-7} J)	erg	erg	I
270	Force	dyne (1 dyn = 10^{-5} N)	dyn	dyn	I
271	Dynamic viscosity	poise (1 P = 0,1 Pa s)	P	p	I
272	Kinematic viscosity	stokes (1 St = 1 cm^2/s)	St	st	I
273	Luminance	stilb (1 sb = 10^4 cd/m^2)	sb	sb	I
274	Illuminance	phot (1 ph = 10^4 lx)	ph	ph	I
275	Acceleration	gal (1 Gal = 10^{-2} m s^{-2}) NOTE This "Gal" is an abbreviation for "Galileo" not "gallon"	Gal	gal	I
276	Magnetic flux	Maxwell (1 Mx = 10^{-8} Wb)	Mx	mx	I
277	Magnetic flux density	Gauss (1 G = 10^{-4} T)	G	gauss	I
278	Magnetic field	Œrsted (1 Oe = ($10^3/4\pi$) A/m)	Oe	oe	I
N = Normative I = Informative D = Deprecated since last edition					

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
EESC WG of Smart Grids
No reproduction or circulation
Oct 2024
Single user licence

C.2.19 Attribute #18, currency

Currency codes are defined in ISO 4217. A handful of codes have been repeated in Table C.28 for reference. Additional currency codes may be drawn freely from ISO 4217.

Table C.28 – Currency units of measure (from ISO 4217)

Code	Displayable Symbol	Unit name	Normative Status
0		None	N
36	AUD	Australian Dollar	I
124	CAD	Canadian Dollar	I
156	CNY	Chinese Yuan Renminbi	I
208	DKK	Danish Crown	I
356	INR	India Rupee	I
392	JPY	Japanese Yen	I
578	NOK	Norwegian Crown	I
643	RUB	Russian Ruble	I
710	ZAR	South African Rand	I
752	SEK	Swedish Krona	I
756	CHF	Swiss Franc	I
826	GBP	British Pound	I
840	USD	US Dollar	I
978	EUR	Euro	I
N = Normative I = Informative D = Deprecated since last edition			

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEC SC WG 01 Smart Grids
No reproduction or circulation
Oct 2024

C.3 Using data element attributes to define the ReadingType name – Construction formula with example ReadingType codes

The "ReadingType" may be automatically generated by judiciously populating each of the attributes and presenting them in order side-by-side. It is recommended that attributes be as explicit as possible to identify a data element, but on the other hand, not become so explicit that it overspecifies the data element.

A ReadingType Name may be generated by presenting the numeric form of each attribute in side-by-side fashion separated by dots.

<ReadingType.Name.name>::= <macroPeriod> "." <aggregate> "."<measuringPeriod>"," <accumulation> "." <flowDirection> "." <commodity> "." <measurementKind> "." <interharmonicNumerator> "." <interharmonicDenominator> "." <argumentNumerator> "." <argumentDenominator> "." <tou> "." <cpp> "." <consumptionTier> "." <phases> "." <multiplier> "." <unit> "." <currency>

These fields can be converted to a regionalized pronounceable name by using the regional text form for each non-zero attribute, and presenting them in order, side-by-side, separated by spaces and other symbols as appropriate. For most applications, this usually provides more information than needs to be said (verbally) about the data. It is accepted practice in common speech to suppress descriptive adjectives which are mutually understood by the context of the communication. Table C.29 provides examples of such conversions into English. It can be noted that in the EBNF formula below, symbols such as "(", and ")" are introduced to improve readability. Spaces around the unit of measure are also omitted to improve readability.

<Name.description>::= [<macroPeriod> " "] [<aggregate> " "] [<measuringPeriod> " "] [<accumulation> " "] [<flowDirection> " "] [<commodity> " "] [<measurementKind> " "] [<interharmonicNumerator> " "] [<interharmonicDenominator> " "] [<argumentNumerator> " "] [<argumentDenominator> " "] [<tou> " "] [<cpp> " "] [<consumptionTier> " "] [<phases>" "] "(" [<multiplier>] [<unit>] [<currency>] ")"

While a good interface will eliminate ambiguity, and not publish "anonymous" data, a good interface will also not go to the other extreme and overspecify the data it publishes. The concept is similar to the practice of publishing an appropriate number of digits of resolution for a numerical value. One system may know (for example) the phase on which a voltage was measured and supply it as an attribute of the measurement. Another system might not know the phase with good authority and simply publish the voltage measured at a given meter. The ReadingTypeIDs used in a response may (therefore) differ slightly than the ReadingTypeIDs used in a request. The ReadingType codes used by a data publisher should be appropriate for the data supplied.

The examples listed in Table C.29 are by no means an exhaustive list of what can be constructed given the enumeration values listed above. After searching the examples (below), and searching the lists of enumerations (above), and a needed enumeration cannot be found, custom made enumerations may be made. Some of the fields (such a "numerator") are naturally an integer field. If the needed enumeration is merely an integer, then the user should supply the integer required. However, if the field is a list-type enumeration, some care should be used. Rather than merely using the next available number on the list, custom user enumerations should be created numbered 9 000 or above.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Withdrawn

Table C.29 – ReadingType Examples

ReadingType ID Code	Description	Normative Status
8.0.0.0.0.1.152.0.0.0.0.0.0.0.0.0.0.840	billingPeriod electricitySecondaryMetered billCarryover (USD)	N
8.0.0.0.0.1.150.0.0.0.0.0.0.0.0.0.0.840	billingPeriod electricitySecondaryMetered billLastPeriod (USD)	N
8.8.0.3.1.1.8.0.0.0.0.0.0.0.0.3.38.0	billingPeriod maximum cumulative forward electricitySecondaryMetered demand (kW)	N
8.8.53.6.1.1.8.0.0.0.0.0.0.0.0.3.38.0	billingPeriod maximum fixedBlock15Min indicating forward electricitySecondaryMetered demand (kW)	N
8.8.0.6.1.1.8.0.0.0.0.0.0.0.0.3.63.0	billingPeriod maximum indicating forward electricitySecondaryMetered demand (kVAr)	N
8.8.0.6.1.1.8.0.0.0.0.0.0.0.0.3.38.0	billingPeriod maximum indicating forward electricitySecondaryMetered demand (kW)	N
8.8.0.6.1.1.8.0.0.0.0.0.1.0.0.3.38.0	billingPeriod maximum indicating forward electricitySecondaryMetered demand touA (kW)	N
8.8.0.6.1.1.8.0.0.0.0.2.0.0.0.3.38.0	billingPeriod maximum indicating forward electricitySecondaryMetered demand touB (kW)	N
8.8.0.6.1.1.8.0.0.0.0.3.0.0.0.3.38.0	billingPeriod maximum indicating forward electricitySecondaryMetered demand touC (kW)	N
8.8.0.6.1.1.8.0.0.0.0.4.0.0.0.3.38.0	billingPeriod maximum indicating forward electricitySecondaryMetered demand touD (kW)	N
8.8.0.6.19.1.8.0.0.0.0.0.0.0.0.3.38.0	billingPeriod maximum indicating reverse electricitySecondaryMetered demand (kW)	N
8.8.71.6.1.1.8.0.0.0.0.0.0.0.0.3.38.0	billingPeriod maximum rollingBlock15MinIntvl5MinSubIntvl indicating forward electricitySecondaryMetered demand (kW)	N
8.8.101.6.1.1.8.0.0.720.1.0.0.0.0.3.38.0	billingPeriod maximum specifiedFixedBlock indicating forward electricitySecondaryMetered demand n720 (kW)	N
8.8.102.6.1.1.8.0.0.720.240.0.0.0.0.3.38.0	billingPeriod maximum specifiedRollingBlock indicating forward electricitySecondaryMetered demand n720/240 (kW)	N
8.0.0.9.1.1.12.0.0.0.0.1.0.0.0.3.72.0	billingPeriod summation forward electricitySecondaryMetered energy touA (kWh)	N
8.0.0.9.1.1.12.0.0.0.0.2.0.0.0.3.72.0	billingPeriod summation forward electricitySecondaryMetered energy touB (kWh)	N
8.0.0.9.1.1.12.0.0.0.0.3.0.0.0.3.72.0	billingPeriod summation forward electricitySecondaryMetered energy touC (kWh)	N
0.0.0.1.0.1.122.0.0.0.0.0.0.0.0.0.111.0	bulkQuantity electricitySecondaryMetered demandReset (count)	N
0.0.0.1.0.1.11.0.0.0.0.0.0.0.0.0.111.0	bulkQuantity electricitySecondaryMetered energization (count)	N
0.0.0.1.0.1.131.0.0.0.0.0.0.0.0.0.111.0	bulkQuantity electricitySecondaryMetered loadInterrupt (count)	N
0.0.0.1.0.1.141.0.0.0.0.0.0.0.0.0.111.0	bulkQuantity electricitySecondaryMetered relayActivation (count)	N
0.0.0.1.0.1.142.0.0.0.0.0.0.0.0.0.111.0	bulkQuantity electricitySecondaryMetered relayCycle (count)	N
0.0.0.1.1.1.12.0.0.0.0.0.0.0.0.3.73.0	bulkQuantity forward electricitySecondaryMetered energy (kVArh)	N
0.0.0.1.1.1.12.0.0.0.0.0.0.0.0.3.72.0	bulkQuantity forward electricitySecondaryMetered energy (kWh)	N
0.0.0.1.1.7.58.0.0.0.0.0.0.0.0.2.120.0	bulkQuantity forward naturalGas volume (hft³(compensated))	N
0.0.0.1.1.7.58.0.0.0.0.0.0.0.0.2.121.0	bulkQuantity forward naturalGas volume (hft³(uncompensated))	N
0.0.0.1.1.7.58.0.0.0.0.0.0.0.0.3.120.0	bulkQuantity forward naturalGas volume (kft³(compensated))	N

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Reproduction with permission of Operational Solutions for Electrical Grids

ReadingType ID Code	Description	Normative Status
0.0.0.1.1.7.58.0.0.0.0.0.0.0.3.121.0	bulkQuantity forward naturalGas volume (kft³(uncompensated))	N
0.0.0.1.4.1.12.0.0.0.0.0.0.0.3.73.0	bulkQuantity net electricitySecondaryMetered energy (kVArh)	N
0.0.0.1.4.1.12.0.0.0.0.0.0.0.3.72.0	bulkQuantity net electricitySecondaryMetered energy (kWh)	N
0.0.0.1.19.1.12.0.0.0.0.0.0.0.3.73.0	bulkQuantity reverse electricitySecondaryMetered energy (kVArh)	N
0.0.0.1.19.1.12.0.0.0.0.0.0.0.3.72.0	bulkQuantity reverse electricitySecondaryMetered energy (kWh)	N
0.0.0.1.20.1.12.0.0.0.0.0.0.0.3.73.0	bulkQuantity total electricitySecondaryMetered energy (kVArh)	N
0.0.0.1.20.1.12.0.0.0.0.0.0.0.3.73.0	bulkQuantity total electricitySecondaryMetered energy (kVArh)	N
0.0.0.1.20.1.12.0.0.0.0.0.0.0.3.72.0	bulkQuantity total electricitySecondaryMetered energy (kWh)	N
0.0.0.0.0.3.97.0.0.0.1.0.0.0.0.0.114.0	communication deviceAddressType2 n0 (code)	N
0.0.0.0.0.3.123.0.0.0.0.0.0.0.0.0.114.0	communication diagnostic (code)	N
0.0.0.0.0.3.104.0.0.0.1.0.0.0.0.0.114.0	communication groupAddressType2 n0 (code)	N
0.0.0.0.0.3.133.0.0.0.0.0.0.0.0.0.114.0	communication maintenance (code)	N
0.0.0.0.0.3.114.0.0.0.1.0.0.0.0.0.114.0	communication oneWayAddress n0 (code)	N
0.0.0.0.0.3.114.0.0.1.1.0.0.0.0.0.114.0	communication oneWayAddress n1 (code)	N
11.0.0.1.4.1.12.0.0.0.0.0.0.0.3.72.0	daily bulkQuantity net electricitySecondaryMetered energy (kWh)	N
11.0.0.4.0.1.126.0.0.0.0.0.0.0.0.111.0	daily deltaData electricitySecondaryMetered ieee1366MomentaryInterruption (count)	N
11.0.0.4.0.1.127.0.0.0.0.0.0.0.0.111.0	daily deltaData electricitySecondaryMetered ieee1366MomentaryInterruptionEvent (count)	N
11.0.0.4.0.1.128.0.0.0.0.0.0.0.0.111.0	daily deltaData electricitySecondaryMetered ieee1366SustainedInterruption (count)	N
11.0.0.4.0.1.128.0.0.0.0.0.0.0.0.27.0	daily deltaData electricitySecondaryMetered ieee1366SustainedInterruption (s)	N
11.8.0.6.1.1.8.0.0.0.0.0.0.0.3.38.0	daily maximum indicating forward electricitySecondaryMetered demand (kW)	N
11.0.0.9.4.1.12.0.0.0.0.1.0.0.0.3.72.0	daily summation net electricitySecondaryMetered energy touA (kWh)	N
0.0.0.4.1.1.12.0.0.0.0.0.0.0.3.73.0	deltaData forward electricitySecondaryMetered energy (kVArh)	N
0.0.0.4.1.1.12.0.0.0.0.0.0.0.3.72.0	deltaData forward electricitySecondaryMetered energy (kWh)	N
0.0.0.4.4.1.12.0.0.0.0.0.0.0.3.73.0	deltaData net electricitySecondaryMetered energy (kVArh)	N
0.0.0.4.4.1.12.0.0.0.0.0.0.0.3.72.0	deltaData net electricitySecondaryMetered energy (kWh)	N
0.0.0.4.19.1.12.0.0.0.0.0.0.0.3.73.0	deltaData reverse electricitySecondaryMetered energy (kVArh)	N
0.0.0.4.19.1.12.0.0.0.0.0.0.0.3.72.0	deltaData reverse electricitySecondaryMetered energy (kWh)	N
0.0.0.4.20.1.12.0.0.0.0.0.0.0.3.73.0	deltaData total electricitySecondaryMetered energy (kVArh)	N
0.0.0.4.20.1.12.0.0.0.0.0.0.0.3.72.0	deltaData total electricitySecondaryMetered energy (kWh)	N
0.0.0.0.0.1.5.0.0.0.0.0.0.0.0.111.0	electricitySecondaryMetered currentAngle (count)	N

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024

ReadingType ID Code	Description	Normative Status
0.0.0.0.0.1.6.0.0.0.0.0.0.0.0.0.0.111.0	electricitySecondaryMetered currentImbalance (count)	N
0.0.0.0.0.1.11.0.0.0.0.0.0.0.0.0.0.109.0	electricitySecondaryMetered energization (status)	N
0.0.0.0.0.1.13.0.0.0.0.0.0.0.0.0.0.109.0	electricitySecondaryMetered energizationLoadSide (status)	N
0.0.0.0.0.1.43.0.0.0.0.0.0.0.0.0.0.109.0	electricitySecondaryMetered switchPosition (status)	N
0.0.0.0.0.1.57.0.0.0.0.0.0.0.0.0.0.111.0	electricitySecondaryMetered voltageImbalance (count)	N
0.0.0.0.0.1.59.0.0.0.0.0.0.0.0.0.0.111.0	electricitySecondaryMetered zeroFlowDuration (count)	N
0.4.0.0.0.1.55.0.0.0.0.0.0.0.0.0.0.111.0	excess electricitySecondaryMetered voltageAngle (count)	N
0.0.2.4.1.1.12.0.0.0.0.0.0.0.0.3.72.0	fifteenMinute deltaData forward electricitySecondaryMetered energy (kWh)	N
0.0.0.6.0.1.4.0.0.0.0.0.0.0.0.5.0	indicating electricitySecondaryMetered current (A)	N
0.0.0.6.0.1.4.0.0.0.0.0.0.0.128.0.5.0	indicating electricitySecondaryMetered current phaseA (A)	N
0.0.0.6.0.1.4.0.0.0.0.0.0.0.64.0.5.0	indicating electricitySecondaryMetered current phaseB (A)	N
0.0.0.6.0.1.4.0.0.0.0.0.0.0.32.0.5.0	indicating electricitySecondaryMetered current phaseC (A)	N
0.0.0.6.0.1.5.0.0.0.0.0.0.0.136.0.9.0	indicating electricitySecondaryMetered currentAngle phaseAtoAv (deg)	N
0.0.0.6.0.1.5.0.0.0.0.0.0.0.72.0.9.0	indicating electricitySecondaryMetered currentAngle phaseBtoAv (deg)	N
0.0.0.6.0.1.5.0.0.0.0.0.0.0.40.0.9.0	indicating electricitySecondaryMetered currentAngle phaseCtoAv (deg)	N
0.0.0.6.0.1.15.0.0.0.0.0.0.0.0.33.0	indicating electricitySecondaryMetered frequency (Hz)	N
0.0.0.6.0.1.38.0.0.0.0.0.0.0.0.65.0	indicating electricitySecondaryMetered powerFactor (cosθ)	N
0.0.0.6.0.1.54.0.0.0.0.0.0.0.0.29.0	indicating electricitySecondaryMetered voltage (V)	N
0.0.0.6.0.1.54.0.0.0.0.0.0.0.128.0.29.0	indicating electricitySecondaryMetered voltage phaseA (V)	N
0.0.0.6.0.1.54.0.0.0.0.0.0.0.64.0.29.0	indicating electricitySecondaryMetered voltage phaseB (V)	N
0.0.0.6.0.1.54.0.0.0.0.0.0.0.32.0.29.0	indicating electricitySecondaryMetered voltage phaseC (V)	N
0.0.0.6.0.1.55.0.0.0.0.0.0.0.72.0.9.0	indicating electricitySecondaryMetered voltageAngle phaseBtoAv (deg)	N
0.0.0.6.0.1.55.0.0.0.0.0.0.0.40.0.9.0	indicating electricitySecondaryMetered voltageAngle phaseCtoAv (deg)	N
0.0.0.6.19.1.8.0.0.0.0.0.0.0.0.3.38.0	indicating reverse electricitySecondaryMetered demand (kW)	N
0.0.0.12.1.1.37.0.0.0.0.0.0.0.0.3.63.0	instantaneous forward electricitySecondaryMetered power (kVAr)	N
0.0.0.12.1.1.37.0.0.0.0.0.0.0.0.3.38.0	instantaneous forward electricitySecondaryMetered power (kW)	N
0.0.0.12.20.1.37.0.0.0.0.0.0.0.0.3.38.0	instantaneous total electricitySecondaryMetered power (kW)	N
0.0.0.13.0.1.140.0.0.0.0.0.0.0.0.0.108.0	latchingQuantity electricitySecondaryMetered pushbutton (timeStamp)	N
0.8.0.6.1.1.8.0.0.0.0.0.0.0.0.3.38.0	maximum indicating forward electricitySecondaryMetered demand (kW)	N
0.9.0.6.0.1.38.0.0.0.0.0.0.0.0.0.65.0	minimum indicating electricitySecondaryMetered powerFactor (cosθ)	N

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Electric Power Industry Reference Model for Smart Grids
Copyright International Electrotechnical Commission

ReadingType ID Code	Description	Normative Status
0.0.0.0.19.1.4.0.0.0.0.0.0.0.0.0.111.0	reverse electricitySecondaryMetered current (count)	N
22.0.0.1.1.1.12.0.0.0.0.0.0.0.0.3.73.0	seasonal bulkQuantity forward electricitySecondaryMetered energy (kVArh)	N
22.8.0.6.1.1.8.0.0.0.0.1.0.0.0.3.38.0	seasonal maximum indicating forward electricitySecondaryMetered demand touA (kW)	N
22.8.0.6.1.1.8.0.0.0.0.2.0.0.0.3.38.0	seasonal maximum indicating forward electricitySecondaryMetered demand touB (kW)	N
22.8.0.6.1.1.8.0.0.0.0.3.0.0.0.3.38.0	seasonal maximum indicating forward electricitySecondaryMetered demand touC (kW)	N
22.0.0.9.1.1.12.0.0.0.0.1.0.0.0.3.72.0	seasonal summation forward electricitySecondaryMetered energy touA (kWh)	N
22.0.0.9.1.1.12.0.0.0.0.2.0.0.0.3.72.0	seasonal summation forward electricitySecondaryMetered energy touB (kWh)	N
22.0.0.9.1.1.12.0.0.0.0.3.0.0.0.3.72.0	seasonal summation forward electricitySecondaryMetered energy touC (kWh)	N
0.0.7.4.1.1.12.0.0.0.0.0.0.0.0.3.73.0	sixtyMinute deltaData forward electricitySecondaryMetered energy (kVArh)	N
0.0.7.4.1.1.12.0.0.0.0.0.0.0.0.3.72.0	sixtyMinute deltaData forward electricitySecondaryMetered energy (kWh)	N
0.0.7.4.4.1.12.0.0.0.0.0.0.0.0.3.73.0	sixtyMinute deltaData net electricitySecondaryMetered energy (kVArh)	N
0.0.7.4.4.1.12.0.0.0.0.0.0.0.0.3.72.0	sixtyMinute deltaData net electricitySecondaryMetered energy (kWh)	N
0.0.7.4.19.1.12.0.0.0.0.0.0.0.0.3.73.0	sixtyMinute deltaData reverse electricitySecondaryMetered energy (kVArh)	N
0.0.7.4.19.1.12.0.0.0.0.0.0.0.0.3.72.0	sixtyMinute deltaData reverse electricitySecondaryMetered energy (kWh)	N
0.0.7.4.20.1.12.0.0.0.0.0.0.0.0.3.73.0	sixtyMinute deltaData total electricitySecondaryMetered energy (kVArh)	N
0.0.7.4.20.1.12.0.0.0.0.0.0.0.0.3.72.0	sixtyMinute deltaData total electricitySecondaryMetered energy (kWh)	N
0.0.100.4.1.1.12.0.0.30.1.0.0.0.0.3.72.0	specifiedInterval deltaData forward electricitySecondaryMetered energy n30 (kWh)	N
32.0.0.4.0.1.12.0.0.0.0.0.0.0.0.3.72.0	specifiedPeriod deltaData electricitySecondaryMetered energy (kWh)	N
32.0.0.0.0.1.151.0.0.0.0.0.0.0.0.0.840	specifiedPeriod electricitySecondaryMetered billToDate (USD)	N
0.0.0.9.20.1.12.0.0.0.0.1.0.0.0.3.72.0	summation total electricitySecondaryMetered energy touA (kWh)	N
0.0.0.9.20.1.12.0.0.0.0.2.0.0.0.3.72.0	summation total electricitySecondaryMetered energy touB (kWh)	N
0.0.0.9.20.1.12.0.0.0.0.3.0.0.0.3.72.0	summation total electricitySecondaryMetered energy touC (kWh)	N
0.0.0.9.20.1.12.0.0.0.0.4.0.0.0.3.72.0	summation total electricitySecondaryMetered energy touD (kWh)	N
N = Normative I = Informative D = Deprecated since last edition		

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Withdrawn
Licensed to Electric Power Research Institute
For Standards Development Organization Use Only

Annex D
(normative)

Quality code enumerations

D.1 General

Quality codes may be returned with a Reading.value to indicate that there is something remarkable about the data. This Annex D describes a profile of enumerations for quality codes to be used in this context.

The presence of a quality code is optional. A missing element implies that no assertion regarding the goodness of the data is being offered by the data producer. Some systems (such as a MS) may have a policy of "no news is good news" and only add quality codes when problems are found. This keeps the volume of data to a minimum. Other systems (such a MDM) will add value to the data by validating it. At this point quality codes may be added to the data to explicitly declare that the data is "valid" or has passed formal "validation" tests.

The quality code values defined by this Annex D are conveyed within a message using the ReadingQuality.quality element.

D.2 Identification of the system offering commentary on the data

Concievably, any piece of equipment which touches the data could introduce error, or offer remarks regarding the veracity of the data. For example, a meter might record interval data, and offer this data to the data collection system, but in doing so also indicate that something remarkable (such as a power outage or clock adjustment) occurred during some of the intervals. A meter data collection system might obtain readings from the field, but perform a sanity check on the values to find that some of them are unreasonable. A meter data management system, armed with a knowledge of the account history and usage patterns might scrutinize the data to find that certain values are suspect or possibly suggest that tampering may have occurred. All of these systems need an opportunity to comment on the data without (necessarily) changing it. When a system does change the data, this too can be noted in the quality codes.

D.3 Construction

The North American profile defines the ReadingQuality.quality code to be built from a three part field:

ReadingQuality.quality::= <System Identifier> "." <Categorization> "." <Index>

This creates a name with 3 fields. The mappings to CIM ReadingQualityType are defined by IEC 61968-11 as follows:

System Identifier = ReadingQualityType.systemId

Categorization = ReadingQualityType.category

Index = ReadingQualityType.subCategory

D.4 Quality code system identifier

The first of the three fields provides an identification of the system which has declared the issue with the data. This is described in Table D.1. Other systems, outside of an IEC 61968-9 subsystem, may also identify problems with data.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
ESMB Single user licence Smart Grids
No reproduction or circulation
Oct 2024

Table D.1 – System identifier

Reprinted with the permission of UCAIug.

System Identifier Code	Description	Normative Status
0	Not Applicable	N
1	End Device	N
2	Metering system (data collection) network	N
3	Meter Data Management System	N
4	Other system (not listed)	N
5	Externally specified (see accompany data)	I
I = Informative N = Normative D = Deprecated		

D.5 Quality code categorization

The second of the three fields in the quality code identifies a category for the issue. These are described individually in Table D.2.

Table D.2 – Example quality code categories

Reprinted with the permission of UCAIug.

Category	Description	Comment	Normative Status
0	Valid	Data valid	N
1	Diagnostics related	The equipment producing or handling the data has identified a diagnostics related issue which may have some effect on this value.	N
2	Power quality related issues at the data collection point	The equipment producing the data has identified power quality related issues which may have some effect on the veracity of the data.	N
3	Tamper / Revenue Protection related	A system identifies that the data is questionable due to tamper or revenue-protection related reasons.	N
4	Data collection related	A significant event or condition has occurred (which is not tamper related, power quality related, or diagnostics related) which may effect the veracity of the data.	N
5	Failed reasonability testing	Data at first blush appears to be invalid.	N
6	Failed validation testing	Data fails one or more validation rules.	N
7	Edited	Replaced or approved by a human.	N
8	Estimated	Replaced by a machine computed value based on analysis of historical data using the same type of measurement.	N
9	~~Oscillatory~~	This category appears to be covered by other categories in this standard.	D

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEEE SG WG on Smart Grids
No reproduction or circulation
© IEC 2024

Category	Description	Comment	Normative Status
10	Questionable	The veracity of the data is suspect for a reason other than those described by categories 1 to 6.	N
11	Derived	Value has been calculated (using logic or mathematical operations) based upon one or more readings from the meter or device to which the value is attributed and/or readings from meter(s) or device(s) other than the meter or device to which the value is attributed.	N
12	Projected	Forecasted value.	N
I = Informative N = Normative D = Deprecated			

D.6 Quality code index

Each category provides the context with which to understand a particular index.

Table D.3 elaborates on the "category 0" defined in Table D.2.

Table D.3 – Validity related codes

Reprinted with the permission of UCAIug.

Category	Index	Description	Definition	Normative Status
0	0	Data Valid	No data quality problems have been detected; however, the data has not been processed by a formal Validation, Editing, and Estimation (VEE) process.	N
0	1	Validated	Reading has successfully passed the validation portion of a formal Validation, Editing and Estimation (VEE) process and has not been subsequently edited or estimated.	N
I = Informative N = Normative D = Deprecated				

Table D.4 elaborates on the "category 1" defined in Table D.2.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESG WG on Smart Grids
No reproduction or circulation
© IEC 2024

Table D.4 – Diagnostics related codes

Reprinted with the permission of UCAIug.

Category	Index	Description	Comments	Normative Status
1	0	DiagnosticsFlag	One or more diagnostics have been generated from the originating equipment.	N
1	1	BatteryLow		N
1	3	SensorFailure		N
1	4	WatchdogFlag	A timeout of the watchdog timer or another failure of the watchdog function has occurred in the originating equipment.	N
1	5	ParityError	A parity error has been generated from the originating equipment.	N
1	6	CRCError	A cyclic redundancy check error has been generated from the originating equipment.	N
1	7	RAMChecksumError	A checksum error has been detected in the random access memory of the equipment.	N
1	8	ROMChecksumError	A checksum error has been detected in the read only memory of the equipment.	N
1	9	ClockError	A failure or abnormality has been detected with the clock in the equipment.	N
I = Informative N = Normative D = Deprecated NOTE Diagnostic related codes may produce corresponding EndDeviceEvents to be generated.				

Table D.5 elaborates on the "category 2" defined in Table D.2.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

Table D.5 – Power quality related codes

Reprinted with the permission of UCAIug.

Category	Index	Description	Comments	Normative Status
2	0	PowerQualityFlag	Look for related MeterEvent(s)	N
2	1	ExcessiveOutageCount	Power outage threshold count exceeded	N
2	2	PqCounter	Power quality threshould count exceeded	N
2	3	ServiceDisconnectSwitching	Service Disconnect operation during data collection interval	N
2	32	PowerFail	Power fail occurred during or at the start of this interval. ANSI C12.19. If power is out for the entire interval, the data value presented should be zero.	N
I = Informative N = Normative D = Deprecated				

Table D.6 elaborates on the "category 3" defined in Table D.2.

Table D.6 – Tamper / revenue protection related codes

Reprinted with the permission of UCAIug.

Category	Index	Description	Comments	Normative Status
3	0	RevenueProtection	Generic	N
3	1	CoverOpened	The meter reports that a sealed cover has been opened.	N
3	2	LogicalDisconnect	Value originates from a meter which (in theory) should have no flow or very minimal flow.	N
3	3	RevenueProtectionSuspect		N
3	4	ReverseRotation	Reverse flow of the measured commodity has been detected. This may indicate tampering at sites which have not been identified as being capable of customer-side generation.	N
3	5	StaticDataFlag	The meter shows very little (if any) historical usage.	N
I = Informative N = Normative D = Deprecated				

Table D.7 elaborates on the "category 4" defined in Table D.2.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
EESC WG on Smart Grids
Single user licence
No reproduction or circulation
Oct 2024

Table D.7 – Data collection related codes

Reprinted with the permission of UCAIug.

Category	Index	Description	Comments	Normative Status
4	0	AlarmFlag	Generic alarm	N
4	1	OverflowConditionDetected	A numeric overflow condition for a reading value or pulse counter was detected.	N
4	2	PartialInterval	Partial (short) interval due to clock change, power outage, or some similar event.	N
4	3	LongInterval	Long interval recorded due to a clock change or some similar event.	N
4	4	SkippedInterval	Skipped interval by the meter due to a clock change or similar event.	N
4	5	TestData	Data value was obtained while the equipment was in test mode.	N
4	6	ConfigurationChanged	A configuration change has occurred that may affect the reading value or its interpretation.	N
4	7	NotRecording	Load profile recording stopped	N
4	8	ResetOccurred	A reset has occurred that may affect the reading value or its interpretation.	N
4	9	ClockChanged	A change in the clock time has occurred.	N
4	10	LoadControlOccurred	Data value was obtained at a time when load control was in effect.	N
4	16	DstInEffect	Daylight saving time in effect during or at start of this interval	N
4	64	ClockSetForward	Clock set forward during or at the start of this interval. The interval may be short.	N
4	128	ClockSetBackward	Clock set backward during or at the start of this interval. The interval may be long.	N
4	129	FailedProbeAttempt	A failure occurred that prevented the reading from being obtained through a manual probe.	N
4	130	CustomerRead	The reading value was provided by a customer.	N
4	131	ManualRead	The reading value was obtained by a utility employee performing a manual read.	N
4	259	DstChangeOccurred	Data has been adversely affected by a change in Daylight Saving Time. Timestamps and/or data values may be incorrect. NOTE Compared to the ANSI C12.19 approach in which the DST flag is set for the entire Summer, this flag is only set for the affected data when the DST change occurs in the Spring and Fall.	N
I = Informative N = Normative D = Deprecated				

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence for IEC TC57 WG 9 only
No reproduction or circulation
Official use only

Table D.8 elaborates on the "category 5" defined in Table D.2.

Table D.8 – Failed reasonability testing related codes

Reprinted with the permission of UCAIug.

Category	Index	Description	Comments	Normative Status
5	256	DataOutsideExpectedRange	Presented data was identified as "invalid" by the originating system.	N
5	257	ErrorCode	Data was identified as "invalid" by the originating system and replaced with a special coded value to indicate an error.	N
5	258	Suspect	Data should be scrutinized and considered suspect	N
5	259	KnownMissingRead	NOTE 1 The "value" element should be empty when the quality code indicates that it is (obviously) missing. NOTE 2 If a reason is known, this can be supplied in the MeterReadings.Reason element.	N
I = Informative N = Normative D = Deprecated				

Table D.9 elaborates on the "category 6" defined in Table D.2.

Table D.9 – Failed validation testing related codes

Reprinted with the permission of UCAIug.

Category	Index	Enumeration	Comments	Normative Status
6	0	Failed validation – Generic	The reading failed one or more unspecified validation checks. This is a generic code that can be used if a more specific code is not available in this table.	N
6	1	Failed validation – ZeroUsageOn ActiveMeter	The reading failed validation due to zero usage on an active meter.	N
6	2	Failed validation – UsageOn InactiveMeter	The reading failed validation due to non-zero usage on an inactive meter.	N
6	3	Failed validation – UsageAbove Maximum	The reading failed validation because it represents usage greater than an allowed absolute maximum.	N
6	4	Failed validation – UsageBelow Minimum	The reading failed validation because it represents usage less than a required absolute minimum.	N
6	5	Failed validation – UsageAbove MaximumPct	The reading failed validation because it represents usage greater than an allowed maximum percentage.	N
6	6	Failed validation – UsageBelow MinimumPct	The reading failed validation because it represents usage less than a required minimum percentage.	N
6	9	Failed Validation – TOU SumCheck Failure	The reading failed validation because the sum of interval values failed a comparison with the corresponding difference in register readings.	N

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESG WG on Smart Grid
No reproduction or circulation
Oct 2024

Category	Index	Enumeration	Comments	Normative Status
6	y	Failed Validation Rule Y	The reading failed one or more defined validation checks. "y" is to be replaced by a positive integer indicating which validation rule was failed. It is recommended that values for y begin at 1001 to allow for the build-out over time of the list of normative enumerations in the IEC standard up to 1000. There is no limit to how large a number can be used for "y"; however; the parties exchanging this code shall have a common understanding of what each validation rule #y means.	I
I = Informative N = Normative D = Deprecated				

Individual deployments will subscribe to particular sets of formal validation rules. While there is no one worldwide standard regarding validation rules, this standard provides a placeholder where the first rule for a given deployment can be defined as "rule #1," the second rule "rule #2," and so on as necessary until all of the rules are numbered. Each system then, operating at a given utility under a given set of rules, will all be subject to the same set of rules which have been formally listed and numbered.

Table D.10 describes the "category 7" defined in Table D.2.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

Table D.10 – Edit related codes

Reprinted with the permission of UCAIug.

Category	Index	Description	Comments	Normative Status
7	0	Manually Edited – Generic	The reading value was edited by a person using an unspecified manual estimation method. This is a generic code that can be used if a more specific code is not available in this table.	N
7	1	Manually Added	A reading value was added by a person.	N
7	3	Manually Rejected	A value was proposed by the system or failed some level of quality checking. The value was reviewed and rejected by a human user	N
7	Y	Manually Edited – Method Y	The reading value was edited by a person using a defined manual estimation method. "y" is to be replaced by a positive integer indicating which manual estimation method was used. It is recommended that values for y begin at 1001 to allow for the build-out over time of the list of normative enumerations in the IEC standard up to 1 000. There is no limit to how large a number can be used for "y"; however; the parties exchanging this code shall have a common understanding of what each manual editing method #y means.	I
I = Informative N = Normative D = Deprecated				

The concept of "edited" means that a human was involved in creating the value. It may be hand-keyed into the system. It may be suggested by the system using one of many approaches, but ultimately approved by a human. Values that are computer generated and never approved by a human belong to the "estimated" category. Values that are originally from a meter, identified as suspect, yet nonetheless accepted for use by a human fall into the "questionable" category.

Different systems may find different ways to assist the user in creating a new value. The numbering scheme allows the various ways to be listed and formally identified for a given deployment.

Table D.11 describes the "category 8" defined in Table D.2.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEC SC WG on CIM Users
Not for production circulation
Oct 2024

Table D.11 – Estimation related codes

Reprinted with the permission of UCAIug.

Category	Index	Enumeration	Comments	Normative Status
8	0	Estimated – Generic	The reading value was machine-estimated by a computing algorithm using an unspecified estimation method. This is a generic code that can be used if a more specific code is not available in this table.	N
8	Y	Machine Estimated – Method Y	The reading value was machine-estimated by a computing algorithm using a defined estimation method. "y" is to be replaced by a positive integer indicating which estimation method was used. It is recommended that values for y begin at 1001 to allow for the build-out over time of the list of normative enumerations in the IEC standard up to 1000. There is no limit to how large a number can be used for "y"; however; the parties exchanging this code shall have a common understanding of what each estimation method #y means.	I

I = Informative

N = Normative

D = Deprecated

There are a number of ways in which estimates may be generated. For example, an estimate might be based on a combination of historical usage, trend analysis, and weather patterns. Another approach would be to create a value for one meter by leveraging a measurement of equivalent information from a different different meter. (For example there may be multiple feeder voltage measurement sources available. When the preferred source fails, a different source could be used with an equivalent outcome.) Some of the techniques used may be proprietary. Other estimation techniques may be a matter of public record and may be legally required by certain regulators in certain locations. The numbering scheme "approach #1," "approach #2," etc. provides a placeholder in which the approaches used may be formally listed at a given deployment and identified as a specific technique.

Table D.12 describes the "category 10" defined in Table D.2.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence on SMART GRIDS WG
No reproduction or circulation
© IEC 2024

Table D.12 – Questionable related codes

Reprinted with the permission of UCAIug.

Category	Index	Description	Comments	Normative Status
10	0	Indeterminate	Quality is unknown or cannot be determined. NOTE 1 This is similar to the case in which no quality codes are supplied at all, but in this case other codes may be present which cast doubt on the veracity of the data, or a situation may have arisen which prevents any kind of analysis from being performed on the data or the equipment which supplied the data. NOTE 2 When used in response to a request for Power (Energization) Status or Switch Position, an "Indeterminate" quality means that the energization state or switch position is unknown or cannot be determined. When used in response to a request for other reading types, "Indeterminate" means that the quality of the value supplied is explicitly unknown.	N
10	1	Manually accepted	Indicates that a value failed some level of quality checking, but the failure was overridden by a human user.	N
I = Informative N = Normative D = Deprecated				

Table D.13 describes the "category 11" defined in Table D.2.

Single user licence only, copying and networking prohibited.
IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
No reproduction or circulation
Oct 2024

Table D.13 – Derived related codes

Reprinted with the permission of UCAIug.

Category	Index	Enumeration	Comments	Normative Status
11	0	Derived – Deterministic	"Derived" indicates that the value has been calculated (using logic or mathematical operations) based upon one or more readings from the meter or device to which the value is attributed and/or readings from meter(s) or device(s) other than the meter or device to which the value is attributed. "Deterministic" (as differentiated from "Inferred" – see next entry) is used when a significant degree of uncertainty in the resulting value does not exist. For example, a quality of "x.11.0" or "Derived – Deterministic" can be used when a value for a virtual meter is computed as the sum of the values from two or more other meters.	N
11	1	Derived – Inferred	"Derived" indicates that the value has been calculated (using logic or mathematical operations) based upon one or more readings from the meter or device to which the value is attributed and/or readings from meter(s) or device(s) other than the meter or device to which the value is attributed. "Inferred" (as differentiated from "Deterministic" – see previous entry) is used when a significant degree of uncertainty in the resulting value may exist. When used in response to Power (Energization) Status Checks, "x.11.1" or "Derived – Inferred" is synonymous with "Inferred". For example, a UsagePoint may be determined to have a value of "De-energized" and a Reading Quality of "Derived-Inferred" if it is being inferred as de-energized because one or more other UsagePoints on the same distribution transformer are confirmed to be "De-Energized". In this case, there is a more than a negligible probability that the inference is incorrect.	N
I = Informative N = Normative D = Deprecated				

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG 01 Standards
No reproduction or circulation

Table D.14 describes the "category 12" defined in Table D.2.

Table D.14 – Projected related codes

Reprinted with the permission of UCAIug.

Category	Index	Enumeration	Comments	Normative Status
12	0	Projected – Generic	The reading value was projected (forecast) by a computing algorithm using an unspecified projection (forecast) method. This is a generic code that can be used if a more specific code is not available in this table.	N
12	Y	Projected – Method Y	The reading value was projected (forecast) by a computing algorithm using a defined projection (forecast) method. "y" is to be replaced by a positive integer indicating which projection (forecast) method was used. It is recommended that values for y begin at 1001 to allow for the build-out over time of the list of normative enumerations in the IEC standard up to 1000. There is no limit to how large a number can be used for "y"; however, the parties exchanging this code shall have a common understanding of what each projection method #y means.	I
I = Informative N = Normative D = Deprecated				

Much like in the way "estimated" creates a computer generated value based on a historical view of the data for an event that has occurred in the past, "projected" creates a computer generated value which is forecast into the future. The numbering scheme "approach #1," "approach #2," etc. provides a placeholder in which the approaches used may be formally listed at a given deployment and identified as a specific technique.

D.7 Example quality codes

Some of the codes described in Table D.15 have been found to be in use in systems since the publication of IEC 61968-9:2009.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence on Smart Grid Standards
FESCVG on Smart Grid Standards
No reproduction or circulation
Oct 2024

Table D.15 – Example Quality Codes

Reprinted with the permission of UCAIug.

Quality Code	Origin (From Table D.1)		Category (From Table D.2)		Index (From Tables D.3 to D.15)		Normative Status
Not provided	Not provided		Not provided		AssumedValid	none	N
1.0.0	End Device	1	0	Validity	DataValid	0	N
1.1.4	End Device	1	1	Diag	WatchdogFlag	4	N
1.4.1	End Device	1	4	Data Collection	OverflowConditionDetected	1	N
1.4.16	End Device	1	4	Data Collection	DstInEffect	16	N
1.4.2	End Device	1	4	Data Collection	Partial (short) Interval	2	N
1.4.3	End Device	1	4	Data Collection	LongInterval	3	N
1.4.4	End Device	1	4	Data Collection	SkippedInterval	4	N
1.4.5	End Device	1	4	Data Collection	TestData	5	N
1.5.257	End Device	1	5	Reasonablity	ErrorCode	257	N
2.0.0	Ms Network	2	0	Validity	DataValid	0	N
2.3.4	Ms Network	2	3	Tamper	ReverseRotation	4	N
2.3.5	Ms Network	2	3	Tamper	StaticDataFlag	5	N
2.4.259	Ms Network	2	4	Data Collection	DstChangeOccurred	259	N
2.5.256	Ms Network	2	5	Reasonablity	DataOutsideExpectedRange	256	N
2.5.257	Ms Network	2	5	Reasonablity	ErrorCode	257	N
3.0.0	MDM	3	0	Validity	DataValid	0	N
3.10.0	MDM	3	10	Questionable	Indeterminate	0	N
3.10.1	MDM	3	7	Edited	Manually accepted	1	N
3.11.0	MDM	3	11	Derived	Derived – generic	0	N
3.11.1	MDM	3	11	Derived	Derived – inferred	1	N
3.3.3	MDM	3	3	Tamper	RevenueProtectionSuspect	3	N
3.3.5	MDM	3	3	Tamper	StaticDataFlag	5	N
3.5.259	MDM	3	5	Reasonablity	Known missing read	259	N
3.6.0	MDM	3	6	Validation	Failed validation – Generic	0	N
3.7.0	MDM	3	7	Edited	Manually edited – Generic	0	N
3.8.0	MDM	3	8	Estimated	Estimated – Generic	0	N

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence FESG WG on Smart Grids No reproduction or circulation Oct 2024

Annex E
(normative)

EndDeviceEventType enumerations

E.1 General

Metering systems not only collect readings from meters, but also report events. This Annex E describes recommended codes to be used for properly identifying IEC 61968 events.

Codes for EndDeviceEventTypes are categorized in a manner that divides the enumerated code into four parts:

```
EndDeviceEventType:=
<EndDeviceType>.<EndDeviceDomain>.<EndDeviceSubdomain>.<EndDeviceEventOrAction>

where
      <EndDeviceType>           = a numeric value from the EndDeviceType
                                  enumeration (see EndDeviceType section)
      <EndDeviceDomain>         = a numeric value from the EndDeviceDomain
                                  enumeration (see EndDeviceDomain section)
      <EndDeviceSubdomain>      = a numeric value from the EndDeviceSubdomain
                                  enumeration (see EndDeviceSubdomain section)
      <EndDeviceEventOrAction>  = a numeric value from the EndDeviceEventOrAction
                                  enumeration (see EndDeviceEventOrAction section)
```

E.2 Alarm conditions

E.2.1 General

While the EndDeviceEventType defines the event that has occurred, there is also a need to specify the severity of an event (Alarm, Advisory, Normal, etc.). These values should be set in the EndDeviceEvent.severity field. This allows each system implementing CIM events to classify the severity of its events specific to its intentions, rather than being forced to classify it according to something rigidly defined by IEC 61968-9.

E.2.2 Clearing alarm conditions and communicating state/condition changes

There are scenarios where the state change for a particular setting shall be communicated to an external system. In the small number of cases that we have uncovered, we have simply added a concise EndDeviceEventOrAction to describe it. The events shown in Table E.1 support this method of communication.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EPRI WG on Smart Grids
No reproduction or distribution
Oct 2024

Table E.1 – Example pairings between meter events and EndDeviceEvent enumerated mnemonics

Event or Control Description	EndDeviceEvent Category (using enum mnemonics)
Diagnostic 8 Condition High Neutral Current Cleared	*.Power.NeutralCurrent. MaxLimitReachedCleared
Leading kvarh cleared Caution 040000 Leading kvarh Condition Cleared	*.Power.PowerFactor.OutofRangeCleared
High Distortion Cleared Diagnostic 5 High Distortion Cleared	*.Power.PowerQuality.HighDistortionCleared
Voltage Imbalance Cleared Diagnostic 2 Voltage Imbalance Cleared	*.Power.Voltage.ImbalanceCleared
Phase alert cleared, Condition Phase Angle Alert Cleared	*.Power.PhaseAngle.OutofRangeCleared
Cross phase cleared Diagnostic 1 Condition Polarity, Cross Phase, Rv Energy Flow Cleared	*.Power.Phase.CrossPhaseCleared
Inactive phase cleared Diagnostic 3 Inactive Phase Current Condition Cleared	*.Power.Phase.InactiveCleared
Voltage Swell Started (Phase A)	*.Power.PhaseAVoltage.SwellStarted
Voltage Swell Started (Phase B)	*.Power.PhaseBVoltage.SwellStarted
Voltage Swell Started (Phase C)	*.Power.PhaseCVoltage.SwellStarted
Voltage swell cleared Caution 004000 Demand Overload Condition Cleared	*.Power. Voltage.SwellStopped
Voltage Swell Stopped (Phase A); Diagnostic 7 Condition Over Voltage, Phase A Cleared	*.Power.PhaseAVoltage.SwellStopped
Voltage Swell Stopped (Phase B)	*.Power.PhaseBVoltage.SwellStopped
Voltage Swell Stopped (Phase C)	*.Power.PhaseCVoltage.SwellStopped
Voltage Sag Started (Phase A)	*.Power.PhaseAVoltage.SagStarted
Voltage Sag Started (Phase B)	*.Power.PhaseBVoltage.SagStarted
Voltage Sag Started (Phase C)	*.Power.PhaseCVoltage.SagStarted
Voltage sag cleared Caution 000400 Under Voltage Condition Cleared	*.Power.Voltage.SagStopped
Voltage Sag Stopped (Phase A);Diagnostic 6 Condition UnderVoltage, Phase A Cleared	*.Power.PhaseAVoltage.SagStopped
Voltage Sag Stopped (Phase B)	*.Power.PhaseBVoltage.SagStopped
Voltage Sag Stopped (Phase C)	*.Power.PhaseCVoltage.SagStopped

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEEE WG on Smart Grids
Non-reproduction or circulation
Oct 2024

E.3 Event data

Certain events require or contain more details than just a description and a category. For example, specification of a particular channel number, alarm number, relay number, port number, formula number, version number, etc. These should be set on the EndDeviceEvent.EndDeviceEventDetails name/value pair element.

However, this construct should not be overused or misused. The intention for this construct is only to capture some ancilliary data related to the event. It should not be used in place of sending a full set of EndDeviceEvent information, for example (see Figure E.1).

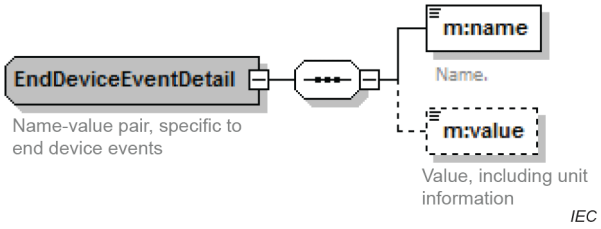


Figure E.1 reproduced with the permission of UCAIug.

Figure E.1 – Event data

Some examples of its use:

A [PAN Pairing Completed] event may also provide the data given in Figure E.2.

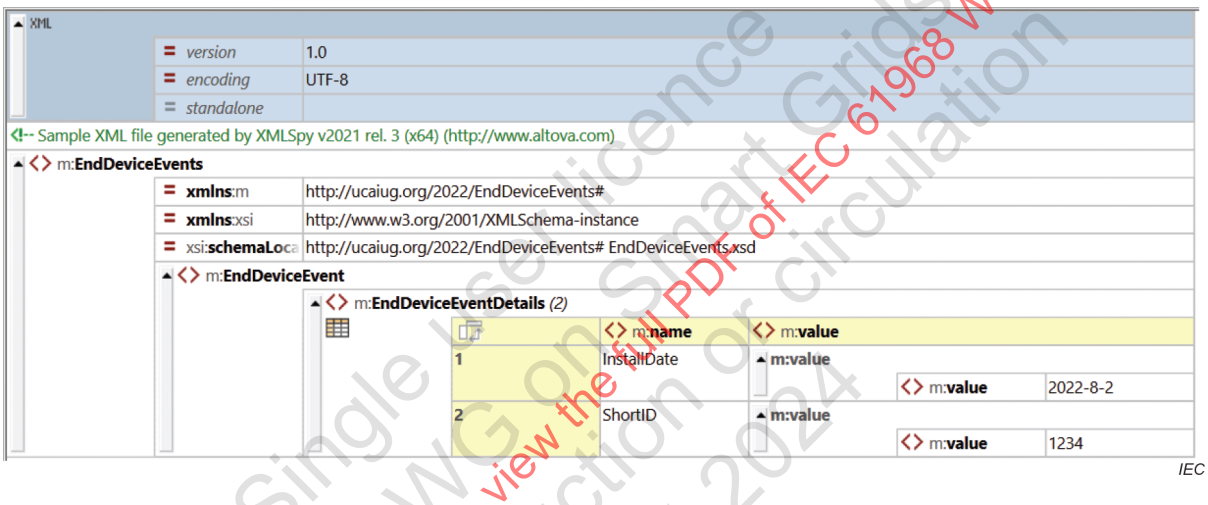


Figure E.2 reproduced with the permission of UCAIug.

Figure E.2 – Multiple EndDeviceEventDetails Example 1

A [Firmware Downloaded] event may also provide the data given in Figure E.3.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single User Licence
IEC SC WG on Smart Grids
No reproduction or circulation
Oct 2024

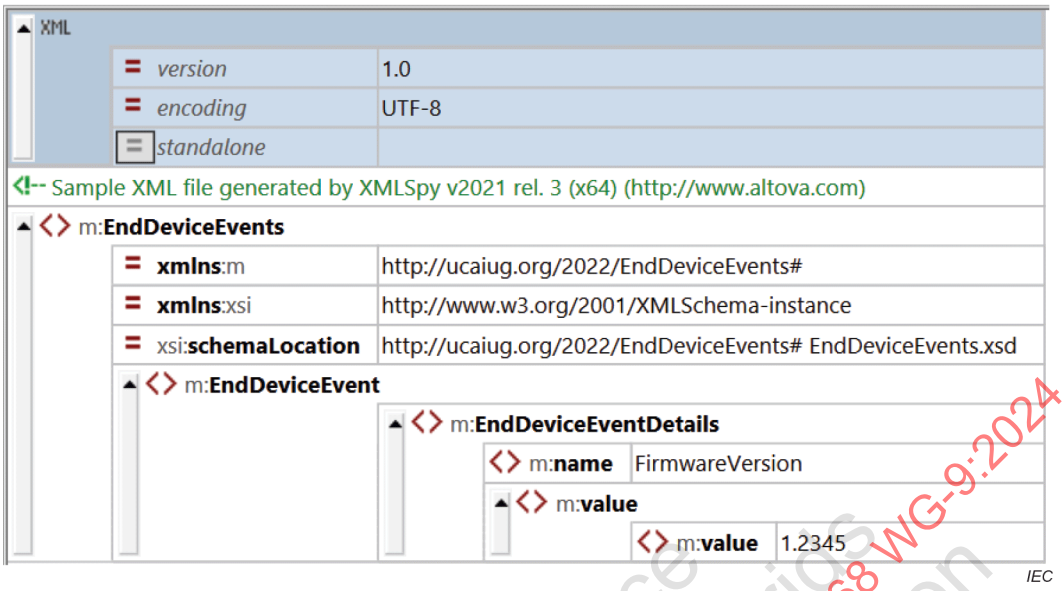


Figure E.3 reproduced with the permission of UCAIug.

Figure E.3 – EndDeviceEventDetails example 2

A [Voltage Exception] event may also provide the data described in Figure E.4.

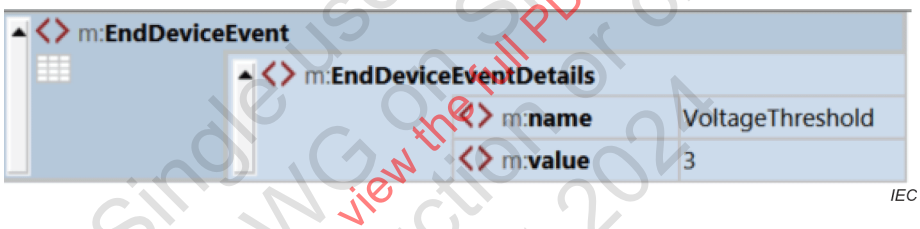


Figure E.4 reproduced with the permission of UCAIug.

Figure E.4 – EndDeviceEvent Example 3

E.4 The 4-Part ID: EndDeviceEventType

Clauses E.5 to E.8 describe each part of the EndDeviceEventType enumeration:

- <EndDeviceType>
- <EndDeviceDomain>
- <EndDeviceSubdomain>
- <EndDeviceEventOrAction>

E.5 EndDeviceType

At the highest level, it is helpful to identify the type of device from which the event was created. Each of these should represent a physical device, although a value of zero (0) can be used in special cases. EndDeviceType codes are enumerated and described in Table E.2.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEEE SCC WG on Smart Grids
No reproduction or circulation
Oct 2024

Table E.2 – EndDeviceType codes

Reprinted with the permission of UCAIug.

EndDeviceType Enumeration		
mnemonic	**Value**	**Description**
n/a	0	Not applicable. Use when a device type is not known.
Cabinet	30	A Smart Cabinet Device
Collector	10	A device that acts as a central point of communication between HES and devices located on premises.
ComDevice	26	A communication device
DAPDevice	1	A data aggregation point device
DERDevice	2	A demand response device
DSPDevice	6	A digital signal processing device
ElectricMeter	3	A device located on premises to measure electricity usage.
ElectricVehicle	58	(or Plug-in Electric Vehicle, PEV) a vehicle that can be plugged into the grid.
EnergyRouter	23	An energy router, analogous to the familiar data and communications router, automatically detects demand for power and delivers processed electricity in the required form (AC or DC) at the correct voltage and frequency on an electrical power system.
Feeder	13	Feeders carry three-phase power, and tend to follow the major streets near the substation.
GasMeter	4	A device located on premises to measure gas usage.
Gateway	5	A gateway device.
Generator	14	Typically a spinning electrical generator. Something has to spin the generator – it might be a water wheel in a hydroelectric dam, a large diesel engine or a gas turbine.
InPremisesDisplay(IPD/IHD)	15	The In-Premises (In-Home) Display (IPD/IHD) allows utility customers to track their energy usage in chart or graph form based upon kwH used.
LoadControlDevice	16	A device used to implement "deferrable" services – commonly referred to as "off-peak".
Luminaire	31	A lamp (fixture and bulb) that provides light to the surrounding area
NetworkRouter	11	A router distributes Digital computer information that is contained within a data packet on a network.
PANDevice	12	A "premises area network" device that is not specifically described in further detail.
PANGateway	7	A PAN gateway connects an external communications network to energy management devices within the premises.
PANMeter	17	A "premises area network" device whose function is to measure (e.g. electricity usage).
PrepaymentTerminal	18	A device that enables the customer to make advance payment before energy can be used.
ProgCtlThermostat(PCT)	19	A thermostat device whose settings can be controlled via an API (ie. without human intervention).
RangeExtender	20	Wireless range-extenders or wireless repeaters can extend the range of an existing wireless network.
Regulator	21	A voltage regulator is an electrical regulator designed to automatically maintain a constant voltage level.
Sensor	32	A defines that measures a physical condition and reports an alarm or measurement as a result
Substation	22	An electrical substation is a subsidiary station of an electricity generation, transmission and distribution system where voltage is transformed from high to low or the reverse using transformers.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single User License Only
EESC Working Group
No reproduction or circulation
Draft 2024

EndDeviceType Enumeration		
mnemonic	**Value**	**Description**
Transformer	8	A device that converts a generator's voltage (which is at the thousands of volts level) up to extremely high voltages for long-distance transmission on the transmission grid.
WasteWaterMeter	25	A device that measures waste water usage.
WaterMeter	24	A device that measures water usage.

E.6 EndDeviceDomain

After the type of device is known, the event should be classified by an EndDeviceDomain code. This code provides an indication as to the high-level nature of the event. Careful consideration shall given to the EndDeviceDomain in which an event is classified By properly classifying events by a small set of EndDeviceDomain codes, a system can more easily run reports based on the types of events that have occurred or been received. EndDeviceDomain codes are enumerated and described in Table E.3.

Table E.3 – EndDeviceDomain Codes

Reprinted with the permission of UCAIug.

EndDeviceDomain Enumeration		
mnemonic	**Value**	**Description**
n/a	0	Not applicable. Use when a domain is not needed. This should rarely be used.
AssociatedDevice	39	A device (for example, a relay) that can be associated with an end device.
Battery	2	Any events or controls related to a device battery.
Billing	20	Events or controls related to cost of energy (Including Pricing, Tariff, TOU, etc.).
Brighten	75	Events or controls related to a dim / brighten function
Cartridge	3	Events or controls related to type solid-state pulse recorders for metering
Channel 1	50	Events or controls related to channel one
Channel 2	51	Events or controls related to channel two
Channel 3	52	Events or controls related to channel three
Channel 4	53	Events or controls related to channel four
Channel 5	54	Events or controls related to channel five
Channel 6	55	Events or controls related to channel six
Channel 7	56	Events or controls related to channel seven
Channel 8	57	Events or controls related to channel eight
Clock	36	Events or controls related to a device internal clock.
Communication	1	Events or controls related to purely communication isssues. Consider other domains before using this one.
Conductor	74	Events related to a conductor
Configuration	7	Events or controls related to device configuration.
Demand	8	Events or controls related to demand (ie. kW) and demand settings (as opposed to consumption (ie. kWh).
Dim	71	Control command to dim a luminaire and ignore any motion sense capability

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence EESG Working Group Smart Grids No reproduction or circulation Oct 2024

EndDeviceDomain Enumeration		
mnemonic	**Value**	**Description**
DimWithMotionSense	72	Control command to dim a luminaire and respond to any nearby motion
Dimmer	70	Events related to a dimming function
Firmware	11	Events or controls related to device firmware.
GasSupply	4	Events or controls related to the supply of natural gas or propane.
Humidity	42	Events or controls related to humidity
Installation	6	Events or controls related to device installation.
KYZPulseCounter	38	Pulse counting function inside a meter or other end device.
LoadControl	15	Events or controls related to the automatic restriction or control of a customer's energy consumption.
LoadProfile	16	Events or controls related to the energy consumption (ie. "load") over time on a device.
Logs	17	Events or controls related to device internal logs.
Memory	18	Events or controls related to device memory.
Metrology	21	Events or controls related to any type of measurement captured by a device.
MobileSecurity	14	Events or controls related to device security when the device is accessed via a mobile tool or device.
Modem	19	Events or controls related to a device's modem.
Network	23	Events or controls generally related to a device's status on the network. Also used for general network events, such as commissioning of a PAN Area network.
Pairing	10	Events or controls related to linking devices together (e.g. PANDevice to Meter, ComDevice to Meter, etc.).
Pole	73	Events related to a distribution power pole
Power	26	Events or controls related to device energization status.
Pressure	29	Events or controls related to device pressure thresholds.
RCDSwitch	31	Events or controls related to device remote connect/disconnect activities.
Recoder	41	A device for encoding
Security	12	Events or controls related to device security (including SecurityKey, HMAC, Parity, Rotation, other TamperDetection, etc.).
Subcomponent	9	Events or controls related to firmware on a module contained by a device.
Temperature	35	Events or controls related to device
VideoDisplay	13	Events or controls related to device CRT/display.
Voltage Fuse	60	Events or controls related to voltage fuse
Volume	40	A quantity of 3-dimensional space enclosed by a boundary; the space occupied by a liquid or gas.
Watchdog	37	A hardware or software function triggered by a timer expiring.
WaterSupply	5	Events or controls related to the supply of water.

E.7 EndDeviceSubDomain

EndDeviceDomain can be subcategorized by EndDeviceSubdomain codes. EndDeviceSubdomain codes are enumerated and described in Table E.4.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC Working Smart Grids
No reproduction or circulation
Oct 2024

Table E.4 – EndDeviceSubdomain codes

Reprinted with the permission of UCAIug.

EndDeviceSubdomain enumeration		
mnemonic	**Value**	**Description**
n/a	0	Not applicable. Use when a subdomain is not needed. This should rarely be used
Access	1	Related to physical security (ie. Accessability) or electronic permission to read/write digital media
Activation	283	Initiation of a function
AlarmTable	285	A table in a device for the tracking of alarms
ADConverter	142	Related to analog-to-digital conversion
AllEvents	148	Related to a set of events (typically used in a Load Control Cancel All Events scenario)
ApparentPower	290	The magnitude of the complex power measured in volt-amps
Allocation	2	Related to designation or allotment; Typically related to memory (RAM/ROM)
Association	74	Related to the linking/pairing of one device/object to another device/object
AUTDProcess	3	Related to Always Up To Date processes; watchdog or keep-alive processes
AutoRegistration	5	Related to automatic registration process
AutoTime	7	Related to automatic setting of time
BTU	13	Related to British Thermal Units
Buffer	14	Related to temporary data storage
Cable	15	Related to a physical cable
Calculation	16	Related to mathematical computation
Calibration	18	Related to a set of gradations that show positions or values
Certificate	21	Related to a document testifying to the truth of something; typically a security certificate
Channel	350	Related to a meter channel
Charge	22	Related to electrical charge; Related to billing charge
Checksum	284	A fixed-size datum computed from an arbitrary block of digital data for the purpose of detecting accidental errors
Concentration	39	Related to the density or composition of something
Constants	23	Related to statically defined values
ControlPoint	26	Related to load control settings
Cover	29	Related to something that provides shelter; a covering
CRC	30	Related to cyclical redundancy check
Credit	8	Related to the right-hand side of an account; billing
Current	6	Related to electrical power measured in amperes
Data	31	Related to factual information
DataLog	33	Related to a record (ie. Log) of factual information
Date	34	Related to calendar time
Day	35	Related to the day portion of calendar time
DaylightSavingTime	56	Related to the practice of setting the clock forward one hour in the spring.
DayLimit	299	A limit established for a daily period
Decryption	36	Related to making encrypted data readable

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEC WG Smart Grids
No reproduction or circulation

EndDeviceSubdomain enumeration		
mnemonic	**Value**	**Description**
Display	143	Related to a CRT, LED, or other form of video device
DLMS/COSEM Key	405	Related to a DLMS/COSEM key.
Door	128	Related to a moveable barrier used to cover an opening; as in a door to a meter or collector
Emergency Codes	361	Relating to global emergency codes in prepayment metering.
Emergency Override	362	Relating to emergency override in prepayment metering.
EmergencySupplyCapacityLimit	138	Related to emergency supply capacity limits
Encoder	40	Related to the thing that converts information from one format to another
EncoderRegister	41	Related to the encoder register (ie. On a meter)
EPROM	42	Related to erasable programmable read-only memory
Event	43	Related to something that has happened; other, more specific subdomains should be used before using this one
EventLog	44	Related to a record (ie. Log) of event data
EWM	45	Related to an external wireless module
Feature	46	Related to a non-specific characteristic
FirmwareReset	47	Related to reverting of firmware to original state
Flow	48	Related to the movement of a substance (electricity, gas, water, etc.)
FPV	49	Related to a form of super-compressibility
Frames	50	Related to fixed-sized blocks; as in memory
Frequency	4	Related to the number of cycles per unit of time
GCAnalyzer	51	Related to gas chromatograph analyzer which is use to measure the component mixture of the natural gas delivers to a site
Groups	390	Relating to groups or teams.
HeadEndSystem	52	Related to the metering/AMI system
Hardware	401	Related to metering hardware
HistoryLog	53	Related to a record (ie. Log) of historical data
HMAC	54	Related to hash-based message authentication code; a specific method for calculated a MAC
Holiday	97	Related to days set aside having special significance
Identity	10	Related to a unique identifier
Imax	400	Related to Imax or maximum current
Initialisation	298	Start-up function
Input	55	Related to data entered into the system
InstallDate	57	Related to the prepared for use date
IntelligentRegister	58	Related to a specific register on a device
Interval	59	Related to interval energy data; the time between to events
IO	60	Related to general input/output
IPAddress	127	Related to an IP Address (Internet Protocol Address)
LANAddress	61	Related to a unique identification of a device on a network of devices
LastRead	62	Related to the final reading from a meter
List	63	Related to an internal list [contained in memory or on firmware]
ListPointers	64	Related to a specific set of values kept by a meter

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC/WG 9 Small Group
No reproduction or circulation
Oct 2024

EndDeviceSubdomain enumeration		
mnemonic	**Value**	**Description**
Login	65	Related to the process by which access is gained to a device, computer, or system
LowSpeedBus	145	Related to a circuit that connects CPU with other devices; low-speed transmission
MagneticSwitch	66	Related to any type of magnetic switch
MaintMode	11	Related to a specific mode of operation into which a device can be set
Measurement	67	Relating to the magnitude of a quantity
MeasurementType	286	A code defining the kind of data under measurement
Mesh	68	Typically related to the type of meter network
MeterBus	147	Related to a circuit that connects a devices or module to a meter
MeteringMode	12	Related to a specific mode of operation into which a device can be set
Mobile	69	Related to devices that are not confined to one place
MOL%	70	Related to percentage of moles
NetworkId	71	Related to a unique identification of a device on a network of devices
NeutralCurrent	137	Related to the essential part of electroweak unification
NVRAM	72	Related to non-volatile random access memory
OptionBoard	146	Related to a type of module in a meter
Parameter	75	Related to a variable passed to a function
ParentDevice	76	Related to a device's owner
Parity	77	Typically related to an odd/even or on/off state; a symmetry property
Password	24	Related to a secret word used for authentication
Phase	25	Typically related to a means of distributing alternating current; When the specific phase is irrelevant, this should be used as the EndDeviceSubdomain
PhaseAngle	130	Related to the angular component of the polar coordinates
PhaseAngleA	306	Related to the angular A component of coordinates
PhaseAngleB	308	Related to the angular B component of coordinates
PhaseAngleC	310	Related to the angular C component of coordinates
PhaseAngleAB	312	Related to the angular AB component of coordinates
PhaseAngleBC	314	Related to the angular BC component of coordinates
PhaseAngleCA	316	Related to the angular CA component of coordinates
PhaseA	126	Related to the A phase of a multi-phase circuit
PhaseAApparentPower	291	The apparent power on phase A of a multi-phase circuit
PhaseAActivePower	324	The active power on phaseA of a multi-phase circuit
PhaseABvoltage	301	Related to the voltage of phase AB
PhaseACurrent	287	Related to the current of the first phase of 3-phase power
PhaseAReactivePower	295	The reactive power on phase A of a multi-phase circuit
PhaseAVoltage	131	Related to the voltage of the first phase of 3-phase power
PhaseAVoltagePotential	126	Related to the voltage potential of the first phase of 3-phase power
PhaseB	134	Related to the B phase of a multi-phase circuit
PhaseBApparentPower	292	The apparent power on phase B of a multi-phase circuit
PhaseBActivePower	326	The active power on phase B of a multi-phase circuit.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEC Webstore
No reproduction or circulation
FESC Working Group

EndDeviceSubdomain enumeration		
mnemonic	**Value**	**Description**
PhaseBCurrent	288	Related to the current of the second phase of 3-phase power
PhaseBCVoltage	302	Related to the voltage of phase BC.
PhaseBReactivePower	296	The reactive power on phase B of a multi-phase circuit
PhaseBVoltage	132	Related to the voltage of the second phase of 3-phase power
PhaseBVoltagePotential	134	Related to the voltage potential of the second phase of 3-phase power
PhaseC	135	Related to the C phase of a multi-phase circuit
PhaseCApparentPower	293	The apparent power on phase C of a multi-phase circuit
PhaseCActivePower	328	The active power on phase C of a multi-phase circuit.
PhaseCAVoltage	304	Related to the voltage of phase CA.
PhaseCCurrent	289	Related to the current of the third phase of 3-phase power
PhaseCReactivePower	297	The reactive power on phase C of a multi-phase circuit
PhaseCVoltage	133	Related to the voltage of the third phase of 3-phase power
PhaseCVoltagePotential	135	Related to the voltage potential of the third phase of 3-phase power
PhaseSequence	78	Related to the order of the phases in multi-phase power
PhaseVoltage	79	In single-phase or in situations where the specific phase is irrelevant, this is related to voltage across the phase
PLC	402	Related to power line carrier
Position	365	Related to a relative position or geographic position
PowerFactor	27	Related to the ratio of the real power flowing to the load to the apparent power in the circuit
PowerFactorPhaseA	318	Related to the ratio of the real power flowing to the load to the apparent power in the circuit related to phase A.
PowerFactorPhaseB	320	Related to the ratio of the real power flowing to the load to the apparent power in the circuit related to phase B.
PowerFactorPhaseC	322	Related to the ratio of the real power flowing to the load to the apparent power in the circuit related to phase C.
PowerQuality	28	Related to the set of limits of electrical properties that allows electrical systems to function in their intended manner without significant loss of performance
PowerQualityRecording	80	Related to the capture and storage of power quality data
PrepayData	360	Related to data involving prepayment metering.
PrepaymentCredit	81	Related to the right-hand side of an account; billing for prepayment accounts
Pricing	9	Related to billing
Processor	82	Related to a CPU, typically
Program	83	Related to a pre-defined set of instructions
Pulse	84	Related to a means by which energy is measured
Queue	197	Related to a relatively temporary storage area used to hold requests or tasks until they can be processed
Radio	136	Related to a physical device that processes radio signals
RAM	85	Related to random access memory
Rate	86	Related to the speed or velocity
ReadAccess	202	Related to the permission level one has; as in read, write, update
Readings	87	Related to the collection of consumption, diagnostic, and status data from a meter
ReactivePower	294	Power that does not perform work measured in VA reactive (VAr)

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single User Licence
IEESCO WG Smart Grids
No reproduction or circulation
Oct 2024

EndDeviceSubdomain enumeration		
mnemonic	**Value**	**Description**
Recoder	300	A device for encoding
Recovery	88	Related to a process of restoring from a broken state
Register	89	Related to a placeholder for information
Registration	90	Related to a process by which a device is recognized or added
Relay	91	Related to an electrically operated switch
RemoteAccess	211	Related to physical security (ie. accessability) or electronic permission to read/write digital media from a mobile device or from a location other than where the object being accessed is
ROM	92	Related to read-only memory
Rotation	93	Related to the movement of an object in a circular motion
RTP	94	Related to real-time pricing
Schedule	95	Related to a timetable or plan of future events
Season	228	Related to the division of a year marked by changes in weather; typically winter, spring, summer, and fall
SecondaryCredit	96	Related to a non-primary amount of credit
SecuredRegister	98	Related to a specific register on a device
SecuredTable	99	Related a table that requires authorization prior to access being granted
SecurityKey	32	Related to a piece of information that determines the functional output of a cryptographic cipher
SecurityKeyLength	119	Related to the length of a security key
SecurityKeyVersion	120	Related to the version of a security key
SelfDetermination	366	Operation based upon parameters that were self determined, e.g. automatic.
SelfRead	231	Related to a process where a device will read itself
SelfTest	100	Related to a process where a device will run an internal test on itself
Sensor	144	Related to a mechanical device that transmits a signal to a measuring device
Session	129	Related to a communication session, typically
SetPoint	101	Related to the threshold at which a feature is engaged; typically related to load control
SigmaticMessage	102	Related to sigmatic messages
Signature	103	Related to electronic security and signing of messages
SignatureLength	104	Related to the length of a security signature
SignatureTimestamp	105	Related to the timeframe within which a security signature is valid
SignatureUsage	106	Related to how a signature is being used
SpecificGravity	240	Related to the ratio of the density of a substance to the density of water
StandardTime	107	Related to the opposite of daylight savings time
StandbyMode	108	Related to a specific mode of operation into which a device can be set
Status	17	Related to the current state of something
Storage	109	Related to the medium on which information is kept; also related to the act of storing information
SupplyCapacityLimit	139	Related to supply capacity limits
Table	110	Relating to a structure containing rows and columns
Tariff	140	Billing term relating to cost or amount chaged

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
FESC WG Sharepoint
No reproduction or circulation
Oct 2024

EndDeviceSubdomain enumeration		
mnemonic	**Value**	**Description**
Test	111	Related to a classification that specifies non-production
TestMode	19	Related to a specific mode of operation into which a device can be set
TextMessage	112	Related to a message or set of characters that are sent to a device
Threshold	261	Related to a level or point at which something will happen
Tier	113	Related to a level
Time	114	Related to time of day, as in hours:minutes:seconds:miliseconds
Timeout	125	Related to a specific threshold specifying when to automatically return after having received no response
TimeReset	115	Related to the resetting of the time of day
TimeSync	116	Related to the process of adjusting the time of day value on a device to match that of a trusted source for time of day
TimeVariance	117	Related to the acceptable difference of a device time of day as compared to a trusted source for time of day
TimeZone	118	Related to the time regions around the Earth defined by the lines of longitude
TOU	121	Related to time of use
Tranceiver	122	Related to a device that has both a transmitter and a receiver
Usage	123	Related to how something is used
Version	124	Related to a specific iteration or translation
Voltage	38	Related to the electrical force that would drive an electric current between two points
Watchdog	370	Related to a watchdog procedure or process.
Window	73	Related to a period of time during which a device can be linked/paired with a meter or other device
WriteAccess	282	Related to the permission level one has; as in read, write, update

E.8 EndDeviceEventOrAction

The most specific part of the EndDeviceEventType is its EndDeviceEventOrAction value. This part of the EndDeviceEventType enumeration is generally in the form of a verb that gives action to the event that just occurred.

EndDeviceEventOrAction codes are enumerated and described in Table E.5.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEC Webstore Smart Standards
No reproduction or circulation
Oct 2024

Table E.5 – EndDeviceEventOrAction codes

Reprinted with the permission of UCAIug.

EndDeviceEventOrAction enumeration		
mnemonic	**Value**	**Description**
n/a	0	Not applicable. Use when a EndDeviceEventOrAction is not needed. This should rarely be used.
Aborted	1	An event that occurs when some intervention causes the item (identified by the EndDeviceDomain/EndDeviceSubdomain) to stop.
Accessed	2	Typically a security event that occurs when physical access or access to data has been obtained (whether permitted or not).
Acknowledged	3	An event that indicates the receipt of the item (identified by the EndDeviceDomain/EndDeviceSubdomain).
Activated	4	An event that indicates that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) that was inactive is now active.
Added	370	An event indicating that a device or service was added
AlmostFull	283	An event to indicate that a resource is near capacity
ArmedForClosure	11	An event that indicates that an ArmForClosure command has been completed successfully.
ArmedForOpen	12	An event that indicates that an ArmForOpen command has been completed successfully.
ArmForClosure	5	A command to indicate a request to arm a switch for closure.
ArmForClosureFailed	226	An event that indicates that an ArmForClosure has failed.
ArmForOpen	6	A command to indicate a request to arm a switch for open.
ArmForOpenFailed	222	An event that indicates that an ArmFor Open has failed.
Attempted	7	An event that indicates that the item (identified by the EndDeviceDomain/EndDeviceSubdomain), based on the EndDeviceDomain and EndDeviceSubdomain combination, has been tried.
Calculated	21	An event that indicates that the item (identified by the EndDeviceDomain/EndDeviceSubdomain), based on the EndDeviceDomain and EndDeviceSubdomain combination, has been computed.
Cancel	8	A command to indicate a request to terminate a prior issued command.
CancelFailed	86	An event that indicates that a Cancel has failed.
Cancelled	10	An event that indicates that a prior issued command or set of commands was terminated successfully.
Change	13	A command to indicate a request to make modifications.
Changed	24	An event that indicates that a related Change request has completed successfully.
ChangedOut	284	An event to indicate that an asset has been replaced
ChangeOutRequired	27	A command to request that a device is replaced by a new device of the same kind.
ChangePending	14	An event that indicates that an update has not yet been performed.
Charged	15	An event that can indicate a billing-related state or in the form of being electrically charged.
Cleared	28	An event that indicates that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) on the device has been either resolved or emptied.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
FESO WG Virtual Meeting
No reproduction or circulation
Oct 2024

EndDeviceEventOrAction enumeration		
mnemonic	**Value**	**Description**
Close	299	A control command for the item described by EndDeviceDomain/EndDeviceSubdomain. NOTE This command might be used to close a pairing window. It should not be used to close a switch. The "Connect" command should be used instead.
Closed	16	An event that indicates the item (identified by the EndDeviceDomain/EndDeviceSubdomain) on the device that had been open is not open anymore.
ColdStarted	31	An event that indicates the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has been started from a stopped state (as opposed to a WarmStart which implies that it was started from an already started state).
Confirmed	17	An event that indicates the receipt and agreement of the item (identified by the EndDeviceDomain/EndDeviceSubdomain).
Connect	18	A command to request that a device be put into service. NOTE This would effectively "close" an electrical switch or "open" a water valve.
Connected	42	An event to indicate that a device has been put into service.
ConnectFailed	67	An event that indicates a Connect request has failed.
Corrupted	43	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has been altered from a correct state to an incorrect state.
CorruptionCleared	281	An event to indicate that a corruption condition has been cleared
Create	82	A command to request that something be created.
Created	83	An event that indicates that a Create request succeeded.
CreateFailed	297	An event that indicates that a Create request failed.
CrossPhaseCleared	70	An event that indicates that instability due to cross-phase modulation has been corrected.
CrossPhaseDetected	45	An event that indicates instability due to cross-phase modulation.
Deactivated	19	An event that indicates that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) on the device that had previously been in an active state is no longer active.
Decreased	57	An event that indicates that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has a lower value or magnitude.
Delayed	20	An event that indicates the item (identified by the EndDeviceDomain/EndDeviceSubdomain) is slower than expected or will complete later than expected.
Disable	22	A command to request that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) be rendered incapable.
Disabled	66	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) was successfully rendered incapable.
DisableFailed	220	An event that indicates that a Disable request has failed.
Disallowed	161	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) was not allowed.
Disconnect	23	A command to request that a device be pulled from service; can also mean a request to sever connection to the item (identified by the EndDeviceDomain/EndDeviceSubdomain). NOTE This would effectively "open" an electrical switch or "close" a water valve.
Disconnected	68	An event to indicate that a device was successfully pulled from service; can also mean that connection to the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has been severed or terminated.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC-WG Smart Grids
No reproduction or circulation

EndDeviceEventOrAction enumeration		
mnemonic	**Value**	**Description**
DisconnectFailed	84	An event that indicates that a Disconnect request has failed.
Display	77	A command to request the display of something (as in a TextMessage).
Displayed	78	An event that indicates that a Display request completed successfully.
DisplayFailed	87	An event that indicates that a Display request failed.
Distorted	91	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has been altered from its expected state.
Downloaded	25	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) transmitted from the network to the device.
Enable	26	A command to request that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) be rendered capable.
Enabled	76	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) was successfully rendered capable.
EnableFailed	221	An event that indicates that an Enable request failed.
Error	79	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) did not complete successfully.
ErrorCleared	279	An event to indicate that an error condition has been cleared
Established	29	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has been recognized.
EventStarted	287	An event to indicate that an event (for example, demand response event) has begun
EventStopped	288	An event to indicate that an event (for example, demand response event) has halted
Exceeded	139	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has gone higher than its expected value.
Execute	30	A command to request that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) be performed.
Expired	64	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has come to an end, typically by date or time.
Failed	85	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has not succeeded.
Fault	375	An event to indicate a fault
FaultCleared	366	An event to indicate the the previously declared fault has cleared
FireAlarm	376	An event to indicate the detection of smoke or flames
FireAlarmCleared	371	An event to indicate that the previously reported FireAlarm has cleared.
Frozen	88	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) is in a static state.
Full	32	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) is at capacity.
Galloping	367	An event to indicate a resonant vibration has been detected
GallopingCeased	368	An event to indicate that the previously reported vibration has ceased.
HighDistortion	69	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has had an undesired change in the waveform of a signal.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence. Smart Grid WG
No reproduction or circulation

EndDeviceEventOrAction enumeration		
mnemonic	**Value**	**Description**
HighDistortionCleared	71	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) is back to normal after having been in a HighDistortion state.
ImbalanceCleared	75	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) is back in balance after having been in an imbalanced state.
Imbalanced	98	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) is not balanced.
Impact	372	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has been struck.
ImpactCleared	377	An event to indicate that the previously reported Impact is no longer being reported or has cleared.
Inactive	100	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) is at a dormant state.
InactiveCleared	72	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) is now in an active state after having been in a dormant state.
Increased	102	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has gotten larger.
Initialized	33	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has been set to starting values.
InProgress	34	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) is currently advancing toward a goal or an end.
Installed	105	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has been prepared for use.
Interruption (temporary)	350	An event to indicate a temporary interruption of service or communication.
Interruption (long)	351	An event to indicate a long interruption of service or communication.
Invalid	35	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) is in a faulty state.
LimitChanged	296	An event to indicate that the set point for a limit has been changed
LimitReached	286	An event to indicate that an upper or lower limit has been breached
Loaded	36	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) is now engaged.
LossDetected	47	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has experienced a deprived condition. This is typically used in relation to power, voltage, or current.
MaxLimitChanged	295	An event to indicate that the set point for a maximum limit has been changed
MaxLimitCleared	293	An event to indicate that a previous MaxLimitReached event has been cleared
MaxLimitReached	93	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has reached a maximum acceptable value.
MaxLimitReachedCleared	73	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has returned to an acceptable state after having been as a MaxLimitReached state.
MinLimitChanged	294	An event to indicate that the set point for a minimum limit has been changed

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC Washington (GTO)
No reproduction or circulation
Oct 2024

EndDeviceEventOrAction enumeration		
mnemonic	**Value**	**Description**
MinLimitCleared	292	An event to indicate that a previous MinLimitReached event has been cleared
MinLimitReached	150	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has reached a minimum acceptable value.
Mismatched	159	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) is not compatible with itself or something within its environment.
Missing	285	An event to indicate that an entity (for example, asset, measurement, etc.) is missing
Normal	37	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) is in its typical state (or norm).
NotArmed	290	An event to indicate that a device is longer in an armed state
NotAuthorized	38	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has been accessed without permission.
NotFound	160	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) is lost or missing.
Open	298	A control command for the item described by EndDeviceDomain/EndDeviceSubdomain. NOTE This command might be used to open a pairing window. It should not be used to open a switch. The "Disconnect" command should be used instead.
Opened	39	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) is accessible.
Opted-In	80	An event that indicates that a consumer has agreed to join a program.
Opted-Out	81	An event that indicates that a consumer does not want to join a program.
OutofRange	40	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has gone outside of acceptable values.
OutofRangeCleared	74	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has gone back to acceptable values.
Overflow	177	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has exceeded its size or volume.
PositionDropped	373	An event to indicate a decrease in elevation
PositionDropCleared	374	An event to indicate that the previously reported PositionDropped has cleared.
Preempted	41	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) been replaced by another that has precedence over it.
Processed	44	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has been successfully been put through the steps of a prescribed procedure.
Read	46	This can be an event (if treated as the past-tense of the verb, read) or a command (if treated as the verb, read).
Ready	48	An event that indicates that a ready condition has been reached on a device.
ReadyForActivation	280	An event to indicate that a device has been made ready
Re-established	49	An event that indicates that a condition, typically a connection, has achieved after having been lost.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence only, copying and networking prohibited.
IEC Webstore
No reproduction or circulation
Oct 2024

EndDeviceEventOrAction enumeration		
mnemonic	**Value**	**Description**
Registered	50	An event that indicates that a device or condition of a device has been recorded.
Released	51	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has been freed.
Removed	212	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has been pulled out of service.
Replaced	52	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) replaced by an new item, usually as a consequence of being old or worn out.
Reprogrammed	213	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has had a change to its directions or program.
Reset	214	A command to request that the item (identified by the EndDeviceDomain.EndDeviceSubdomain) should be set back to a zero-state or original-state.
ResetFailed	65	An event that indicates that a Reset request has failed.
ResetOccurred	215	An event that indicates that a Reset request has completed successfully.
Restarted	53	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has started again typically from an already started state.
Restored	216	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has been put back to its prior state.
Reversed	219	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has changed to be the opposite of its normal state. This is typically used for rotation.
SagStarted	223	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has dipped or shrunk from its expected state.
SagStopped	224	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has stopped sagging. Typically used in conjunction with the SagStarted event.
Same Phase Detected	365	An event to indicate that a similar phase was detected in relation to a request.
Schedule	300	A control command to ask that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) will be set to execute at a future date.
Scheduled	225	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has been set to execute at a future date.
ScheduleFailed	301	An event to indicate that the command to ask that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) to execute at a future date failed to schedule.
Sealed	227	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) is in an airtight enclosure or cannot be accessed directly.
Set to Credit	355	A command to request that a meter be set for credit mode.
Set to Credit Failed	357	An event indicating that the request to change to credit mode failed.
Set to Credit Successful	359	An event indicating that the request to change to credit mode was successful.
Set to Prepay	354	A command to request that a meter be set for prepayment mode.
Set to Prepay Failed	356	An event indicating that the request to change to prepay mode failed.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
FESC Wasim Smart Grids
No reproduction or circulation

EndDeviceEventOrAction enumeration		
mnemonic	**Value**	**Description**
Set to Prepay for Provisioning	361	A command to request that a meter be provisioned for prepayment metering.
Set to Prepay Successful (Block)	360	An event indicating that the request to set a meter to prepayment (block) was successful.
Set to Prepay Successful (TOU)	358	An event indicating that the request to set a meter to prepayment (TOU) was successful.
Start	54	A command to request that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) be triggered or begun.
Started	242	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has started.
StartFailed	217	An event that indicates that a Start request has failed.
Stop	55	A command to request that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) be shut down normally.
StopFailed	218	An event that indicates that a Stop request has failed.
Stopped	243	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has ceased. When this has resulted from a Stop command, it is assumed that things have stopped normally (ie. With no errors).
Substituted	56	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) replaced by an alternate item.
Succeeded	58	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) was accomplished.
SwellStarted	248	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has grown from its expected state.
SwellStopped	249	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has stopped swelling. Typically used in conjunction with the SwellStarted event.
SwitchPositionChanged	289	An event to indicate that a switch position has changed
TamperCleared	291	An event to indicate that a tamper alarm has been cleared
TamperDetected	257	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has been secretly modified or altered. These events are typically associated with security or billing.
Terminate	302	A control command to request that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) end immediately and abruptly.
Terminated	59	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has ended abruptly.
TerminateFailed	303	An event to indicate that the attempt to terminate the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has failed.
Tilted	263	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has been caused to lean, incline, slope, or slant.
TiltCleared	369	The previously identified tilt has ceased
Under Voltage Cleared	353	An event to indicate that an under voltage condition was cleared.
Under Voltage Detected	352	An even tto indicate that an under voltage condition was detected.
Uninitialized	61	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has all its values in their starting state.
Unlocked	62	An event to indicate that the item's (identified by the EndDeviceDomain/EndDeviceSubdomain) lock, physical or software, is undone.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence only, copying and networking prohibited.
IECNORM.COM
No reproduction or circulation

EndDeviceEventOrAction enumeration		
mnemonic	**Value**	**Description**
Unsealed	269	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) is not sealed.
Unsecure	63	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) is in an unprotected state.
Unstable	270	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) is in an irregular state.
Uploaded	60	An event to indicate that the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has been transmitted from the device to the network.
WarmStarted	278	An event that indicates the item (identified by the EndDeviceDomain/EndDeviceSubdomain) has been started from an already started state (as opposed to a ColdStart which implies that it was started from a stopped state).
WriteFailed	282	An event to indicate that a write operation has failed

E.9 Normative EndDeviceEventTypes

EndDeviceType, EndDeviceDomain, EndDeviceSubdomain, and EndDeviceEventOrAction fields are combined and presented as a single string. The normative events are listed in the following Table E.6, Table E.7, Table E.8, Table E.9, Table E.10, Table E.11, Table E.12, Table E.13, Table E.14, Table E.15, Table E.16, Table E.17, Table E.18, Table E.19, Table E.20, Table E.21, Table E.22, Table E.23, Table E.24, Table E.25, Table E.26, Table E.27, Table E.28, Table E.29, Table E.30, Table E.31 and Table E.32, grouped by EndDeviceDomain.

Table E.6 – Battery events

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Battery low condition detected Module Low Battery Detected Low Battery Module Low Battery Detected	*.2.22.150	*	Battery	Charge	MinLimitReached
Battery OK Rf Battery OK	*.2.22.37	*	Battery	Charge	Normal
Battery failed	*.2.0.85	*	Battery	n/a	Failed
Battery installed	*.2.0.105	*	Battery	n/a	Installed
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEEE SA WG offshoot Grids
No reproduction or circulation
Oct 2024

Table E.7 – Billing events

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Adjusted the remaining credit	*.20.8.24	*	Billing	Credit	Changed
Subtracted from remaining credit	*.20.8.57	*	Billing	Credit	Decreased
Added to remaining credit	*.20.8.102	*	Billing	Credit	Increased
Pre-payment emergency credit	*.20.81.102	*	Billing	PrepaymentCredit	Increased
Tariff program changed	*.20.83.24	*	Billing	Program	Changed
RTP activation	*.20.94.4	*	Billing	RTP	Activated
RTP deactivation	*.20.94.19	*	Billing	RTP	Deactivated
Special schedule activation	*.20.95.4	*	Billing	Schedule	Activated
Secondary emergency credit	*.20.96.102	*	Billing	SecondaryCredit	Increased
Daily tariff changed Week tariff changed Rate change	*.20.140.24	*	Billing	Tariff	Changed
Unscheduled billing reset Billing reset	*.20.140.214	*	Billing	Tariff	Reset
Tier changed	*.20.113.24	*	Billing	Tier	Changed
TOU start mismatch TOU mismatch TOU years mismatch	*.20.121.159	*	Billing	TOU	Mismatched
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

Table E.8 – Cartridge events

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Cartridge error	*.3.17.79	*	Cartridge	Status	Error
Cartridge frozen	*.3.17.88	*	Cartridge	Status	Frozen
Cartridge installed	*.3.17.105	*	Cartridge	Status	Installed
No cartridge inserted	*.3.17.160	*	Cartridge	Status	NotFound
Cartridge removed	*.3.17.212	*	Cartridge	Status	Removed
Cartridge changed Pushbutton cartridge changed Handheld terminal cartridge Cartridge change mode, unable to read	*.3.17.52	*	Cartridge	Status	Replaced
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEC WG on Smart Grids
No reproduction or circulation
Oct 2024

Table E.9 – Clock events

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Auto time set performed	*.36.7.58	*	Clock	AutoTime	Succeeded
Date setting changed	*.36.34.24	*	Clock	Date	Changed
Invalid execution date and time Invalid complete date and time range	*.36.34.35	*	Clock	Date	Invalid
Day change error	*.36.35.79	*	Clock	Day	Error
Day of wrong length	*.36.35.35	*	Clock	Day	Invalid
DST change to new time	*.36.56.24	*	Clock	DaylightSavingsTime	Changed
Daylight savings or standard time variance error	*.36.56.40	*	Clock	DaylightSavingsTime	OutofRange
DST change to previous time	*.36.56.214	*	Clock	DaylightSavingsTime	Reset
Change to Spring daylight savings time	*.36.56.242	*	Clock	DaylightSavingsTime	Started
Holiday changed Holidays changed	*.36.97.24	*	Clock	Holiday	Changed
Invalid installation date	*.36.57.35	*	Clock	InstallDate	Invalid
Temporary clock problem	*.36.0.79	*	Clock	n/a	Error
Clock malfunction E-clock failure	*.36.0.85	*	Clock	n/a	Failed
Season changed	*.36.228.24	*	Clock	Season	Changed
Change to Fall standard time	*.36.107.242	*	Clock	StandardTime	Started
Time setting changed to new time Working register time set to new time Time setting changed (old time) Time setting changed Collector Radio Set TimeKeeper Meter Time Adjustment	*.36.114.24	*	Clock	Time	Changed
Time change > 10 seconds	*.36.114.40	*	Clock	Time	OutofRange
Time setting reset to previous time Working register time set to previous time Time reset	*.36.114.214	*	Clock	Time	Reset
Unable to reset time	*.36.115.85	*	Clock	TimeReset	Failed
Time synchronization error	*.36.116.79	*	Clock	TimeSync	Error
Time sync failed:Meter I/O/clock failure(38)	*.36.116.85	*	Clock	TimeSync	Failed
Time synchronization of recorder	*.36.116.58	*	Clock	TimeSync	Succeeded

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESG WG on smart Grids
No reproduction or circulation
Oct 2024

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Time variance exceeded limits even after module tries to correct it Time variance exceeded limits without attempt to correct automatically	*.36.117.139	*	Clock	TimeVariance	Exceeded
Invalid time zone ID	*.36.118.35	*	Clock	TimeZone	Invalid
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

Table E.10 – Communication events

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Watch dog or keep-alive failure detected	*.1.3.85	*	Communication	AUTDProcess	Failed
Cut cable	*.1.15.85	*	Communication	Cable	Failed
Encoder register communication failure	*.1.41.85	*	Communication	EncoderRegister	Failed
RF HES Comm Established	*.1.52.29	*	Communication	HeadEndSystem	Established
Rf No HES Comm	*.1.52.85	*	Communication	HeadEndSystem	Failed
Intelligent register communication failure	*.1.58.85	*	Communication	IntelligentRegister	Failed
Communications between modules within a meter lost	*.1.60.85	*	Communication	IO	Failed
I/O board definition mismatch	*.1.60.159	*	Communication	IO	Mismatched
Rf No Mesh Comm	*.1.68.85	*	Communication	Mesh	Failed
Call-in failure Communications failure	*.1.0.85	*	Communication	n/a	Failed
Communications re-established	*.1.0.49	*	Communication	n/a	Re-established
Communication terminated normally	*.1.0.59	*	Communication	n/a	Terminated
Queue alarm	*.1.197.85	*	Communication	Queue	Failed
Collector Communication Delay	*.1.17.20	*	Communication	Status	Delayed
Rf Tranceiver Reset	*.1.122.214	*	Communication	Tranceiver	Reset
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

IECNORM.COM: Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESG WG on Smart Grids
No reproduction or circulation
Oct 2024

Table E.11 – Configuration events

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Constants changed Primary constant changed Secondary constant changed Output constant changed	*.7.23.24	*	Configuration	Constants	Changed
Meter hard ID changed	*.7.10.24	*	Configuration	Identity	Changed
Invalid gateway ID Invalid Transformer ID	*.7.10.35	*	Configuration	Identity	Invalid
Missing node	*.7.10.160	*	Configuration	Identity	NotFound
Collector Radio Set IP List	*.7.127.24	*	Configuration	IPAddress	Changed
Maintenance mode Meter shop mode started	*.7.11.242	*	Configuration	MaintMode	Started
Meter shop mode stopped	*.7.11.243	*	Configuration	MaintMode	Stopped
Begin recording meter readings Begin idle mode	*.7.12.242	*	Configuration	MeteringMode	Started
Metering mode stopped	*.7.12.243	*	Configuration	MeteringMode	Stopped
Request customer configuration	*.7.0.13	*	Configuration	n/a	Change
Collector Radio Set Network Settings	*.7.0.24	*	Configuration	n/a	Changed
Configuration error detected	*.7.0.79	*	Configuration	n/a	Error
Configuration Initialized	*.7.0.33	*	Configuration	n/a	Initialized
Gateway reprogrammed	*.7.0.213	*	Configuration	n/a	Reprogrammed
Sum definition changed Sum type changed Meter counts synch Sum counts synch Output link changed Energy format changed Power format changed	*.7.75.24	*	Configuration	Parameter	Changed
Meter program change complete	*.7.83.24	*	Configuration	Program	Changed
Rate changed	*.7.86.24	*	Configuration	Rate	Changed
Setpoint exceeded, channel #	*.7.101.139	*	Configuration	SetPoint	Exceeded
Standby mode started	*.7.108.242	*	Configuration	StandbyMode	Started
Storage medium changed	*.7.109.24	*	Configuration	Storage	Changed
Test button pushed	*.7.19.76	*	Configuration	TestMode	Enabled
Test mode started	*.7.19.242	*	Configuration	TestMode	Started
Test mode ended	*.7.19.243	*	Configuration	TestMode	Stopped
Invalid timeout date and time	*.7.125.35	*	Configuration	Timeout	Invalid
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEESC WG on smart Grids
No reproduction or circulation
Oct 2024

Table E.12 – Demand events

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Unable to reset demand	*.8.0.65	*	Demand	n/a	ResetFailed
Demand reset detected	*.8.0.215	*	Demand	n/a	ResetOccurred
Demand definitions mismatch	*.8.0.159	*	Demand	n/a	Mismatched
Demand overload threshold	*.8.261.139	*	Demand	Threshold	Exceeded
Demand threshold caution	*.8.261.93	*	Demand	Threshold	MaxLimitReached
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

Table E.13 – Firmware events

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
A/D converter error	*.11.142.79	*	Firmware	ADConverter	Error
Constants invalid	*.11.23.35	*	Firmware	Constants	Invalid
Unknown in analysis Diagnostic marker	*.11.31.79	*	Firmware	Data	Error
Unrecognized recorder event code Unintelligible message received	*.11.31.35	*	Firmware	Data	Invalid
Frozen error display	*.11.143.88	*	Firmware	Display	Frozen
Alarm acknowledged, alarm #	*.11.43.3	*	Firmware	Event	Acknowledged
Alarm activated, alarm # Area alarm	*.11.46.4	*	Firmware	Feature	Activated
Alarm disabled, alarm # Remote setup disabled Remote synch disabled	*.11.46.66	*	Firmware	Feature	Disabled
Alarm enabled, alarm # Remote setup enabled Remote synch enabled Alarm value set, alarm #	*.11.46.76	*	Firmware	Feature	Enabled
Delayed command failure	*.11.46.85	*	Firmware	Feature	Failed
Illegal command	*.11.46.35	*	Firmware	Feature	Invalid
Unable to reset	*.11.47.85	*	Firmware	FirmwareReset	Failed
Internal device ID mismatch	*.11.10.159	*	Firmware	Identity	Mismatched
Unstable input, input #	*.11.55.270	*	Firmware	Input	Unstable
Read item list error	*.11.63.79	*	Firmware	List	Error
No protocol list, unable to find type No read items in list	*.11.63.160	*	Firmware	List	NotFound
Low speed bus error	*.11.145.79	*	Firmware	LowSpeedBus	Error
Meter bus alarm	*.11.147.79	*	Firmware	MeterBus	Error
Cold start	*.11.0.31	*	Firmware	n/a	ColdStarted
Firmware image corrupted	*.11.0.43	*	Firmware	n/a	Corrupted

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence on Smart Grids IEC SC WG 9 Oct 2024 No reproduction or circulation

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Configuration lost	*.11.0.79	*	Firmware	n/a	Error
Collector Radio Load DCW	*.11.0.85	*	Firmware	n/a	Failed
Meter reprogram End device programmed Configuration written/changed Reprogrammed Meter reconfigured Device has been synchronized	*.11.0.213	*	Firmware	n/a	Reprogrammed
Last reset by watchdog Metering equipment reset	*.11.0.214	*	Firmware	n/a	Reset
Unscheduled restart	*.11.0.53	*	Firmware	n/a	Restarted
Meter not programmed	*.11.0.61	*	Firmware	n/a	Uninitialized
Warm start	*.11.0.278	*	Firmware	n/a	WarmStarted
Option board error	*.11.146.79	*	Firmware	OptionBoard	Error
Parameter error Configuration error	*.11.75.79	*	Firmware	Parameter	Error
Invalid re-programming data Invalid device type, e.g. not TOU	*.11.75.35	*	Firmware	Parameter	Invalid
Miscellaneous configuration mismatch	*.11.75.159	*	Firmware	Parameter	Mismatched
Alternate phone number used	*.11.75.56	*	Firmware	Parameter	Substituted
Register processor failed	*.11.82.85	*	Firmware	Processor	Failed
Illegal command processor state	*.11.82.35	*	Firmware	Processor	Invalid
Processor reset	*.11.82.214	*	Firmware	Processor	Reset
Un-programmed caution	*.11.83.79	*	Firmware	Program	Error
Program malfunction	*.11.83.85	*	Firmware	Program	Failed
Self-check error Diagnostic failure	*.11.100.79	*	Firmware	SelfTest	Error
Self test failure	*.11.100.85	*	Firmware	SelfTest	Failed
Sensor malfunction	*.11.144.85	*	Firmware	Sensor	Failed
Alter option command executed	*.11.17.24	*	Firmware	Status	Changed
Firmware update pending	*.11.17.14	*	Firmware	Status	ChangePending
Firmware downloaded	*.11.17.25	*	Firmware	Status	Downloaded
Firmware download status Meter health checked	*.11.17.37	*	Firmware	Status	Normal
Firmware replaced firmware change complete	*.11.17.52	*	Firmware	Status	Replaced
Device reset occurred	*.11.17.214	*	Firmware	Status	Reset
End of data event table reached	*.11.110.79	*	Firmware	Table	Error
Display table mismatch	*.11.110.159	*	Firmware	Table	Mismatched
Test call-in	*.11.111.58	*	Firmware	Test	Succeeded

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence on smart grids
EESG WG on smart grids
No reproduction or circulation
Oct 2024

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Test mode display mismatch	*.11.19.159	*	Firmware	TestMode	Mismatched
Invalid down limit	*.11.261.35	*	Firmware	Threshold	Invalid
Calculation correction factor > max	*.11.261.40	*	Firmware	Threshold	OutofRange
Invalid meter software version	*.11.124.35	*	Firmware	Version	Invalid
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

Table E.14 – GasSupply events

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Complete loss of gas supply	*.4.0.85	*	GasSupply	n/a	Failed
Gas supply restored	*.4.0.216	*	GasSupply	n/a	Restored
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

Table E.15 – Installation events

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Auto registration status	*.6.5.34	*	Installation	AutoRegistration	InProgress
Auto registration confirmation	*.6.5.58	*	Installation	AutoRegistration	Succeeded
Meter change-out	*.6.0.27	*	Installation	n/a	ChangeOut
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

Table E.16 – LoadControl events

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Control point changed by condition Control point changed by command Control point changed due to prepayment Control point changed by schedule	*.15.26.24	*	Loadcontrol	ControlPoint	Changed
Abort command executed	*.15.0.1	*	Loadcontrol	n/a	Aborted
Load Control User opt-in	*.15.83.4	*	LoadControl	Program	Activated
Load control relay momentary closure, relay # Output control relay toggled, relay #	*.15.91.24	*	Loadcontrol	Relay	Changed

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EEGC WG on Smart Grid
No reproduction or circulation
Oct 2024

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Switch schedule aborted	*.15.95.1	*	Loadcontrol	Schedule	Aborted
Schedule loaded	*.15.95.36	*	Loadcontrol	Schedule	Loaded
Load control restore	*.15.17.216	*	Loadcontrol	Status	Restored
Load control initiate Load control relay closed Load control relay permanent closure, relay # Load control pattern started	*.15.17.242	*	Loadcontrol	Status	Started
Load control relay opened Load control relay opened, relay #	*.15.17.243	*	Loadcontrol	Status	Stopped
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

Table E.17 – LoadProfile events

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
List Pointers reset	*.16.64.214	*	Loadprofile	ListPointers	Reset
Load survey readings failed	*.16.87.85	*	Loadprofile	Readings	Failed
Load profile data corrupt	*.16.109.43	*	Loadprofile	Storage	Corrupted
Load profile data area almost full	*.16.109.32	*	Loadprofile	Storage	Full
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

Table E.18 – Logs events

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Data log uploaded	*.17.33.60	*	Logs	DataLog	Transmitted
Event log last read entry updated	*.17.44.24	*	Logs	EventLog	Changed
Event log cleared	*.17.44.28	*	Logs	EventLog	Cleared
Event log error	*.17.44.79	*	Logs	EventLog	Error
Event log full	*.17.44.32	*	Logs	EventLog	Full
Event log uploaded Event call-in	*.17.44.60	*	Logs	EventLog	Transmitted
History log last read entry updated	*.17.53.24	*	Logs	HistoryLog	Changed
History log cleared	*.17.53.28	*	Logs	HistoryLog	Cleared
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

IECNORM.COM : Click to view the full PDF of IEC 61968-WG-9:2024
Single user licence only, copyright IEEE SCC22 WG on Smart Grids
No reproduction or circulation
Oct 2024

Table E.19 – Memory events

Event or Control Description	EndDeviceEven Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Memory allocation error	*.18.2.79	*	Memory	Allocation	Error
Buffer overflow/overrun error	*.18.14.177	*	Memory	Buffer	Overflow
EPROM read	*.18.42.2	*	Memory	EPROM	Accessed
EPROM written	*.18.42.24	*	Memory	EPROM	Changed
EPROM failure	*.18.42.85	*	Memory	EPROM	Failed
Framing error	*.18.50.79	*	Memory	Frames	Error
Interval overflow – pulses > 65,535	*.18.59.177	*	Memory	Interval	Overflow
Data corruption detection	*.18.0.43	*	Memory	n/a	Corrupted
Mass memory mismatch	*.18.0.159	*	Memory	n/a	Mismatched
NVRAM failure	*.18.72.85	*	Memory	NVRAM	Failed
Family definitions mismatch	*.18.75.159	*	Memory	Parameter	Mismatched
Redundant pulse monitoring error	*.18.84.79	*	Memory	Pulse	Error
RAM error	*.18.85.79	*	Memory	RAM	Error
RAM failure	*.18.85.85	*	Memory	RAM	Failed
RAM memory full	*.18.85.32	*	Memory	RAM	Full
Data recovery error	*.18.88.85	*	Memory	Recovery	Failed
ROM error	*.18.92.79	*	Memory	ROM	Error
ROM failure	*.18.92.85	*	Memory	ROM	Failed
Disk almost full	*.18.109.32	*	Memory	Storage	Full
Data table full	*.18.110.32	*	Memory	Table	Full
Table slot overflow	*.18.110.177	*	Memory	Table	Overflow
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

Table E.20 – Metrology events

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
BTU alarm BTU out of range	*.21.13.40	*	Metrology	BTU	OutofRange
Corrected volume calculation error	*.21.16.79	*	Metrology	Calculation	Error
Calibration change Calibration value set, #	*.21.18.24	*	Metrology	Calibration	Changed
Calibration over-deviation, #	*.21.18.40	*	Metrology	Calibration	OutofRange
Calibration expired	*.21.18.64	*	Metrology	Calibration	Expired
Concentration alarm	*.21.39.40	*	Metrology	Concentration	OutofRange
Event Log Cleared	*.21.44.28	*	Metrology	EventLog	Cleared
EWM potential failure	*.21.45.85	*	Metrology	EWM	Failed
FPV calculated unreasonably	*.21.49.40	*	Metrology	FPV	OutofRange
GC analyzer failure	*.21.51.85	*	Metrology	GCAnalyzer	Failed
History Log Cleared	*.21.53.28	*	Metrology	HistoryLog	Cleared
Form C error, input #	*.21.55.79	*	Metrology	Input	Error

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
No reproduction or circulation
Oct 2024

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Invalid value, channel #	*.21.55.35	*	Metrology	Input	Invalid
Interval read succeeded	*.21.59.58	*	Metrology	Interval	Succeeded
Last read entry updated	*.21.62.24	*	Metrology	LastRead	Changed
Update list pointers	*.21.63.24	*	Metrology	List	Changed
List cleared	*.21.63.28	*	Metrology	List	Cleared
Reset list pointers	*.21.63.214	*	Metrology	List	Reset
Measurement error detected	*.21.67.79	*	Metrology	Measurement	Error
Measurement failed	*.21.67.85	*	Metrology	Measurement	Failed
Total MOL % out of range	*.21.70.40	*	Metrology	MOL%	OutofRange
Measurement error detected	*.21.0.79	*	Metrology	n/a	Error
Meter return within limits, channel #	*.21.0.37	*	Metrology	n/a	Normal
Meter reprogrammed End Device Programmed	*.21.0.213	*	Metrology	n/a	Reprogrammed
Nonvolatile memory failure detected	*.21.72.85	*	Metrology	NVRAM	Failed
Turbine Pulse Error	*.21.84.79	*	Metrology	Pulse	Error
Pulse initiator	*.21.84.85	*	Metrology	Pulse	Failed
Pulse overflow, channel #	*.21.84.177	*	Metrology	Pulse	Overflow
Meter readings failed	*.21.87.85	*	Metrology	Readings	Failed
kWh received – alarm cleared	*.21.87.37	*	Metrology	Readings	Normal
Expected read missed	*.21.87.160	*	Metrology	Readings	NotFound
Scheduled call-in	*.21.87.225	*	Metrology	Readings	Scheduled
Register error	*.21.89.79	*	Metrology	Register	Error
Previous kW > register capacity	*.21.89.139	*	Metrology	Register	Exceeded
Register full	*.21.89.32	*	Metrology	Register	Full
Register definitions mismatch	*.21.89.159	*	Metrology	Register	Mismatched
Register read succeeded	*.21.89.58	*	Metrology	Register	Succeeded
Self meter read	*.21.231.58	*	Metrology	SelfRead	Succeeded
Invalid sigmatic message	*.21.102.35	*	Metrology	SigmaticMessage	Invalid
Specific gravity alarm	*.21.240.40	*	Metrology	SpecificGravity	OutofRange
Self check error detected	*.21.17.79	*	Metrology	Status	Error
Pending table activation	*.21.110.4	*	Metrology	Table	Activated
Table written to	*.21.110.24	*	Metrology	Table	Changed
Pending table clear	*.21.110.28	*	Metrology	Table	Cleared

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EPRI WG on smart Grids
No reproduction or circulation
Oct 2024

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Meter over hi-hi threshold, channel # Meter over threshold, channel # Delta rate over threshold, channel #	*.21.261.139	*	Metrology	Threshold	Exceeded
Limit alarm reported	*.21.261.93	*	Metrology	Threshold	MaxLimitReached
Meter under threshold, channel # Meter over lo-lo threshold, channel # Low limit alarm	*.21.261.150	*	Metrology	Threshold	MinLimitReached
Meter over/under threshold	*.21.261.40	*	Metrology	Threshold	OutofRange
Gas day high limit exceeded	*.21.123.139	*	Metrology	Usage	Exceeded
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

Table E.21 – MobileSecurity events

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
MAT Token Random Data or Target LAN Error	*.14.31.79	*	MobileSecurity	Data	Error
MAT Token Invalid LAN Address Block	*.14.61.35	*	MobileSecurity	LANAddress	Invalid
MAT Token Invalid Network ID	*.14.71.35	*	MobileSecurity	NetworkId	Invalid
MAT Token Message Generation Error	*.14.32.79	*	MobileSecurity	SecurityKey	Error
MAT Token Expired MAT Token Expired, Keep Alive Timeout Exceeded	*.14.32.64	*	MobileSecurity	SecurityKey	Expired
MAT Token Invalid Options	*.14.32.35	*	MobileSecurity	SecurityKey	Invalid
MAT Token pre-empted	*.14.32.41	*	MobileSecurity	SecurityKey	Preempted
MAT Token Processed	*.14.32.44	*	MobileSecurity	SecurityKey	Processed
MAT Token released	*.14.32.51	*	MobileSecurity	SecurityKey	Released
MAT Token Invalid Length	*.14.119.35	*	MobileSecurity	SecurityKeyLength	Invalid
MAT Token Invalid Version	*.14.120.35	*	MobileSecurity	SecurityKeyVersion	Invalid
Prior session already established	*.14.129.161	*	MobileSecurity	Session	Disallowed
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESG WG on Smart Grids
No reproduction or circulation
Oct 2024

Table E.22 – Modem events

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Power outage modem battery low	*.19.22.150	*	Modem	Charge	MinLimitReached
Modem failure detected	*.19.17.85	*	Modem	Status	Failed
Modem initialized	*.19.17.33	*	Modem	Status	Initialized
Modem change-out	*.19.17.105	*	Modem	Status	Installed
No modem	*.19.17.160	*	Modem	Status	NotFound
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

Table E.23 – ModuleFirmware events

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Module firmware replaced	*.9.17.52	*	ModuleFirmware	Status	Replaced
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

Table E.24 – Network events

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Network association failure	*.23.74.85	*	Network	Association	Failed
Collector First Connect	*.23.52.42	*	Network	HeadEndSystem	Connected
Parent device not enabled	*.23.76.66	*	Network	ParentDevice	Disabled
Radio faults	*.23.136.85	*	Network	Radio	Failed
Collector Radio Registration Data	*.23.136.50	*	Network	Radio	Registered
Optional input closure, generator	*.23.17.42	*	Network	Status	Connected
Device not enabled Gateway not enabled	*.23.17.66	*	Network	Status	Disabled
Optional input opening, generator Device disconnected	*.23.17.68	*	Network	Status	Disconnected
DAP error DSP error	*.23.17.79	*	Network	Status	Error
Node failure Node link failure	*.23.17.85	*	Network	Status	Failed
Meter installed Gateway installed	*.23.17.105	*	Network	Status	Installed
End device sealed	*.23.17.227	*	Network	Status	Sealed
End device unsealed	*.23.17.269	*	Network	Status	Unsealed
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESG/WG on Smart Grids
No reproduction or circulation
Oct 2024

Table E.25 – PAN / HAN events

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
PAN pairing window closed	*.10.73.16	*	Pairing	Window	Closed
PAN pairing window opened (Ready To Pair)	*.10.73.39	*	Pairing	Window	Opened
PAN pairing succeeded	*.10.0.58	*	Pairing	n/a	Succeeded
PAN pairing failed	*.10.0.85	*	Pairing	n/a	Failed
PAN text message canceled	*.13.112.10	*	VideoDisplay	TextMessage	Canceled
PAN text message displayed	*.13.112.78	*	VideoDisplay	TextMessage	Displayed
PAN pricing succeeded	*.20.9.58	*	Billing	Pricing	Succeeded
PAN pricing failed	*.20.9.85	*	Billing	Pricing	Failed
PAN load control all events cancel failed	*.15.148.86	*	LoadControl	AllEvents	CancelFailed
PAN load control all events canceled	*.15.148.10	*	LoadControl	AllEvents	Canceled
PAN load control event ancel failed	*.15.43.86	*	LoadControl	Event	CancelFailed
PAN load control event canceled	*.15.43.10	*	LoadControl	Event	Canceled
PAN load control event scheduled	*.15.43.225	*	LoadControl	Event	Scheduled
PAN load control event opt-in	*.15.43.80	*	LoadControl	Event	Opt-In
PAN load control event opt-out	*.15.43.81	*	LoadControl	Event	Opt-Out
PAN device removed PAN load control device removed PAN gateway removed	*.0.0.212	*	n/a	n/a	Removed
PAN network enabled	*.23.0.76	*	Network	n/a	Enabled
PAN network disabled	*.23.0.66	*	Network	n/a	Disabled
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEEE SWG on Smart Grids
No reproduction or circulation
Oct 2024

Table E.26 – Power events

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Low current limit exceeded	*.26.6.150	*	Power	Current	MinLimitReached
Line Frequency Unstable	*.26.4.270	*	Power	Frequency	Unstable
High neutral current	*.26.137.93	*	Power	NeutralCurrent	MaxLimitReached
High neutral current Cleared	*.26.137.73	*	Power	NeutralCurrent	MaxLimitReachedCleared
Cross phase condition	*.26.25.45	*	Power	Phase	CrossPhaseDetected
Cross phase condition Cleared	*.26.25.70	*	Power	Phase	CrossPhaseCleared
Loss of phase, Phase drop out	*.26.25.85	*	Power	Phase	Failed
Inactive phase condition (voltage is present, current is not)	*.26.25.100	*	Power	Phase	Inactive
Inactive phase condition Cleared	*.26.25.72	*	Power	Phase	InactiveCleared
Phase alert cleared	*.26.25.37	*	Power	Phase	Normal
Phase threshold	*.26.25.40	*	Power	Phase	OutofRange
Phase restoration	*.26.25.216	*	Power	Phase	Restored
Phase angle limit above/below threshold	*.26.130.40	*	Power	PhaseAngle	OutofRange
Phase angle limit above/below threshold Cleared	*.26.130.74	*	Power	PhaseAngle	OutofRangeCleared
Phase angle limit exceeded	*.26.130.139	*	Power	PhaseAngle	Exceeded
Voltage Sag Started (PhaseA)	*.26.131.223	*	Power	PhaseAVoltage	SagStarted
Voltage Sag Stopped (PhaseA)	*.26.131.224	*	Power	PhaseAVoltage	SagStopped
Voltage Swell Started (PhaseA)	*.26.131.248	*	Power	PhaseAVoltage	SwellStarted
Voltage Swell Stopped (PhaseA)	*.26.131.249	*	Power	PhaseAVoltage	SwellStopped
Phase A inactive	*.26.126.100	*	Power	PhaseA	Inactive

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESG WG on Smart Grids
No reproduction or circulation
Oct 2024

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Voltage Sag Started (PhaseB)	*.26.132.223	*	Power	PhaseBVoltage	SagStarted
Voltage Sag Stopped (PhaseB)	*.26.132.224	*	Power	PhaseBVoltage	SagStopped
Voltage Swell Started (PhaseB)	*.26.132.248	*	Power	PhaseBVoltage	SwellStarted
Voltage Swell Stopped (PhaseB)	*.26.132.249	*	Power	PhaseBVoltage	SwellStopped
Phase B inactive	*.26.134.100	*	Power	PhaseB	Inactive
Voltage Sag Started (PhaseC)	*.26.133.223	*	Power	PhaseCVoltage	SagStarted
Voltage Sag Stopped (PhaseC)	*.26.133.224	*	Power	PhaseCVoltage	SagStopped
Voltage Swell Started (PhaseC)	*.26.133.248	*	Power	PhaseCVoltage	SwellStarted
Voltage Swell Stopped (PhaseC)	*.26.133.249	*	Power	PhaseCVoltage	SwellStopped
PhaseC inactive	*.26.135.100	*	Power	PhaseC	Inactive
Phase Sequence Error	*.26.78.79	*	Power	PhaseSequence	Error
Loss of voltage transducer on one phase Loss of voltage per phase	*.26.79.47	*	Power	PhaseVoltage	LossDetected
Power factor exceeded limits	*.26.27.139	*	Power	PowerFactor	Exceeded
Leading kvarh cleared Leading kvarh Condition Cleared	*.26.27.24	*	Power	PowerFactor	OutofRangeCleared
Leading kvarh caution Leading kvarh Condition	*.26.27.40	*	Power	PowerFactor	OutofRange
High distortion detected	*.26.28.69	*	Power	PowerQuality	HighDistortion
High Distortion Cleared	*.26.28.71	*	Power	PowerQuality	HighDistortionCleared
Generic Power Quality Event	*.26.28.40	*	Power	PowerQuality	OutofRange
Recording disabled	*.26.80.66	*	Power	PowerQualityRecording	Disabled
Recording enabled	*.26.80.76	*	Power	PowerQualityRecording	Enabled

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEEE SA WG on Smart Grids
No reproduction or circulation
Oct 2024

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Verify Section Power Verify Meter Power Verify Feeder Power Verify Transformer Power	*.26.17.68	*	Power	Status	Disconnected
Rf Collector Power Outage Power outage Power out Undetected power outage Last gasp outage alarm Transformer Outage	*.26.0.85	*	Power	n/a	Failed
Loss of power or voltage on phase A	*.26.126.85	*	Power	PhaseA	Failed
Loss of power or voltage on phase B	*.26.134.85	*	Power	PhaseB	Failed
Loss of power or voltage on phase C	*.26.135.85	*	Power	PhaseC	Failed
Meter Restoration Power on / restored Transformer Restoration	*.26.0.216	*	Power	n/a	Restored
Restoration of power or voltage on phase A	*.26.126.216	*	Power	PhaseA	Restored
Restoration of power or voltage on phase B	*.26.134.216	*	Power	PhaseB	Restored
Restoration of power or voltage on phase C	*.26.135.216	*	Power	PhaseC	Restored
Voltage exception	*.26.38.139	*	Power	Voltage	Exceeded
Voltage Imbalance Condition	*.26.38.98	*	Power	Voltage	Imbalanced
Voltage Imbalance Condition Cleared	*.26.38.75	*	Power	Voltage	ImbalanceCleared
Loss of voltage transducer VT Low loss potential detected	*.26.38.47	*	Power	Voltage	LossDetected
High Voltage	*.26.38.93	*	Power	Voltage	MaxLimitReached
Low voltage	*.26.38.150	*	Power	Voltage	MinLimitReached

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Voltage Imbalance Cleared	*.26.38.37	*	Power	Voltage	Normal
Voltage swell cleared	*.26.38.37	*	Power	Voltage	Normal
Voltage sag	*.26.38.223	*	Power	Voltage	SagStarted
Voltage sag cleared	*.26.38.224	*	Power	Voltage	SagStopped
Voltage swell condition	*.26.38.248	*	Power	Voltage	SwellStarted
Voltage swell cleared	*.26.38.249	*	Power	Voltage	SwellStopped
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

Table E.27 – Pressure events

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Sensed pressure equals P max	*.29.261.93	*	Pressure	Threshold	MaxLimitReached
Sensed pressure equals P min	*.29.261.150	*	Pressure	Threshold	MinLimitReached
Pressure is out of range	*.29.261.40	*	Pressure	Threshold	OutofRange
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

Table E.28 – RCDSwitch events

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Service turn-on Status input closure, # Meter connected Connect executed	*.31.0.42	*	RCDswitch	n/a	Connected
Connect failed	*.31.0.67	*	RCDSwitch	n/a	ConnectFailed
Service turn-off Status input opening, # Meter disconnected Breaker operation Disconnect executed	*.31.0.68	*	RCDswitch	n/a	Disconnected
Connect failed Disconnect failed	*.31.0.84	*	RCDswitch	n/a	DisconnectFailed
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEEE SC WG on Smart Grids
No reproduction or circulation
Oct 2024

Table E.29 – Security events

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Unauthorized access attempted	*.12.1.38	*	Security	Access	NotAuthorized
Unit accessed Unit accessed by reader Unit accessed by recorder	*.12.1.58	*	Security	Access	Succeeded
Certificate expiration alert Certificate expiration	*.12.21.64	*	Security	Certificate	Expired
Cover removal detected	*.12.29.212	*	Security	Cover	Removed
CRC error	*.12.30.79	*	Security	CRC	Error
Decryption Error Plain Text	*.12.31.63	*	Security	Data	Unsecure
Decryption Error General	*.12.36.79	*	Security	Decryption	Error
Decryption Failure	*.12.36.85	*	Security	Decryption	Failed
Collector Door Event	*.12.128.2	*	Security	Door	Accessed
Door closed	*.12.141.16	*	Security	Enclosure	Closed
Door opened	*.12.141.39	*	Security	Enclosure	Opened
Encoder tamper	*.12.40.257	*	Security	Encoder	TamperDetected
Crypto Init Failure	*.12.298.85	*	Security	Initialisation	Failed
Reverse flow detected	*.12.48.219	*	Security	Flow	Reversed
Decryption Error HMAC Failure	*.12.54.85	*	Security	HMAC	Failed
User login failure Gateway login failure	*.12.65.85	*	Security	Login	Failed
Magnetic switch alarm	*.12.66.257	*	Security	MagneticSwitch	TamperDetected
Physical tamper Tamper indication Tamper attempt suspected	*.12.0.257	*	Security	n/a	TamperDetected
Tilt detected	*.12.0.263	*	Security	n/a	Tilted
Configuration Token Invalid Network ID	*.12.71.35	*	Security	NetworkId	Invalid
Parity error	*.12.77.79	*	Security	Parity	Error
Password changed	*.12.24.24	*	Security	Password	Changed
Invalid password	*.12.24.35	*	Security	Password	Invalid
Unit accessed remotely	*.12.211.58	*	Security	RemoteAccess	Succeeded
Inverted meter or reverse rotation detected Reverse Rotation detected	*.12.93.219	*	Security	Rotation	Reversed
Read secured register Read secured table	*.12.98.2	*	Security	SecuredRegister	Accessed
Local key disable	*.12.32.66	*	Security	SecurityKey	Disabled
Local key enable	*.12.32.76	*	Security	SecurityKey	Enabled
Configuration Token Message Generation Error	*.12.32.79	*	Security	SecurityKey	Error

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESG WG on Smart Grids
No reproduction or circulation
Oct 2024

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Invalid security key	*.12.32.35	*	Security	SecurityKey	Invalid
Configuration Token Invalid Options	*.12.32.35	*	Security	SecurityKey	Invalid
Previous Key Used	*.12.32.41	*	Security	SecurityKey	Preempted
Configuration Token Processed	*.12.32.44	*	Security	SecurityKey	Processed
Local key unlock	*.12.32.62	*	Security	SecurityKey	Unlocked
Configuration Token Invalid Length	*.12.119.35	*	Security	SecurityKeyLength	Invalid
Configuration Token Invalid Version	*.12.120.35	*	Security	SecurityKeyVersion	Invalid
Signature General Error	*.12.103.79	*	Security	Signature	Error
Signature Algorithm Error Signature Verify Failure Signature Algorithm Error Signature Verify Failure Signature Algorithm Error Signature Verify Failure	*.12.103.85	*	Security	Signature	Failed
Invalid Signature Key Specified Signature Verification Error Invalid Signature Key Specified Signature Verification Error Invalid Signature Key Specified Signature Verification Error	*.12.103.35	*	Security	Signature	Invalid
Signature Missing	*.12.103.160	*	Security	Signature	NotFound
Invalid Length	*.12.104.35	*	Security	SignatureLength	Invalid
Invalid Signature Timestamp	*.12.105.35	*	Security	SignatureTimestamp	Invalid
Signature Usage Error	*.12.106.79	*	Security	SignatureUsage	Error
End device accessed for write	*.12.282.58	*	Security	WriteAccess	Succeeded
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

Table E.30 – Temperature events

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Temperature returns within range	*.35.0.37	*	Temperature	n/a	Normal
Temperature is out of range	*.35.0.40	*	Temperature	n/a	OutofRange
Sensed temperature equals T max	*.35.261.93	*	Temperature	Threshold	MaxLimitReached
Sensed temperature equals T min	*.35.261.150	*	Temperature	Threshold	MinLimitReached
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

Table E.31 – VideoDisplay events

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Display failure	*.13.17.85	*	VideoDisplay	Status	Failed
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

Table E.32 – WaterSupply events

Event or Control Description	EndDeviceEvent Type	EndDevice Type	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Complete loss of water supply	*.5.0.47	*	WaterSupply	n/a	Failed
Water supply restored	*.5.0.270	*	WaterSupply	n/a	Restored
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence
EEE & WG on Smart Grids
No reproduction or circulation
Oct 2024

Annex F
(normative)

EndDeviceControlType enumerations

F.1 General

Many metering systems have the capability to issue a command to equipment in the field that takes an action. The action might be to perform a demand-reset, open or close a switch, or a number of other activities. This Annex F describes example codes that may be used for such applications.

EndDeviceControlType enumerations are categorized in the same manner as the EndDeviceEventType enumerations described in Annex E. The code is divided into four parts:

```
EndDeviceControl.type:=
<EndDeviceType>.<EndDeviceDomain>.<EndDeviceSubdomain>.<EndDeviceEventOrAction>

where
      <EndDeviceType>           a numeric value from the EndDeviceType enumeration
                                (see EndDeviceType section in Annex E)
      <EndDeviceDomain>         a numeric value from the EndDeviceDomain
                                enumeration (see EndDeviceDomain section in
                                Annex E)
      <EndDeviceSubdomain>      a numeric value from the EndDeviceSubdomain
                                enumeration (see EndDeviceSubdomain section in
                                Annex E)
      <EndDeviceEventOrAction>  a numeric value from the EndDeviceEventOrAction
                                enumeration (see EndDeviceEventOrAction section in
                                Annex E)
```

These control types are inclusive of the control types used for PAN device controls. Controls may cause an event to be generated by the end device, which would then be reported using a EndDeviceEvents message.

F.2 Normative EndDeviceControlType Enumerations

EndDeviceType, EndDeviceDomain, EndDeviceSubdomain, and EndDeviceEventOrAction fields are combined and presented as a single string. The normative events are listed in Table F.1, Table F.2, Table F.3 and Table F.4, grouped by EndDeviceDomain.

Table F.1 – Demand Controls

Event or Control Description	EndDeviceControl Type	Expected Events	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Reset Demand	*.8.0.214	*.8.0.215 *.8.0.65	Demand	n/a	Reset
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEESC Working Group Smart Grids
No reproduction or circulation
Oct 2024

Table F.2 – LoadControl Controls

Event or Control Description	EndDeviceControl Type	Expected Events	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Load control initiate, port 0	*.15.0.54	*.15.17.242 *.15.17.217	LoadControl	n/a	Start
Load control stop/terminate, port 1	*.15.0.55	*.15.17.216 *.15.17.218	LoadControl	n/a	Stop
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

Table F.3 – PAN / HAN Controls

Event or Control Description	EndDeviceControl Type	Expected Events	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
PAN Pairing Window Open	*.10.73.298	*.10.73.39	Pairing	Window	Open
PAN Pairing Window Close	*.10.73.299	*.10.73.16	Pairing	Window	Close
PAN Text Message Display	*.13.112.77	*.13.112.78	VideoDisplay	TextMessage	Display
PAN Text Message Cancel	*.13.112.8	*.13.112.10	VideoDisplay	TextMessage	Cancel
PAN Price Signal Create	*.20.9.82	*.20.9.58	Billing	Pricing	Create
PAN Load Control All Event Cancel	*.15.148.8	*.15.148.10	LoadControl	AllEvents	Cancel
PAN Load Control Event Cancel	*.15.43.8	*.15.43.10	LoadControl	Event	Cancel
PAN Load Control Event Schedule	*.15.43.300	*.15.43.225	LoadControl	Event	Schedule
PAN Network Enable	*.23.0.26	*.23.0.76	Network	n/a	Enable
PAN Network Disable	*.23.0.22	*.23.0.66	Network	n/a	Disable
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

Table F.4 – RCDSwitch Controls

Event or Control Description	EndDeviceControl Type	Expected Events	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Disable RCD Emergency Supply Capacity Limit	*.31.138.22	*.31.138.66 *.31.138.220	RCDSwitch	EmergencySupplyCapacityLimit	Disable
Enable RCD Emergency Supply Capacity Limit	*.31.138.26	*.31.138.76 *.31.138.221	RCDSwitch	EmergencySupplyCapacityLimit	Enable
Arm Remote Connect/Disconnect Switch for Closure	*.31.0.5	*.31.0.11 *.31.0.226	RCDSwitch	n/a	ArmForClosure
Arm Remote Connect/Disconnect Switch for Open	*.31.0.6	*.31.0.12 *.31.0.222	RCDSwitch	n/a	ArmForOpen
Close Remote Connect/Disconnect Switch	*.31.0.18	*.31.0.42 *.31.0.67	RCDSwitch	n/a	Connect

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EPRI WG on Smart Grids
No reproduction or circulation
Oct 2024

Event or Control Description	EndDeviceControl Type	Expected Events	EndDevice Domain	EndDevice SubDomain	EndDevice EventOrAction
Disable Demand Limiting formula #1 for RCD Switch Disable RCD Switch	*.31.0.22	*.31.0.66 *.31.0.220	RCDSwitch	n/a	Disable
Open Remote Connect/Disconnect Switch	*.31.0.23	*.31.0.68 *.31.0.84	RCDSwitch	n/a	Disconnect
Enable Demand Limiting formula #2 for RCD Switch Enable RCD Switch	*.31.0.26	*.31.0.76 *.31.0.221	RCDSwitch	n/a	Enable
Disable RCD Supply Capacity Limit	*.31.139.22	*.31.139.66 *.31.139.220	RCDSwitch	SupplyCapacityLimit	Disable
Enable RCD Supply Capacity Limit	*.31.139.26	*.31.139.76 *.31.139.221	RCDSwitch	SupplyCapacityLimit	Enable
An asterisk (*) denotes any of the EndDeviceType values. It is assumed that the value used in any production use of these events will be relevant to the device that is actually sending this event.					

Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024
IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024

Annex G
(normative)

XML schemas for message payloads

G.1 General

The purpose of this Annex G is to provide links to the XSD serializations of the profiles of message payloads to augment the descriptions provided earlier in this document. These XSDs are normative, but may be extended as needed for specific implementation needs.

NOTE 1 There is no requirement to use IEC 61968-100:2022 when doing IEC 61869-9 messaging. However, if IEC 61968-100:2022 is to be employed in doing IEC 61869-9 messaging, these profiles will need to be extended to reference the AbstractPayload as defined in IEC 61968-100:2022. Refer to IEC 61968-100:2022, Annex C for examples.

NOTE 2 The referenced schemas were created from CIM Version iec61970cim17v40_iec61968cim13v13b_iec62325cim03v17b_cim100.1.1.1, with CIMTool Version 1.10.0. The user of the standard who wishes to utilize these schemas exactly or to modify them for specific implementation purposes will find these products as well as the current and historical versions of the CIM and CIMTool at https://cimug.ucaiug.org/Standards%20Artifacts/Forms/AllItems.aspx.

A library of *CIM Meter Reading and Control Profile Messages* are available at https://cimug.ucaiug.org. The website[1] may have other useful artefacts for the developer including (but not limited to) owl files and tabular representations of the owl files for the profiles.

G.2 ComModuleConfig

The ComModuleConfig schema is available online at

https://cimug.ucaiug.org/Standards%20Artifacts/UCA%20TF%2014/Part%209/3rd-Edition%20(CDV2)/XSDs/ComModuleConfig.xsd

G.3 EndDeviceConfig

The EndDeviceConfig schema is available at

https://cimug.ucaiug.org/Standards%20Artifacts/UCA%20TF%2014/Part%209/3rd-Edition%20(CDV2)/XSDs/EndDeviceConfig.xsd

G.4 EndDeviceControls

The EndDeviceControls schema is available at

https://cimug.ucaiug.org/Standards%20Artifacts/UCA%20TF%2014/Part%209/3rd-Edition%20(CDV2)/XSDs/EndDeviceControls.xsd

G.5 EndDeviceEvents

The EndDeviceEvents schema is available at

https://cimug.ucaiug.org/Standards%20Artifacts/UCA%20TF%2014/Part%209/3rd-Edition%20(CDV2)/XSDs/EndDeviceEvents.xsd

[1] The links will be hosted as long as the 2023 (third) edition of IEC 61869-9 remains in effect. When this document is superceded or withdrawn, the links may become invalid.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEC/TC 57/WG 9 Smart Grids
No reproduction or circulation
Oct 2024

G.6 GetComModuleConfig

The GetComModuleConfig schema is available at

https://cimug.ucaiug.org/Standards%20Artifacts/UCA%20TF%2014/Part%209/3rd-Edition%20(CDV2)/XSDs/GetComModuleConfig.xsd

G.7 GetEndDeviceConfig

The GetEndDeviceConfig schema is available at

https://cimug.ucaiug.org/Standards%20Artifacts/UCA%20TF%2014/Part%209/3rd-Edition%20(CDV2)/XSDs/GetEndDeviceConfig.xsd

G.8 GetEndDeviceControls

The GetEndDeviceControls schema is available at

https://cimug.ucaiug.org/Standards%20Artifacts/UCA%20TF%2014/Part%209/3rd-Edition%20(CDV2)/XSDs/GetEndDeviceControls.xsd

G.9 GetEndDeviceEvents

The GetEndDeviceEvents schema is available at

https://cimug.ucaiug.org/Standards%20Artifacts/UCA%20TF%2014/Part%209/3rd-Edition%20(CDV2)/XSDs/GetEndDeviceEvents.xsd

G.10 GetEndDeviceGroups

The GetEndDeviceGroups schemas is available at

https://cimug.ucaiug.org/Standards%20Artifacts/UCA%20TF%2014/Part%209/3rd-Edition%20(CDV2)/XSDs/GetEndDeviceGroups.xsd

G.11 GetMeterConfig

The GetMeterConfig schema is available at

https://cimug.ucaiug.org/Standards%20Artifacts/UCA%20TF%2014/Part%209/3rd-Edition%20(CDV2)/XSDs/GetMeterConfig.xsd

G.12 GetMeterReadings

The GetMeterReadings schema is available at

https://cimug.ucaiug.org/Standards%20Artifacts/UCA%20TF%2014/Part%209/3rd-Edition%20(CDV2)/XSDs/GetMeterReadings.xsd

G.13 GetMeterReadSchedules

The GetMeterReadSchedules schema is available at

https://cimug.ucaiug.org/Standards%20Artifacts/UCA%20TF%2014/Part%209/3rd-Edition%20(CDV2)/XSDs/GetMeterReadSchedules.xsd

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence
IEEE WG on Smart Grids
No reproduction or circulation
Oct 2024

G.14 GetUsagePointConfig

The GetUsagePointConfig is available at

https://cimug.ucaiug.org/Standards%20Artifacts/UCA%20TF%2014/Part%209/3rd-Edition%20(CDV2)/XSDs/GetUsagePointConfig.xsd

G.15 GetUsagePointGroups

The GetUsagePointGroups schema is available at

https://cimug.ucaiug.org/Standards%20Artifacts/UCA%20TF%2014/Part%209/3rd-Edition%20(CDV2)/XSDs/GetUsagePointGroups.xsd

G.16 GetUsagePointLocationConfig

The GetUsagePointLocationsConfig schema is available at

https://cimug.ucaiug.org/Standards%20Artifacts/UCA%20TF%2014/Part%209/3rd-Edition%20(CDV2)/XSDs/GetUsagePointLocationConfig.xsd

G.17 MasterDataLinkageConfig

The MasterDataLinkageConfig schema is available at

https://cimug.ucaiug.org/Standards%20Artifacts/UCA%20TF%2014/Part%209/3rd-Edition%20(CDV2)/XSDs/MasterDataLinkageConfig.xsd

G.18 MeterConfig

The MeterConfig schema is available at

https://cimug.ucaiug.org/Standards%20Artifacts/UCA%20TF%2014/Part%209/3rd-Edition%20(CDV2)/XSDs/MeterConfig.xsd

G.19 MeterReadings

The MeterReadings schema is available at

https://cimug.ucaiug.org/Standards%20Artifacts/UCA%20TF%2014/Part%209/3rd-Edition%20(CDV2)/XSDs/MeterReadings.xsd

G.20 MeterReadSchedules

The MeterReadSchedules schema is available at

https://cimug.ucaiug.org/Standards%20Artifacts/UCA%20TF%2014/Part%209/3rd-Edition%20(CDV2)/XSDs/MeterReadSchedules.xsd

G.21 UsagePointConfig

The UsagePointConfig schema is available at

https://cimug.ucaiug.org/Standards%20Artifacts/UCA%20TF%2014/Part%209/3rd-Edition%20(CDV2)/XSDs/UsagePointConfig.xsd

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence
ESCC WG on Smart Grids
No reproduction or circulation
Oct 2024

G.22 UsagePointGroups

The UsagePointGroups schema is available at

https://cimug.ucaiug.org/Standards%20Artifacts/UCA%20TF%2014/Part%209/3rd-Edition%20(CDV2)/XSDs/UsagePointGroups.xsd

G.23 UsagePointLocationConfig

The UsagePointLocationConfig schema is available at

https://cimug.ucaiug.org/Standards%20Artifacts/UCA%20TF%2014/Part%209/3rd-Edition%20(CDV2)/XSDs/UsagePointLocationConfig.xsd

Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024
IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024

Annex H
(normative)

Querying data using Get profiles

H.1 General

The purpose of this Annex H is to describe the use of Get messages to retrieve data. Get messages utilize a Get profile to provide the parameters used to specify the request. These parameters serve as filters for the data set returned in the REPLY message. This is in effect a "query" pattern. If needed, these filters can be defined as contextual profiles in a manner similar to those used to define payloads. Those structures are then realized as XML schemas.

Please refer to 8.4 of IEC 61968-100:2022 for proper usage of Get profiles within a larger messaging context. Annex D of IEC 61968-100:2022 contains examples of message exchanges using Get profiles.

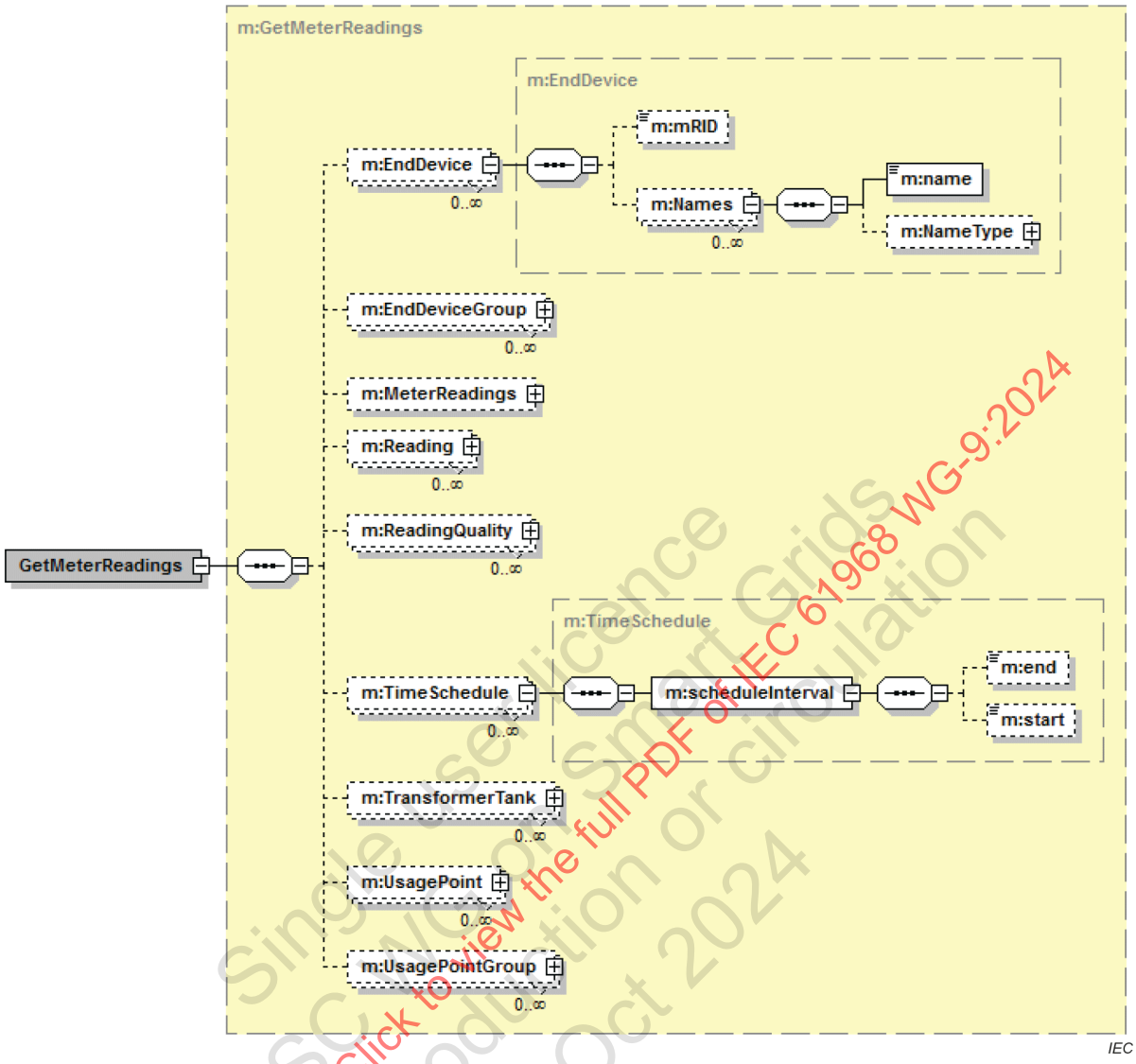
Clauses H.2 and H.3 illustrate the structure of two Get profiles listed in Table 2. Examples of the use of these two profiles are contained in Clauses D.7 and D.4 of IEC 61968-100:2022.

Users of this standard may define additional Get profiles to meet their data exchange requirements.

H.2 GetMeterReadings

The structure in Figure H.1 is a contextual profile that can be used to qualify "Get MeterReadings" requests. This provides a representative example of how mRIDs, names and time may be specified within a "Get" profile to qualify a query.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024



Reproduced with the permission of UCAIug.

Figure H.1 – GetMeterReadings

H.3 GetEndDeviceConfig

The structure in Figure H.2 is a contextual profile that can be used to qualify "GET MeterConfig" requests.

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single User Licence EESG WG of Smart Grids Oct 2024 No reproduction or circulation

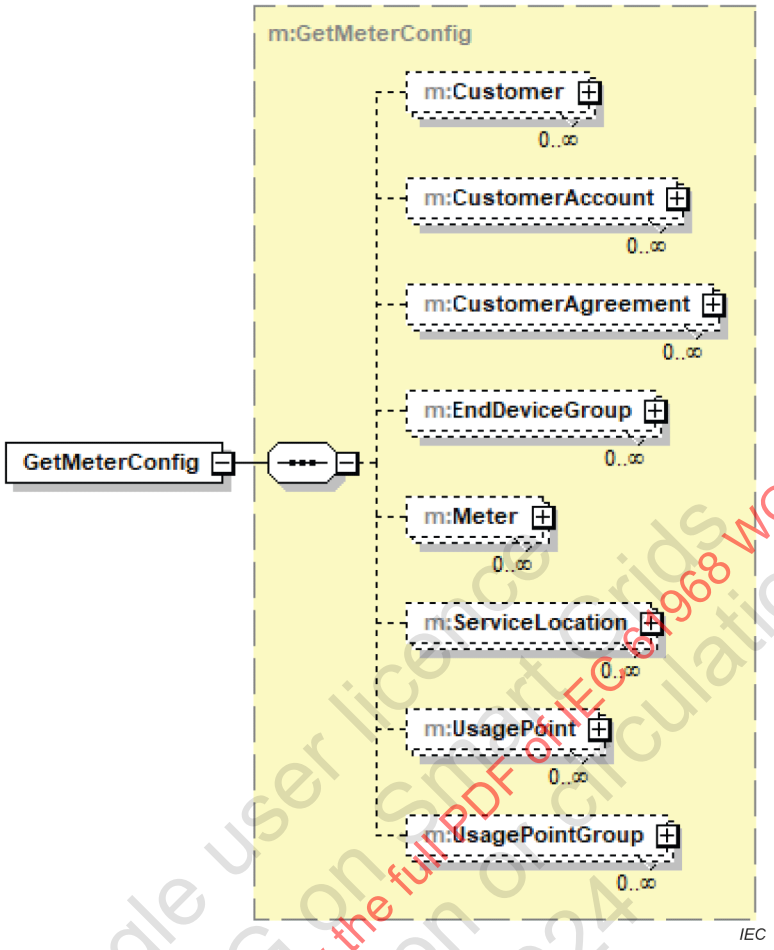


Figure H.2 reproduced with the permission of UCAIug.

Figure H.2 – GetMeterConfig

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

Annex I
(informative)

Master data management transaction processing

The purpose of this Annex I is to describe how transaction processing is performed in order to support the master data management needs of IEC 61968-9. The introduction of the "update" verb in IEC 61968-100:2022 takes care of the issues created when deleting one or more attributes or instances of associated CIM object in an operation set. However, in this document, care still must be taken when performing two or more related Master Data Management actions that must be handled in a specific sequence and/or with overall transactional integrity (i.e., either all actions must succeed or all must be rolled back).

An IEC 61968-9 message utilizing the OperationSet construct always has a Header verb of either "execute" or "executed" and a noun of "OperationSet". An OperationSet in turn contains one or more Operations, and each Operation has an operationId which supplements the overall message CorrelationID to provide a fine-grained ability to correlate the contents of one or more reply messages with the individual Operations in an OperationSet. Individual Operations within an OperationSet have OperationSet-level verbs and nouns. Allowable verbs are create, created, change, changed, delete, deleted, update and updated.

Each OperationSet may have either an EnforceMsgSequence boolean or an EnforceTransactionalIntegrity boolean, or both. The EnforceMsgSequence boolean is to be set to "true" when the Operations in the OperationSet must be executed in ascending order of their operationID. The EnforceTransactionalIntegrity boolean is to be set to "true" if all Operations in the OperationSet must succeed. In this case, if all such Operations do not succeed, all must be aborted or rolled back. If either or both of these booleans are omitted, they are assumed to be "false".

For additional information on performing Master Data Management transactions and for a full description of the new message XSD and normative exchange patterns, refer to IEC 61968-100:2022.

It should also be noted that while this document provides the means to convey Master Data Management transactions using XML schema-based data structures, it is also technically possible to leverage IEC 61970-552 for transactions based upon RDF. Such capability may or may not be provided in future editions of IEC 61968-9 and IEC 61968-100.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single User Licence for IEC WG 9 Expert Group
No reproduction or circulation
Oct 2024

Annex J
(informative)

Master data management use cases

J.1 General

The purpose of this Annex J is to provide a description of informative use cases related to master data management.

IEC 61968-100 contains verbs and constructs which are useful in performing master data management, and the examples below utilize this standard. However, it is possible to use other common practices in IT such as the common Create, Read, Update, and Delete (CRUD) verbs, as well as other methods to perform data management.

Table J.1 identifies Master Data Management / Data Synchronization use cases and provides guidance on how to construct and populate the request or event stereotype message for each use case.

Managing master data between multiple systems may often involve the use of profiles from multiple IEC 61968 parts. For example, Customer Management (IEC 61968-8) functions include billing of customers using Meter Reading and Control Data (IEC 61968-9). As such, IEC 61968-8 business functions and systems may need to utilize IEC 61968-9 profiles and vice versa. Annex J illustrates the use of profiles from multiple IEC 61968 parts to provide a comprehensive set of master data management scenarios that may apply to IEC 61968-9 business functions and systems. For profiles appearing in Annex J that are owned by other IEC 61968 parts, the owning part has been identified for convenience.

Although the intent is to not create a dependency in this part on other parts, the manipulation of master data requires the formation of relationships between data sets, and this is most easily done with IEC 61968-100. This annex therefore will use IEC 61968-100 in its examples.

It is not the intent of these use cases to provide full configuration details for these objects; it is simply to illustrate the techniques involved in creating, modifying, and deleting these objects as well as the techniques for managing the relationships between these objects using the MasterDataLinkageConfig profile.

In Table J.1, entries in the row "Relationship Line" refer to the relationship lines in Figure 49.

Please refer also to IEC 61968-100:2022 for additional information related to master data management / data synchronization.

NOTE The introduction of the "update" and "updated" verbs in IEC 61968-100:2022 fundamentally changed the way that individual attributes and instances of elements can be added, deleted, or removed from a configured item. Use of the "change" and "changed" verbs now (in IEC 61968-100:2022) requires specification of a complete replacement payload. In the table below usecases that previously used the "change/changed" verbs have been modified to use the "update/updated" verbs. When using the "update" and "updated" verbs, the IEC 61968-100:2022 message envelope contains an UpdateAction that has enumerated values of "add", "remove", or "modify" to indicate whether the attributes and/or elements specified in the payload are to be added, removed, or modified in the configuration item.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single User Licence
IEC VPN 3.0 Not for Resale
No reproduction or distribution
Oct 2024

Table J.1 – Exemplary master data management / data synchronization use cases

Use Case #	DS-1	DS-2	DS-3	DS-4
Use Case Description	Create a meter and / or receive meter into Inventory	Add or update one or more simple attributes for a meter in inventory	Delete one or more simple attributes for a meter in inventory	Add an additional instance of a class such as Register to a meter in inventory
Header Verb	create/created	update/updated	update/updated	update/updated
Header Noun	MeterConfig	MeterConfig	MeterConfig	MeterConfig
Enforce Seq	n/a	n/a	n/a	n/a
Enforce Trans	n/a	n/a	n/a	n/a
Op Set Verb	n/a	n/a	n/a	n/a
Op Set Noun	n/a	n/a	n/a	n/a
UpdateAction	n/a	add/modify	remove	add
Payload Description	1) ID of the Meter 2) As many details about the Meter as available / desired 3) Effectivity dates and reason as appropriate	1) ID of the Meter 2) Attributes and/or instances of elements that are being added or modified 3) Effectivity dates and reason as appropriate	1) ID of the Meter 2) Attributes that are being deleted 3) Effectivity dates and reason as appropriate	1) ID of the Meter 2) ID and details of the Register being added 3) Effectivity dates and reason as appropriate
Relationship Line	n/a	n/a	n/a	n/a
Comments	Meter ID can be either an mRID and/or one or more Names.name. Present tense of verbs used for request/reply patterns; past tense used for published notifications (no reply).	Simple attributes have only one occurrence at any given location within the schema.		

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence
NESC WG of Smart Grids
No reproduction or circulation
Oct 2024

Use Case #	DS-5	DS-6	DS-7	DS-8
Use Case Description	Delete an instance of a class such as Register from a meter in inventory	Configure meter with no previously defined registers to collect fwd kWh register and 15-minute interval readings	Re-configure meter to have Channel 2 of Register 1 collect 5-minute fwd kWh register readings rather than 15-minute fwd kWh interval readings	Delete a meter from inventory
Header Verb	update/updated	update/updated	update/updated	delete/deleted
Header Noun	MeterConfig	MeterConfig	MeterConfig	MeterConfig
Enforce Seq	n/a	n/a	n/a	n/a
Enforce Trans	n/a	n/a	n/a	n/a
Op Set Verb	n/a	n/a	n/a	n/a
Op Set Noun	n/a	n/a	n/a	n/a
UpdateAction	remove	n/a	n/a	n/a
Payload Description	1) ID of the Meter 2) ID of the Register being deleted 3) Effectivity dates and reason as appropriate	1) ID of meter 2) ID of Register 1 3) As many details of Register 1 as available / desired 4) ID of Channel 1 of Register 1 5) As many details of Channel 1 of Register 1 as available / desired, including ReadingType for BulkQuantity fwd kWh 6) ID of Channel 2 of Register 1 7) As many details of Channel 2 of Register 1 as available / desired, including ReadingType for 15-minute DeltaData fwd kWh 8) Effectivity dates and reason as appropriate	1) ID of meter 2) ID of Register 1 3) ID of Channel 2 of Register 1 4) As many details of Channel 2 of Register 1 as available / desired, including ReadingType for 5minute DeltaData fwd kWh 5) Effectivity dates and reason as appropriate	1) ID of meter 2) Effectivity dates and reason as appropriate
Relationship Line	n/a	n/a	n/a	n/a
Comments				Many systems may choose not to delete meters but to mark the meters as removed and/or retired.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
IEEE SC Working Group
No reproduction or circulation
Single User Licence
Smart Grids

Use Case #	DS-9	DS-10	DS-11	DS-12
Use Case Description	Receive com module into inventory	Create a service category	Create a service supplier	Create a service location
Header Verb	create/created	create/created	create/created	create/created
Header Noun	ComModuleConfig	ServiceCategoryConfig (IEC 61968-8)	SupplierConfig (IEC 61968-8)	ServiceLocationConfig (IEC 61968-8)
Enforce Seq	n/a	n/a	n/a	n/a
Enforce Trans	n/a	n/a	n/a	n/a
Op Set Verb	n/a	n/a	n/a	n/a
Op Set Noun	n/a	n/a	n/a	n/a
UpdateAction	n/a	n/a	n/a	n/a
Payload Description	1) ID of the ComModule 2) As many details about the ComModule as available / desired 3) Effectivity dates and reason as appropriate	1) ID of the ServiceCategory 2) As many details about the ServiceCategory as available / desired 3) Effectivity dates and reason as appropriate	1) ID of the ServiceSupplier 2) As many details about the ServiceSupplier as available / desired 3) Effectivity dates and reason as appropriate	1) ID of the ServiceLocation 2) As many details about the ServiceLocation as available / desired 3) Effectivity dates and reason as appropriate
Relationship Line	n/a	n/a	n/a	n/a
Comments	Follow the examples of Use Cases DS-2 through DS-8 for changes to or deletion of a ComModule after it is in inventory.	Follow the examples of Use Cases DS-2 through DS-8 for changes to or deletion of a ServiceCategory.	In de-regulated markets, the distribution utility and the retailer may be separate ServiceSuppliers (having different ServiceSupplier.kind) Follow the examples of Use Cases DS-2 through DS-8 for changes to or deletion of a ServiceSupplier.	Follow the examples of Use Cases DS-2 through DS-8 for changes to or deletion of a Servicelocation.

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
IEC WG-9:2024
No reproduction or circulation
Single user licence for Smart Grids

Use Case #	DS-13	DS-14	DS-15
Use Case Description	Create a usage point location	Create a usage point	Create a customer
Header Verb	create/created	create/created	create/created
Header Noun	UsagePointLocationConfig	UsagePointConfig	CustomerConfig (IEC 61968-8)
Enforce Seq	n/a	n/a	n/a
Enforce Trans	n/a	n/a	n/a
Op Set Verb	n/a	n/a	n/a
Op Set Noun	n/a	n/a	n/a
UpdateAction	n/a	n/a	n/a
Payload Description	1) ID of the UsagePointLocation 2) As many details about the UsagePointLocation as available / desired 3) Effectivity dates and reason as appropriate	1) ID of the UsagePoint 2) As many details about the UsagePoint as available / desired 3) Effectivity dates and reason as appropriate	1) ID of the Customer 2) As many details about the Customer as available / desired 3) Effectivity dates and reason as appropriate
Relationship Line	n/a	n/a	n/a
Comments	Follow the examples of Use Cases DS-2 through DS-8 for changes to or deletion of a UsagePointLocation.	If the UsagePoint is also a service delivery point (point of demarcation between utility and customer ownership), set the isSdp Boolean to "true". If any of the following are to be included as part of the creation of the UsagePoint, they shall exist in advance of the create / created UsagePointConfig message: ServiceSupplier, ServiceCategory, ServiceLocation, UsagePointLocation. Follow the examples of Use Cases DS-2 through DS-8 for changes to or deletion of a UsagePoint.	Follow the examples of Use Cases DS-2 through DS-8 for changes to or deletion of a Customer.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
EESC WG Single User Service
No reproduction or circulation
Open Smart Grids

Use Case #	DS-16	DS-17	DS-18	DS-19
Use Case Description	Create a customer account	Create a customer agreement	Create a pricing structure	Create a non-meter end device (including a PAN device)
Header Verb	create/created	create/created	create/created	create/created
Header Noun	CustomerAccountConfig (IEC 61968-8)	CustomerAgreementConfig (IEC 61968-8)	Pricing StructureConfig (IEC 61968-8)	EndDeviceConfig
Enforce Seq	n/a	n/a	n/a	n/a
Enforce Trans	n/a	n/a	n/a	n/a
Op Set Verb	n/a	n/a	n/a	n/a
Op Set Noun	n/a	n/a	n/a	n/a
UpdateAction	n/a	n/a	n/a	n/a
Payload Description	1) ID of the CustomerAccount 2) As many details about the CustomerAccount as available / desired 3) Effectivity dates and reason as appropriate	1) ID of the CustomerAgreement 2) As many details about the Customer Agreement as available / desired 3) Effectivity dates and reason as appropriate	1) ID of the PricingStructure 2) As many details about the PricingStructure as available / desired 3) Effectivity dates and reason as appropriate	1) ID of the EndDevice 2) As many details about the EndDevice as available / desired 3) Effectivity dates and reason as appropriate
Relationship Line	n/a	n/a	n/a	n/a
Comments	Follow the examples of Use Cases DS-2 through DS-8 for changes to or deletion of a CustomerAccount.	Follow the examples of Use Cases DS-2 through DS-8 for changes to or deletion of a CustomerAgreement.	Follow the examples of Use Cases DS-2 through DS-8 for changes to or deletion of a PricingStructure.	If the EndDevice is a PAN device, set the isPan Boolean to "true"or meters, see Use Case DS-1. Follow the examples of Use Cases DS-2 through DS-8 for changes to or deletion of an EndDevice.

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
IEEE SA WG-9 Single user licence
No reproduction or circulation
Open 2024

Use Case #	DS-20	DS-21	DS-22	DS-23
Use Case Description	Shop install a com module into a meter	Remove a com module from a meter	Reflect the pairing of an end device (e.g., a PAN device) to a meter	Reflect the unpairing of an end device (e.g., a PAN device) from a meter
Header Verb	create/created	delete/deleted	create/created	delete/deleted
Header Noun	MasterDataLinkageConfig	MasterDataLinkageConfig	MasterDataLinkageConfig	MasterDataLinkageConfig
Enforce Seq	n/a	n/a	n/a	n/a
Enforce Trans	n/a	n/a	n/a	n/a
Op Set Verb	n/a	n/a	n/a	n/a
Op Set Noun	n/a	n/a	n/a	n/a
UpdateAction	n/a	n/a	n/a	n/a
Payload Description	1) ID of the ComModule 2) ID of the Meter 3) Effectivity dates and reason as appropriate	1) ID of the ComModule 2) ID of the Meter 3) Effectivity dates and reason as appropriate	1) ID of the EndDevice 2) ID of the Meter 3) Effectivity dates and reason as appropriate	1) ID of the EndDevice 2) ID of the Meter 3) Effectivity dates and reason as appropriate
Relationship Line	A	A	B	B
Comments	Assumes the Meter and the ComModule already exist. ComModules may not exist for meters with integral communications capabilities. Multiple com modules (e.g., one for AMI network and amodule for Home Area Networking) may be installed into a meter. This transaction accomplishes only the "linkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.	ComModules may not exist for meters with integral communications capabilities. This transaction accomplishes only the "delinkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.	Assumes the EndDevice and the Meter already exist. Multiple EndDevices devices may be paired with a given meter. An EndDevice may optionally be "paired" with a UsagePoint rather than a meter. This would most typically be done when the communication with a PAN device is not via the meter. See Use Case DS25. At any given time, a EndDevice should not be paired with both a Meter and a UsagePoint. This transaction accomplishes only the "linkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.	Multiple EndDevices may be paired with a given meter. Un-pairing an EndDevice does not delete the EndDevice but only takes it out-of-service for that meter. This transaction accomplishes only the "delinkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024

Use Case #	DS-24	DS-25	DS-26	DS-27
Use Case Description	Reflect the pairing of an end device (e.g., a PAN device) to a usage point	Reflect the unpairing of an end device (e.g., a PAN device) from a a usage point	Reflect the installation of a meter at usage point	Reflect the removal of a meter from a usage point
Header Verb	create/created	delete/deleted	create/created	delete/deleted
Header Noun	MasterDataLinkageConfig	MasterDataLinkageConfig	MasterDataLinkageConfig	MasterDataLinkageConfig
Enforce Seq	n/a	n/a	n/a	n/a
Enforce Trans	n/a	n/a	n/a	n/a
Op Set Verb	n/a	n/a	n/a	n/a
Op Set Noun	n/a	n/a	n/a	n/a
UpdateAction	n/a	n/a	n/a	n/a
Payload Description	1) ID of the EndDevice 2) ID of the UsagePoint 3) Effectivity dates and reason as appropriate	1) ID of the EndDevice 2) ID of the UsagePoint 3) Effectivity dates and reason as appropriate	1) ID of the Meter 2) ID of the UsagePoint 3) Effectivity dates and reason as appropriate	1) ID of the Meter 2) ID of the UsagePoint 3) Effectivity dates and reason as appropriate
Relationship Line	C	C	D	D
Comments	Assumes the EndDevice and the UsagePoint already exist. Multiple end devices may be paired with a given UsagePoint. A EndDevice may optionally be "paired" with a meter rather than a UsagePoint. This would most typically be done when the communication with a PAN device is via the meter. See Use Case DS-23. At any given time, an EndDevice should not be paired with both a Meter and a UsagePoint. This transaction accomplishes only the "linkage" of these objects. I there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.	Multiple end devices may be paired with a given Usage Point. Un-pairing an EndDevice does not delete the EndDevice but only takes it out-of-service for that UsagePoint. This transaction accomplishes only the "delinkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.	Assumes that both the Meter and the UsagePoint already exist. Multiple meters may be installed at a given UsagePoint, although some enterprise systems do not support doing so. This is the master data synchronization transaction reflecting the meter installation. It may be preceded by or accompanied by another Part 9 message associated with a service request for the field work associated with the installation. This transaction accomplishes only the "linkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.	Multiple meters may be installed at a given UsagePoint, although some enterprise systems do not support doing so. Removing (uninstalling) a meter does not delete the Meter but only takes it out-of-service for that UsagePoint. This transaction accomplishes only the "delinkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024

Use Case #	DS-28	DS-29	DS-30	DS-31
Use Case Description	Associate a pricing structure with a usage point	Disassociate a pricing structure from a usage point	Associate a customer agreement with a usage point	Disassociate a customer agreement from a usage point
Header Verb	create/created	delete/deleted	create/created	delete/deleted
Header Noun	MasterDataLinkageConfig	MasterDataLinkageConfig	MasterDataLinkageConfig	MasterDataLinkageConfig
Enforce Seq	n/a	n/a	n/a	n/a
Enforce Trans	n/a	n/a	n/a	n/a
Op Set Verb	n/a	n/a	n/a	n/a
Op Set Noun	n/a	n/a	n/a	n/a
UpdateAction	n/a	n/a	n/a	n/a
Payload Description	1) ID of the PricingStructure 2) ID of the UsagePoint 3) Effectivity dates and reason as appropriate	1) ID of the PricingStructure 2) ID of the UsagePoint 3) Effectivity dates and reason as appropriate	1) ID of the CustomerAgreement 2) ID of the UsagePoint 3) Effectivity dates and reason as appropriate	1) ID of the CustomerAgreement 2) ID of the UsagePoint 3) Effectivity dates and reason as appropriate
Relationship Line	G	G	H	H
Comments	Assumes that both the PricingStructure and the UsagePoint already exist. This transaction accomplishes only the "linkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.	This transaction accomplishes only the "delinkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.	Assumes that both the CustomerAgreement and the UsagePoint already exist. This transaction accomplishes only the "linkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.	This transaction accomplishes only the "delinkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence only, copying and networking prohibited
EESC WG 04 Not for distribution

Use Case #	DS-32	DS-33	DS-34	DS-35
Use Case Description	Associate a customer account with a usage point	Disassociate a customer account from a usage point	Associate a customer with a usage point	Disassociate a customer from a usage point
Header Verb	create/created	delete/deleted	create/created	delete/deleted
Header Noun	MasterDataLinkageConfig	MasterDataLinkageConfig	MasterDataLinkageConfig	MasterDataLinkageConfig
Enforce Seq	n/a	n/a	n/a	n/a
Enforce Trans	n/a	n/a	n/a	n/a
Op Set Verb	n/a	n/a	n/a	n/a
Op Set Noun	n/a	n/a	n/a	n/a
UpdateAction	n/a	n/a	n/a	n/a
Payload Description	1) ID of the CustomerAccount 2) ID of the UsagePoint 3) Effectivity dates and reason as appropriate	1) ID of the CustomerAccount 2) ID of the UsagePoint 3) Effectivity dates and reason as appropriate	1) ID of the Customer 2) ID of the UsagePoint 3) Effectivity dates and reason as appropriate	1) ID of the Customer 2) ID of the UsagePoint 3) Effectivity dates and reason as appropriate
Relationship Line	K	K	L	L
Comments	Assumes that both the CustomerAccount and the UsagePoint already exist. This transaction accomplishes only the "linkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.	This transaction accomplishes only the "delinkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.	Assumes that both the Customer and the UsagePoint already exist. This transaction accomplishes only the "linkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.	This transaction accomplishes only the "delinkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence only, copying and networking prohibited
EESC WG 9 Committee Draft
Not for distribution or circulation

Use Case #	DS-36	DS-37	DS-38	DS-39
Use Case Description	Associate a pricing structure with a customer agreement	Disassociate a pricing structure from a customer agreement	Associate a service location with a customer agreement	Disassociate a service location from a customer agreement
Header Verb	create/created	delete/deleted	create/created	delete/deleted
Header Noun	MasterDataLinkageConfig	MasterDataLinkageConfig	MasterDataLinkageConfig	MasterDataLinkageConfig
Enforce Seq	n/a	n/a	n/a	n/a
Enforce Trans	n/a	n/a	n/a	n/a
Op Set Verb	n/a	n/a	n/a	n/a
Op Set Noun	n/a	n/a	n/a	n/a
UpdateAction	n/a	n/a	n/a	n/a
Payload Description	1) ID of the PricingStructure 2) ID of the CustomerAgreement 3) Effectivity dates and reason as appropriate	1) ID of the PricingStructure 2) ID of the CustomerAgreement 3) Effectivity dates and reason as appropriate	1) ID of the ServiceLocation 2) ID of the CustomerAgreement 3) Effectivity dates and reason as appropriate	1) ID of the ServiceLocation 2) ID of the CustomerAgreement 3) Effectivity dates and reason as appropriate
Relationship Line	N	N	O	O
Comments	Assumes that both the PricingStructure and the CustomerAgreement already exist. This transaction accomplishes only the "linkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.	This transaction accomplishes only the "delinkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.	Assumes that both the ServiceLocation and the CustomerAgreement already exist. This transaction accomplishes only the "linkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.	This transaction accomplishes only the "delinkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence only, copying and networking prohibited
IEC TC 57 WG 9:2024 - Interface standards for distribution management
Not for resale, duplication or distribution

Use Case #	DS-40	DS-41	DS-42	DS-43
Use Case Description	Associate a usage point location with a service location	Disassociate a usage point location from a service location	Associate a customer account with a customer	Disassociate a customer account from a customer
Header Verb	create/created	delete/deleted	create/created	delete/deleted
Header Noun	MasterDataLinkageConfig	MasterDataLinkageConfig	MasterDataLinkageConfig	MasterDataLinkageConfig
Enforce Seq	n/a	n/a	n/a	n/a
Enforce Trans	n/a	n/a	n/a	n/a
Op Set Verb	n/a	n/a	n/a	n/a
Op Set Noun	n/a	n/a	n/a	n/a
UpdateAction	n/a	n/a	n/a	n/a
Payload Description	1) ID of the UsagePointLocation 2) ID of the ServiceLocation 3) Effectivity dates and reason as appropriate	1) ID of the UsagePointLocation 2) ID of the ServiceLocation 3) Effectivity dates and reason as appropriate	1) ID of the CustomerAccount 2) ID of the Customer 3) Effectivity dates and reason as appropriate	1) ID of the CustomerAccount 2) ID of the Customer 3) Effectivity dates and reason as appropriate
Relationship Line	P	P	Q	Q
Comments	Assumes that both the UsagePointLlocation and the ServiceLocation already exist. This transaction accomplishes only the "linkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.	This transaction accomplishes only the "delinkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.	Assumes that both the CustomerAccount and the Customer already exist. This transaction accomplishes only the "linkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.	This transaction accomplishes only the "delinkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence only, copying and networking prohibited
IEC Webstore
No reproduction or networking permitted without licence from IHS

Use Case #	DS-44	DS-45	DS-46	DS-47
Use Case Description	Associate a customer agreement with a customer account	Disassociate a customer agreement from a customer account	Associate a service supplier with a customer account	Disassociate a service supplier from a customer account
Header Verb	create/created	delete/deleted	create/created	delete/deleted
Header Noun	MasterDataLinkageConfig	MasterDataLinkageConfig	MasterDataLinkageConfig	MasterDataLinkageConfig
Enforce Seq	n/a	n/a	n/a	n/a
Enforce Trans	n/a	n/a	n/a	n/a
Op Set Verb	n/a	n/a	n/a	n/a
Op Set Noun	n/a	n/a	n/a	n/a
UpdateAction	n/a	n/a	n/a	n/a
Payload Description	1) ID of the CustomerAgreement 2) ID of the CustomerAccount 3) Effectivity dates and reason as appropriate	1) ID of the CustomerAgreement 2) ID of the CustomerAccount 3) Effectivity dates and reason as appropriate	1) ID of the ServiceSupplier 2) ID of the CustomerAccount 3) Effectivity dates and reason as appropriate	1) ID of the ServiceSupplier 2) ID of the CustomerAccount 3) Effectivity dates and reason as appropriate
Relationship Line	R	R	S	S
Comments	Assumes that both the CustomerAgreement and the Customer account already exist. This transaction accomplishes only the "linkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.	This transaction accomplishes only the "delinkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.	Assumes that both the ServiceSupplier and the CustomerAccount already exist. This transaction accomplishes only the "linkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.	This transaction accomplishes only the "delinkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence only, copying and networking prohibited
IEC TC 57 offers no opinion on any of these terms and conditions
Not for distribution or resale

Use Case #	DS-48	DS-49	DS-50	DS-51
Use Case Description	Associate a service supplier with a customer agreement	Disassociate a service supplier from a customer agreement	Associate a customer agreement with a customer	Disassociate a customer agreement from a customer account
Header Verb	create/created	delete/deleted	create/created	delete/deleted
Header Noun	MasterDataLinkageConfig	MasterDataLinkageConfig	MasterDataLinkageConfig	MasterDataLinkageConfig
Enforce Seq	n/a	n/a	n/a	n/a
Enforce Trans	n/a	n/a	n/a	n/a
Op Set Verb	n/a	n/a	n/a	n/a
Op Set Noun	n/a	n/a	n/a	n/a
UpdateAction	n/a	n/a	n/a	n/a
Payload Description	1) ID of the ServiceSupplier 2) ID of the CustomerAgreement 3) Effectivity dates and reason as appropriate	1) ID of the ServiceSupplier 2) ID of the CustomerAgreement 3) Effectivity dates and reason as appropriate	1) ID of the CustomerAgreement 2) ID of the Customer 3) Effectivity dates and reason as appropriate	1) ID of the CustomerAgreement 2) ID of the Customer 3) Effectivity dates and reason as appropriate
Relationship Line	T	T	U	U
Comments	Assumes that both the ServiceSupplier and the CustomerAgreement already exist. This transaction accomplishes only the "linkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.	This transaction accomplishes only the "delinkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.	Assumes that both the CustomerAgreement and the Customer already exist. This transaction accomplishes only the "linkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.	This transaction accomplishes only the "delinkage" of these objects. If there is a desire to update either or both of the object records, additional messages can be created. Additionally, the multiple actions may be combined with control over sequence and overall transaction integrity using the OperationSet construct in Message.xsd. This approach is illustrated in a number of separate use cases.

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence only, copying and networking prohibited
EESC WG of IEC 61968-9:2024
Not for distribution or resale

Use Case #	DS-52			
Use Case Description	Exchange meter 2 for meter 1 at a usage point and update the install date for meter 2 and the removal date for meter 1			
Header Verb	execute/executed			
Header Noun	OperationSet (IEC 61968-100)			
Enforce Seq	"true"			
Enforce Trans	"true"			
Op Set Verb	delete/deleted	create/created	update/updated	update/updated
Op Set Noun	MasterDataLinkageConfig	MasterDataLinkageConfig	MeterConfig	MeterConfig
UpdateAction	n/a	n/a	modify	modify
Payload Description	1) ID of Meter 1 2) ID of the UsagePoint 3) Effectivity dates and reason as appropriate	1) ID of Meter 2 2) ID of the UsagePoint 3) Effectivity dates and reason as appropriate	1) ID of Meter 1 2) Removal date for Meter 1 3) Effectivity dates and reason as appropriate	1) ID of Meter 2 2) Installation date for Meter 2 3) Effectivity dates and reason as appropriate
Relationship Line	D	D	n/a	n/a
Comments	Assumes creation / configuration of meter 2 occurred in advance of ithe meter exchange transaction. The enforceMessageSequence flag is set to "true" to ensure that meter 1 is removed before meter 2 is installed. The EnforceTransactionalIntegrity flag is set to "true" to ensure that all portions of this transaction are rolled back (voided) if any of the transactions fail. This ensures overall integrity of the database in the receiving system.			

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence
EEBC WG Smart Grids
No reproduction or circulation
Oct 2024

Use Case #	DS-53	
Use Case Description	Reflect the creation of a PAN device and its pairing with an existing meter	
Header Verb	execute/executed	
Header Noun	OperationSet (IEC 61968-100)	
Enforce Seq	"true"	
Enforce Trans	"true"	
Op Set Verb	create/created	create/created
Op Set Noun	EndDeviceConfig	MasterDataLinkageConfig
UpdateAction	n/a	n/a
Payload Description	1) ID of the EndDevice (PAN device) 2) As many details about the EndDevice (PAN device) as available / desired 3) Effectivity dates and reason as appropriate	1) ID of the EndDevice (PAN device) 2) ID of the Meter 3) Effectivity dates and reason as appropriate
Relationship Line	n/a	B
Comments	For this Pan device example, the isPan Boolean in the EndDeviceConfig will be set to "true". Assumes the meter was created in advance of the this composite transaction. The EnforceMessageSequence flag is set to "true" to ensure that the PAN device is created before it is associated with the meter. The EnforceTransactionalIntegrity flag is set to "true" to ensure that all portions of this transaction are rolled back (voided) if any of the transactions fail. This ensures overall integrity of the database in the receiving system.	

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
EESCWG Single user licence
No reproduction or circulation
Oct 2024
Smart Grids

J.2 Sample XML for Exemplary Master Data Management use cases

J.2.1 General

The remainder of this Annex provides sample XML for a set of use cases that illustrates the intended use of the IEC 61869-9 Master Data Management Transaction profile set.

Although only a small subset of the available profiles is included, the examples are applicable to the remaining Master Data Management use cases and profiles.

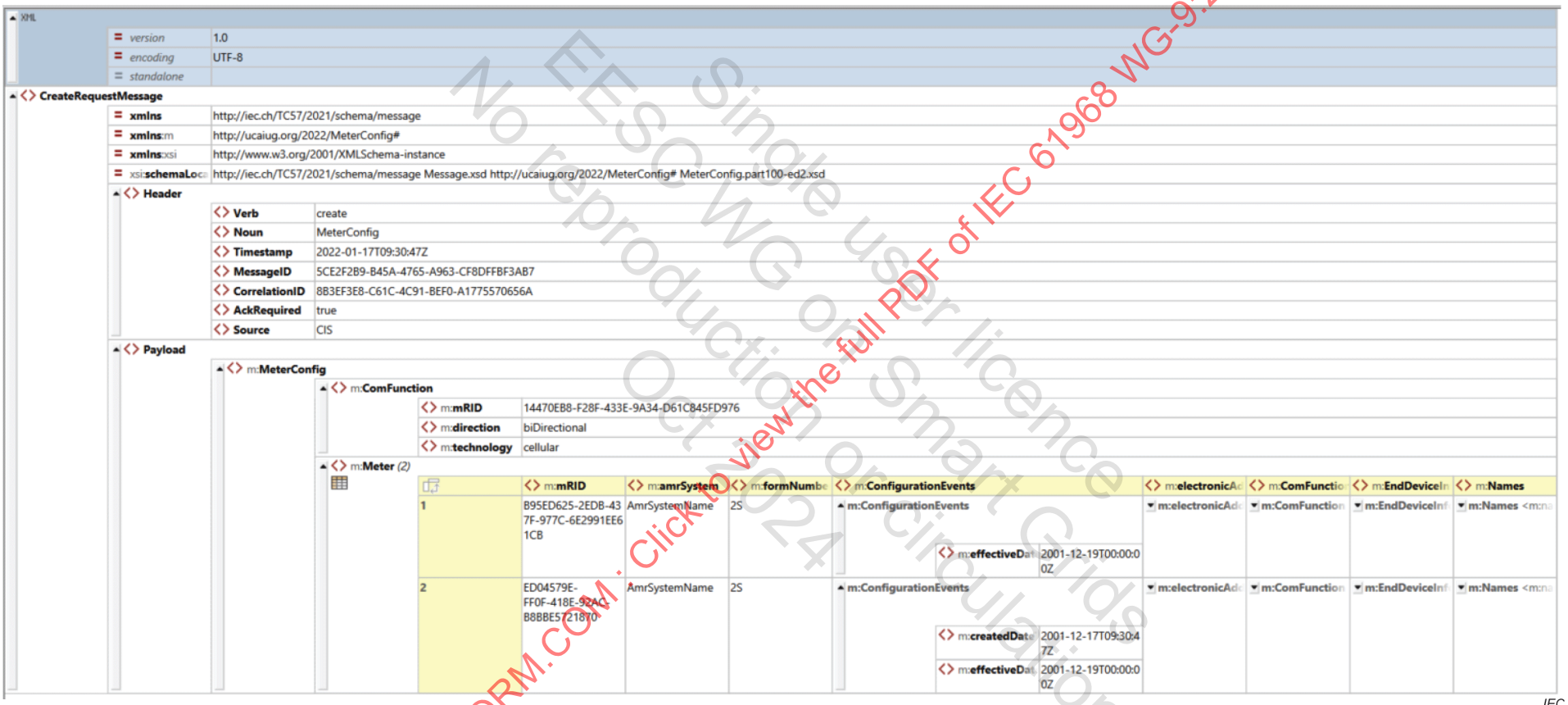
In most of the examples below, there are four steps for each use case:

- a CIS system sends a message to the Meter Data Management System (MDMS) to synchronize certain master data,
- the MDMS sends a simple acknowledgment response message to the CIS to indicate it has received the request. (This is an optional step that is bypassed when using JMS messaging if the AckRequired in the Header of the Step 1 request message is set to "false"),
- the MDMS sends a response message to the CIS to indicate that the request was completed successfully, or
- the MDMS sends a response message to the CIS to indicate that the request failed to complete successfully.

Single user licence only, copyright IEC
IEC SC WG on Smart Grid
No reproduction or circulation
Oct 2024
IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024

J.2.2 Create MeterConfig – Two Meters – Step 1

The first step for instantiating two meters using a MeterConfig message is illustrated in Figure J.1. This figure is large and shows several columns collapsed in the top part, and expanded in the bottom part.



XML		
	version	1.0
	encoding	UTF-8
	standalone	

CreateRequestMessage		
	xmlns	http://iec.ch/TC57/2021/schema/message
	xmlns:m	http://ucaiug.org/2022/MeterConfig#
	xmlns:xsi	http://www.w3.org/2001/XMLSchema-instance
	xsi:schemaLoc	http://iec.ch/TC57/2021/schema/message Message.xsd http://ucaiug.org/2022/MeterConfig# MeterConfig.part100-ed2.xsd

Header		
	Verb	create
	Noun	MeterConfig
	Timestamp	2022-01-17T09:30:47Z
	MessageID	5CE2F2B9-B45A-4765-A963-CF8DFFBF3AB7
	CorrelationID	8B3EF3E8-C61C-4C91-BEF0-A1775570656A
	AckRequired	true
	Source	CIS

Payload / m:MeterConfig / m:ComFunction		
	m:mRID	14470EB8-F28F-433E-9A34-D61C845FD976
	m:direction	biDirectional
	m:technology	cellular

m:Meter (2)

	m:mRID	m:amrSystem	m:formNumbe	m:ConfigurationEvents	m:electronicAd	m:ComFunctio	m:EndDeviceIn	m:Names
1	B95ED625-2EDB-437F-977C-6E2991EE61CB	AmrSystemName	2S	m:ConfigurationEvents / m:effectiveDat: 2001-12-19T00:00:00Z	m:electronicAd	m:ComFunction	m:EndDeviceInf	m:Names <m:na
2	ED04579E-FF0F-418E-92AC-B8BBE5721870	AmrSystemName	2S	m:ConfigurationEvents / m:createdDate: 2001-12-17T09:30:47Z / m:effectiveDat: 2001-12-19T00:00:00Z	m:electronicAd	m:ComFunction	m:EndDeviceInf	m:Names <m:na

IEC

EESCWG of Smart Grids
No reproduction or circulation
Oct 2024
Single user licence
IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024

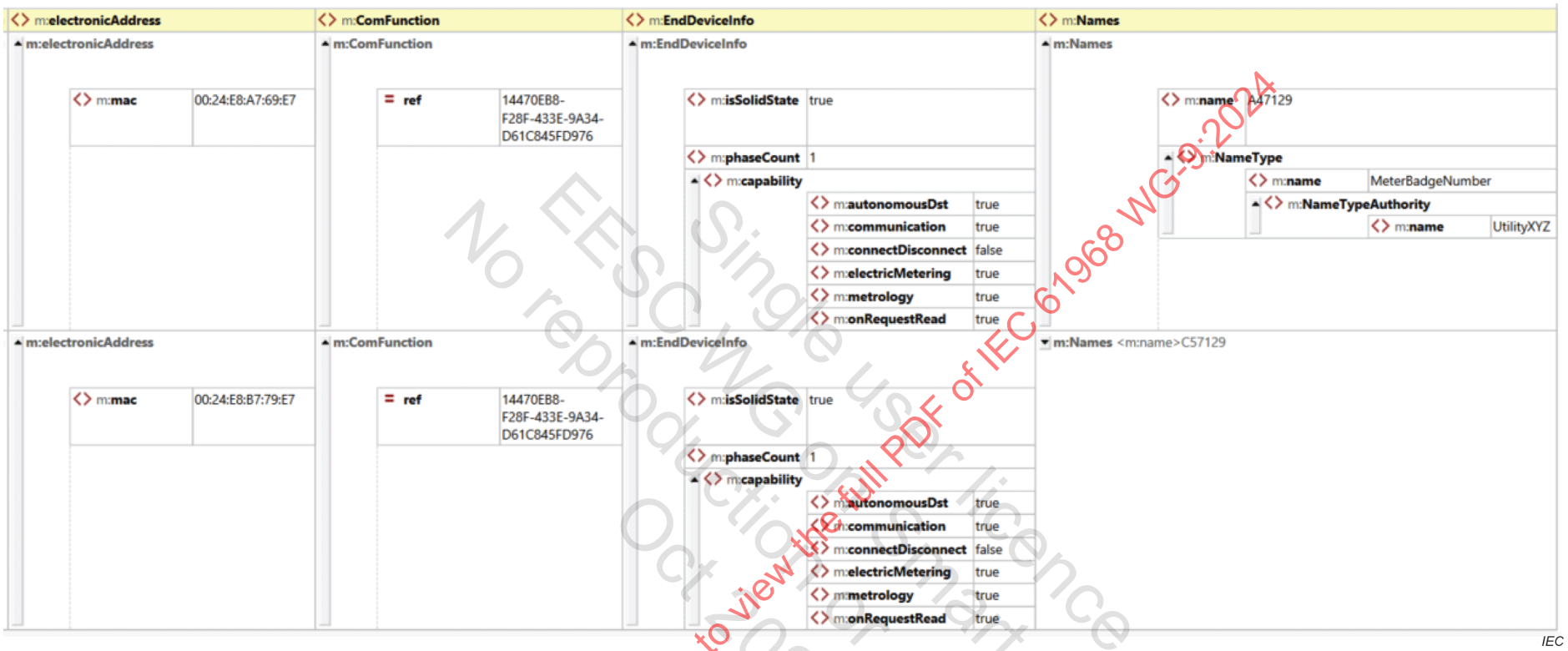


Figure J.1 reproduced with the permission of UCAIug.

Figure J.1 – Create MeterConfig – Two Meters – Step 1

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
EESCWG Enterprise Smart Grids
No reproduction for circulation
Oct 2024
Single user licence

J.2.3 Create MeterConfig – Two Meters – Step 2

The second step for instantiating two meters using a MeterConfig message is illustrated in Figure J.2.

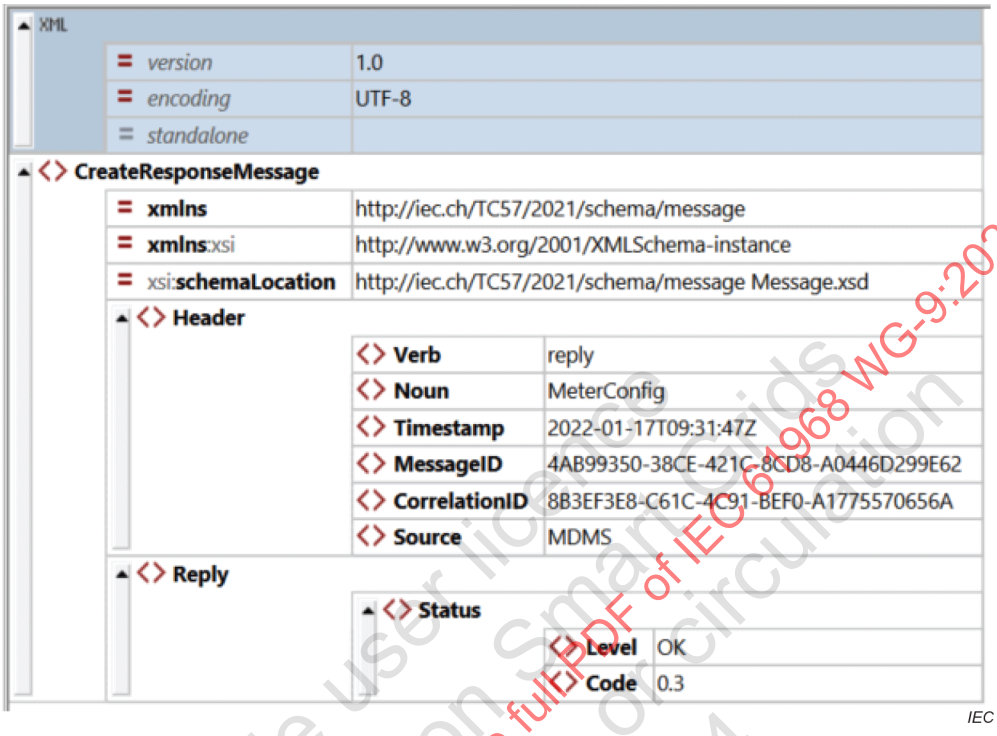


Figure J.2 reproduced with the permission of UCAIug.

Figure J.2 – Create MeterConfig – Two Meters – Step 2

J.2.4 Create MeterConfig – Two Meters – Step 3

The third step for instantiating two meters using a MeterConfig message is illustrated in Figure J.3.

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence
EESG WG on Smart Grids
No reproduction or circulation
Oct 2024

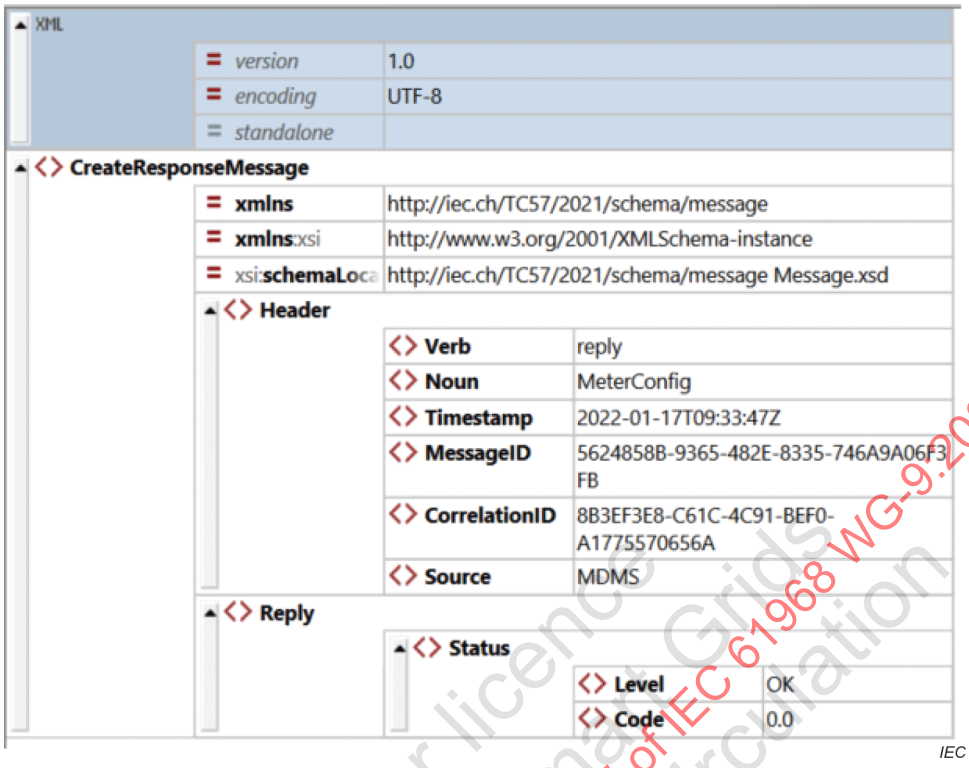


Figure J.3 reproduced with the permission of UCAIug.

Figure J.3 – Create MeterConfig – Two Meters – Step 3

J.2.5 Create MeterConfig – Two Meters – Step 4

The fourth step for instantiating two meters using a MeterConfig message is illustrated in Figure J.4.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG 01 Smart Grids
No reproduction or circulation
Oct 2024

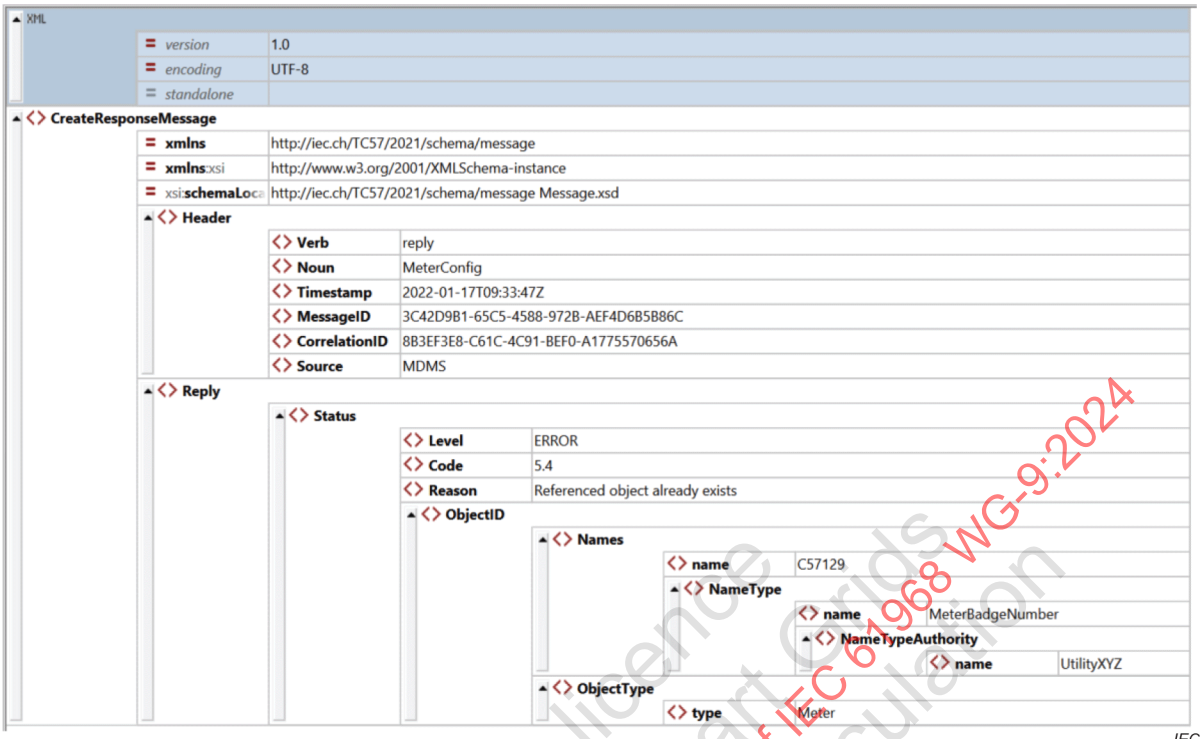


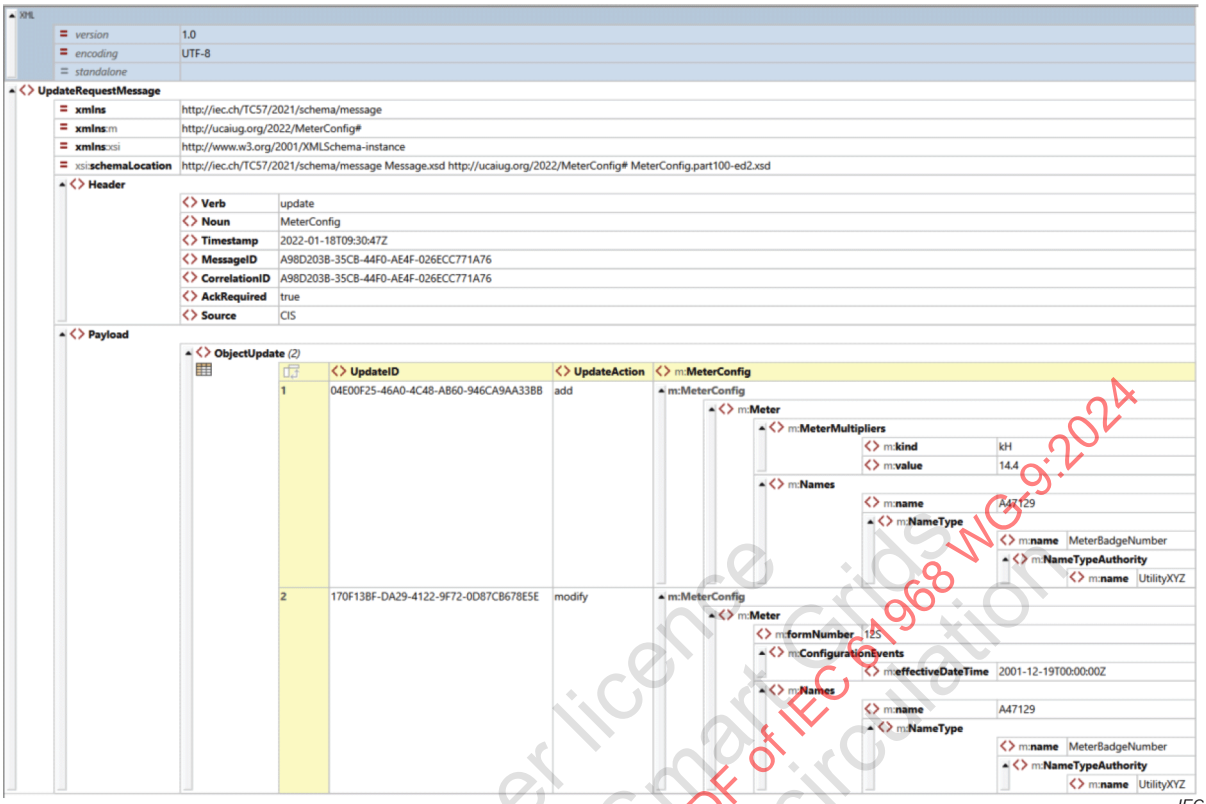
Figure J.4 reproduced with the permission of UCAIug.

Figure J.4 – Create MeterConfig – Two Meters – Step 4

J.2.6 **Update MeterConfig** (add MeterMultipliers, modify formNumber and ConfigurationEvent) **– Step 1**

The first step for updating a meter configuration using MeterConfig message is illustrated in Figure J.5.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024



IEC

Figure J.5 reproduced with the permission of UCAIug.

Figure J.5 – Create MeterConfig – Update MeterConfig (add MeterMultiplies, modify formNumber and ConfigurationEvent) Step 1

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

J.2.7 **Update MeterConfig** (add MeterMultipliers, modify formNumber and ConfigurationEvent) **– Step 2**

The second step for updating a meter configuration using MeterConfig message is illustrated in Figure J.6.

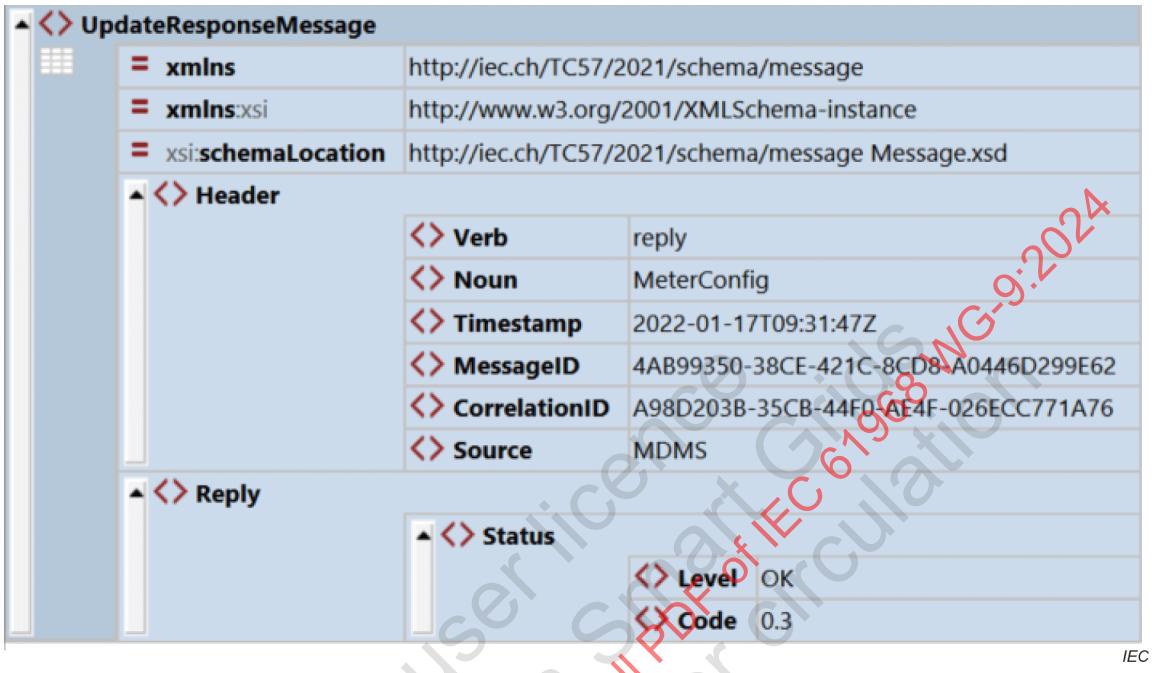


Figure J.6 reproduced with the permission of UCAIug.

Figure J.6 – Update MeterConfig (add MeterMultiplies, modify formNumber and ConfigurationEvent) Step 2

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

J.2.8 **Update MeterConfig** (add MeterMultipliers, modify formNumber and ConfigurationEvent) **– Step 3**

The third step for updating a meter configuration using MeterConfig message is illustrated in Figure J.7.

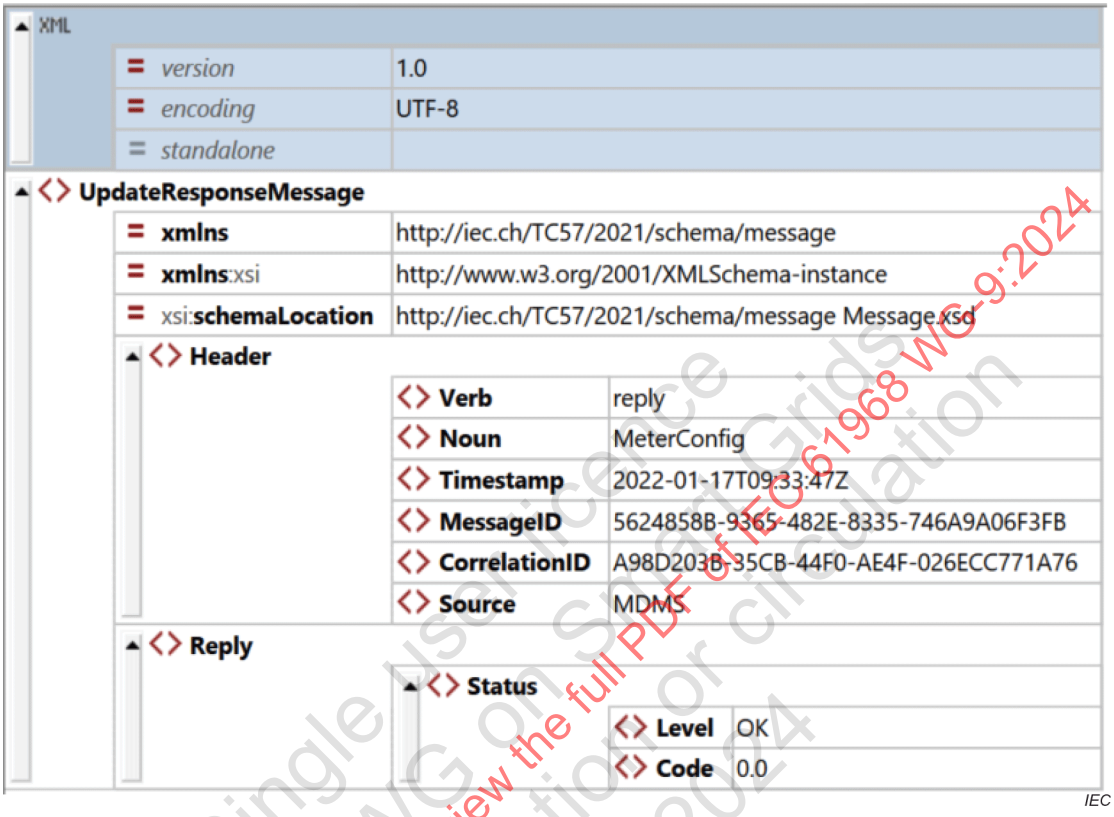


Figure J.7 reproduced with the permission of UCAIug.

Figure J.7 – Update MeterConfig (add MeterMultiplies, modify formNumber and ConfigurationEvent) Step 3

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single User Licence EEBus WG on Smart Grids No reproduction or circulation Oct 2024

J.2.9 **UpdateMeterConfig** (add MeterMultipliers, modify formNumber and ConfigurationEvent) **– Step 4**

The fourth step for updating a meter configuration using MeterConfig message is illustrated in Figure J.8.

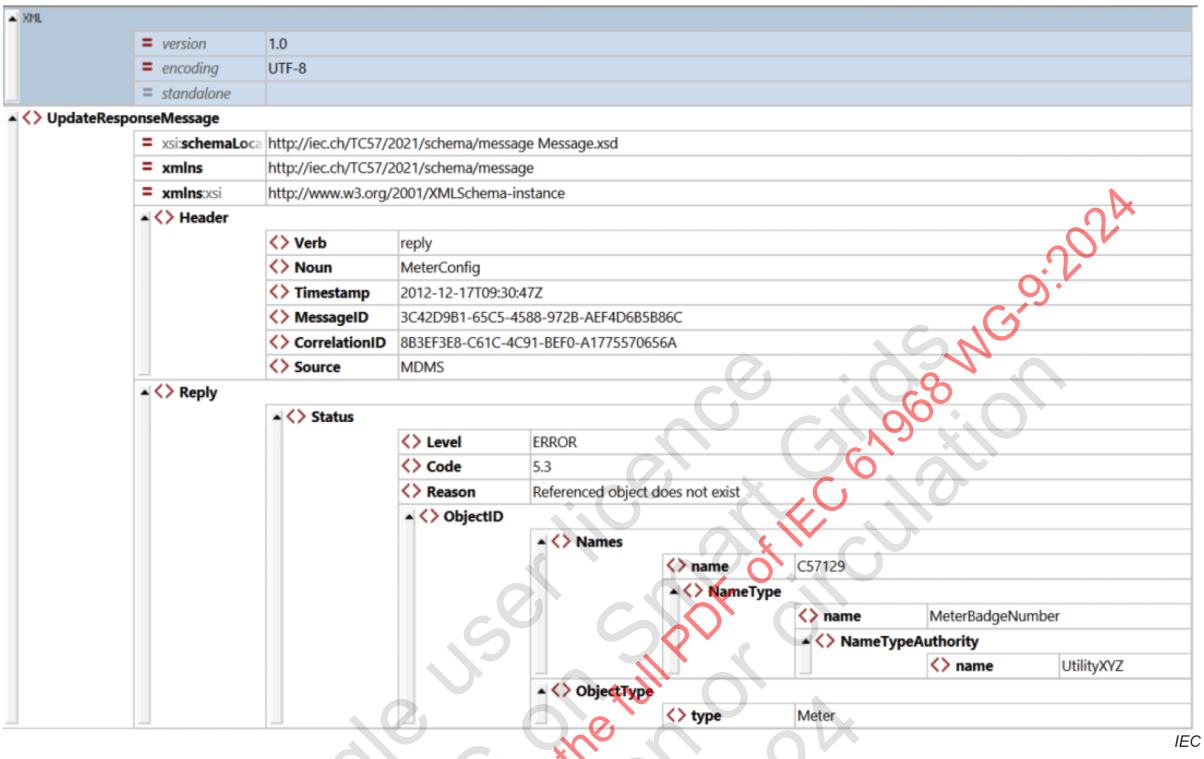


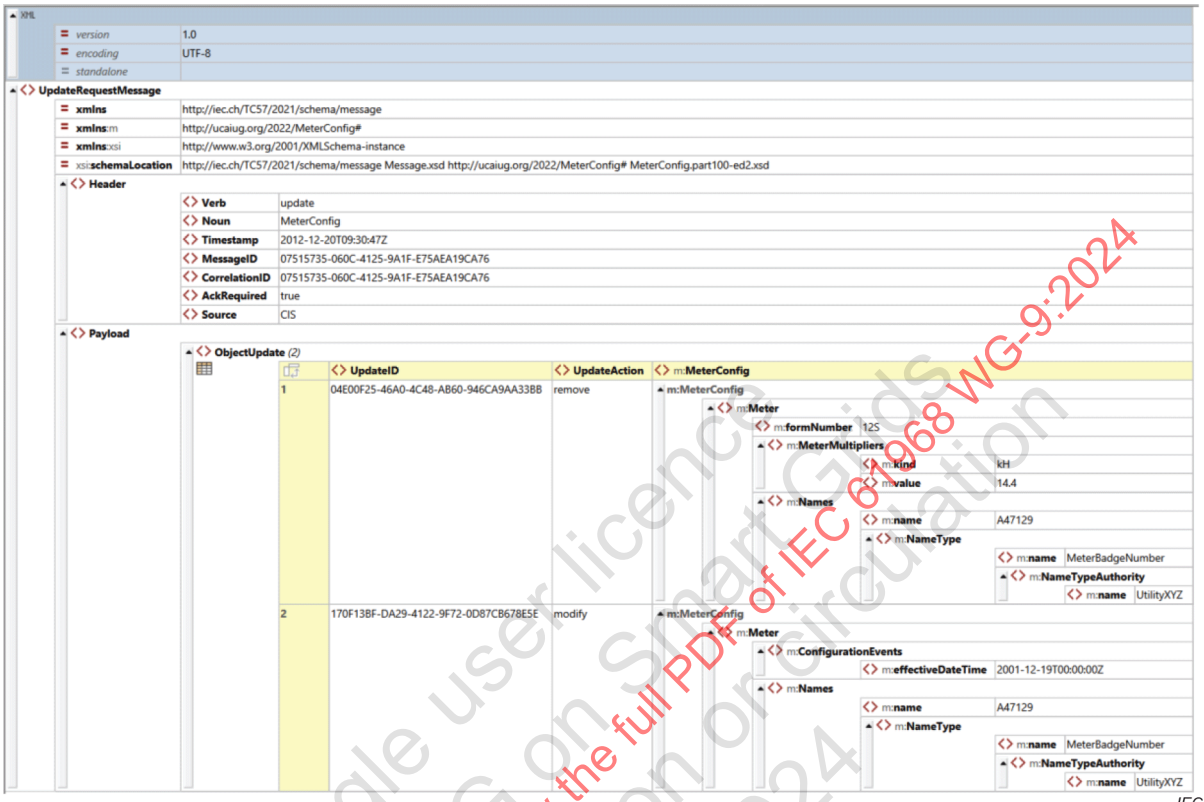
Figure J.8 reproduced with the permission of UCAIug.

Figure J.8 – Update MeterConfig (add MeterMultiplies, modify formNumber and ConfigurationEvent) Step 4

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence
EESCWG on Smart Grids
No reproduction or circulation
Oct 2024

J.2.10 **Update MeterConfig** (delete details) **– Step 1**

The first step for deleting a meter configuration using a MeterConfig message is illustrated in Figure J.9. This use case deletes information concerning a Meter – not the Meter itself.



IEC

Figure J.9 reproduced with the permission of UCAIug.

Figure J.9 – Update MeterConfig (delete details) – Step 1

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024 CMV WG-9:2024
EESC WG on Smart Grids
single user licence
No reproduction or circulation
Out 2024

J.2.11 **Update MeterConfig** (delete details) **– Step 2**

The first step for deleting a meter configuration using a MeterConfig message is illustrated in Figure J.10.

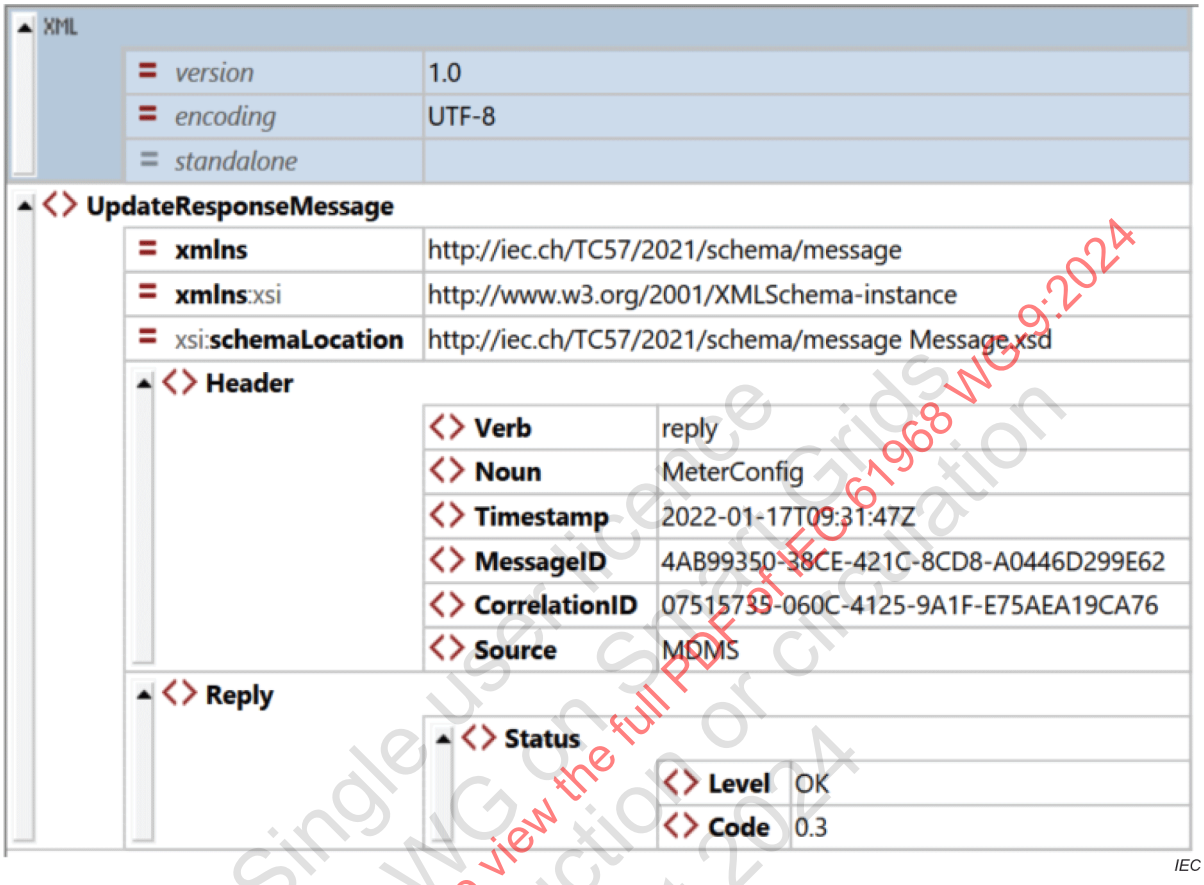


Figure J.10 reproduced with the permission of UCAIug.

Figure J.10 – Update MeterConfig (delete details) – Step 2

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESG WG on Smart Grids
No reproduction or circulation
Oct 2024

J.2.12 **Update MeterConfig** (delete details) **– Step 3**

The third step for deleting a meter configuration using a MeterConfig message is illustrated in Figure J.11.

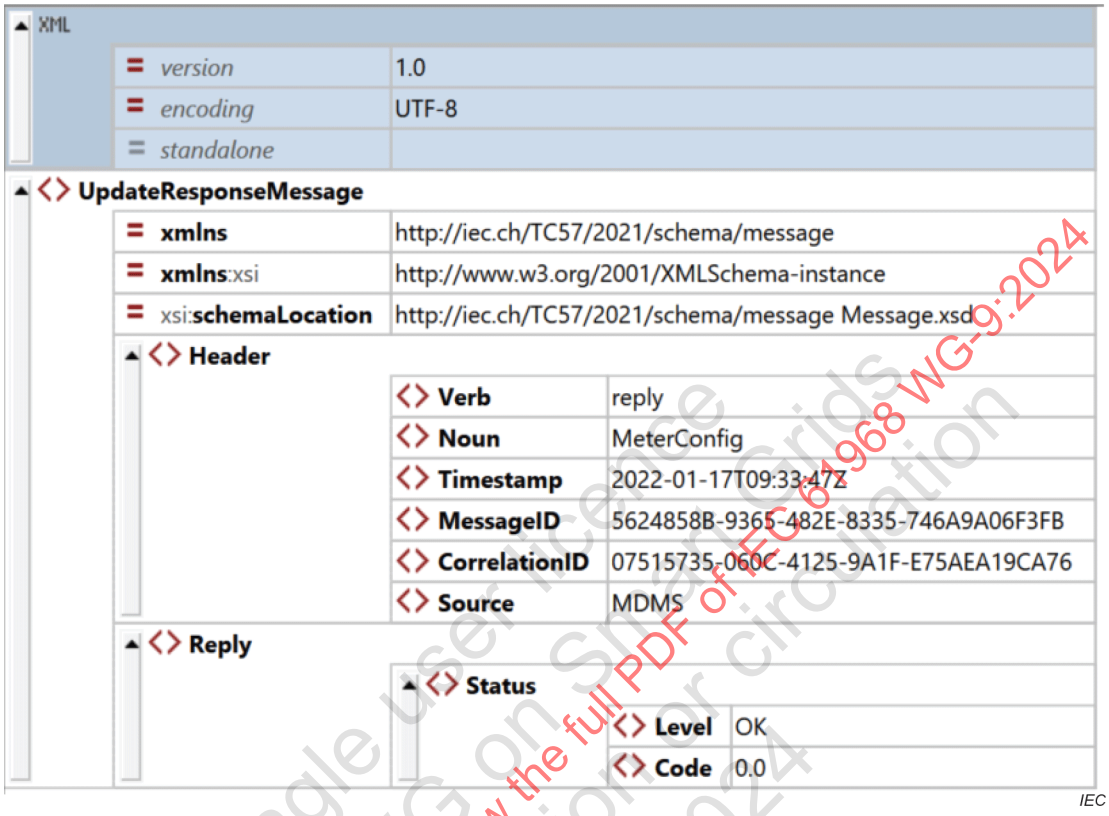


Figure J.11 reproduced with the permission of UCAIug.

Figure J.11 – Update MeterConfig (delete details) – Step 3

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESG WG on Smart Grids
No reproduction or circulation
Out 2024

J.2.13 **Update MeterConfig** (delete details) **– Step 4**

The fourth step for deleting a meter configuration using a MeterConfig message is illustrated in Figure J.12.

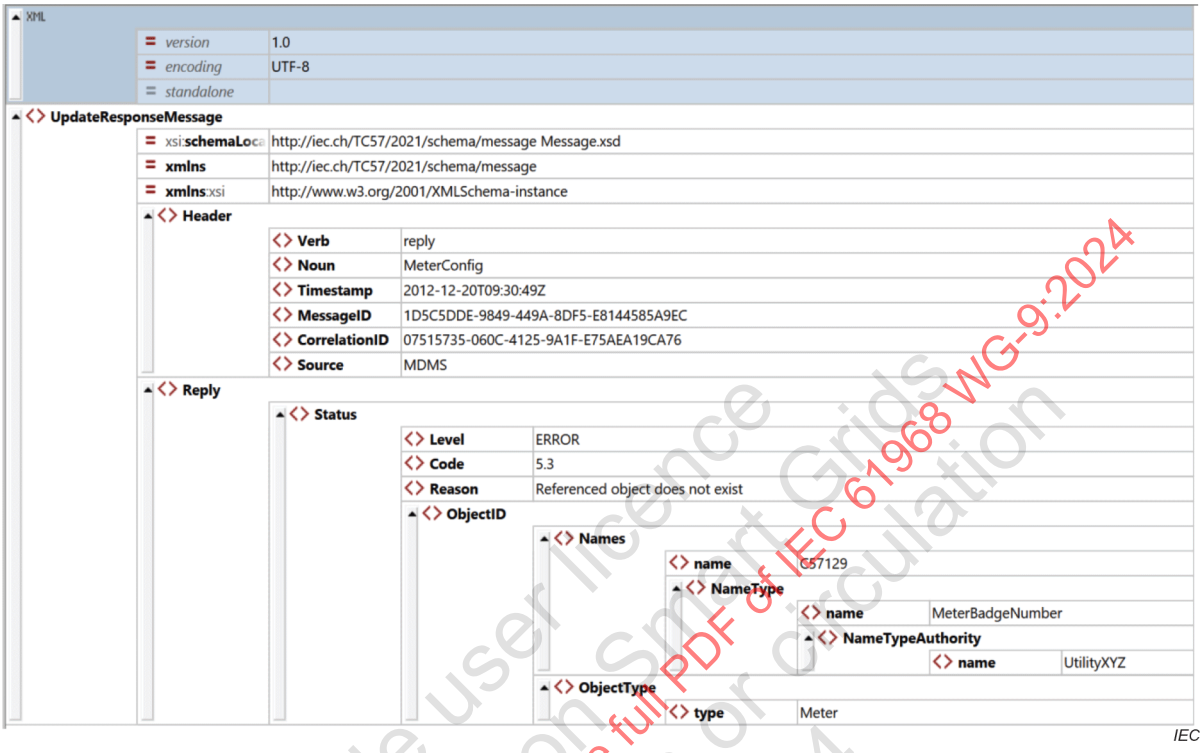


Figure J.12 reproduced with the permission of UCAIug.

Figure J.12 – Update MeterConfig (delete details) – Step 4

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

J.2.14 Delete MeterConfig – Step 1

The first step for deleting a meter is illustrated in Figure J.13.

This use case deletes the Meter itself – not just information concerning a Meter. Note that this may involve marking the meter as deleted rather than actually purging it from a system.

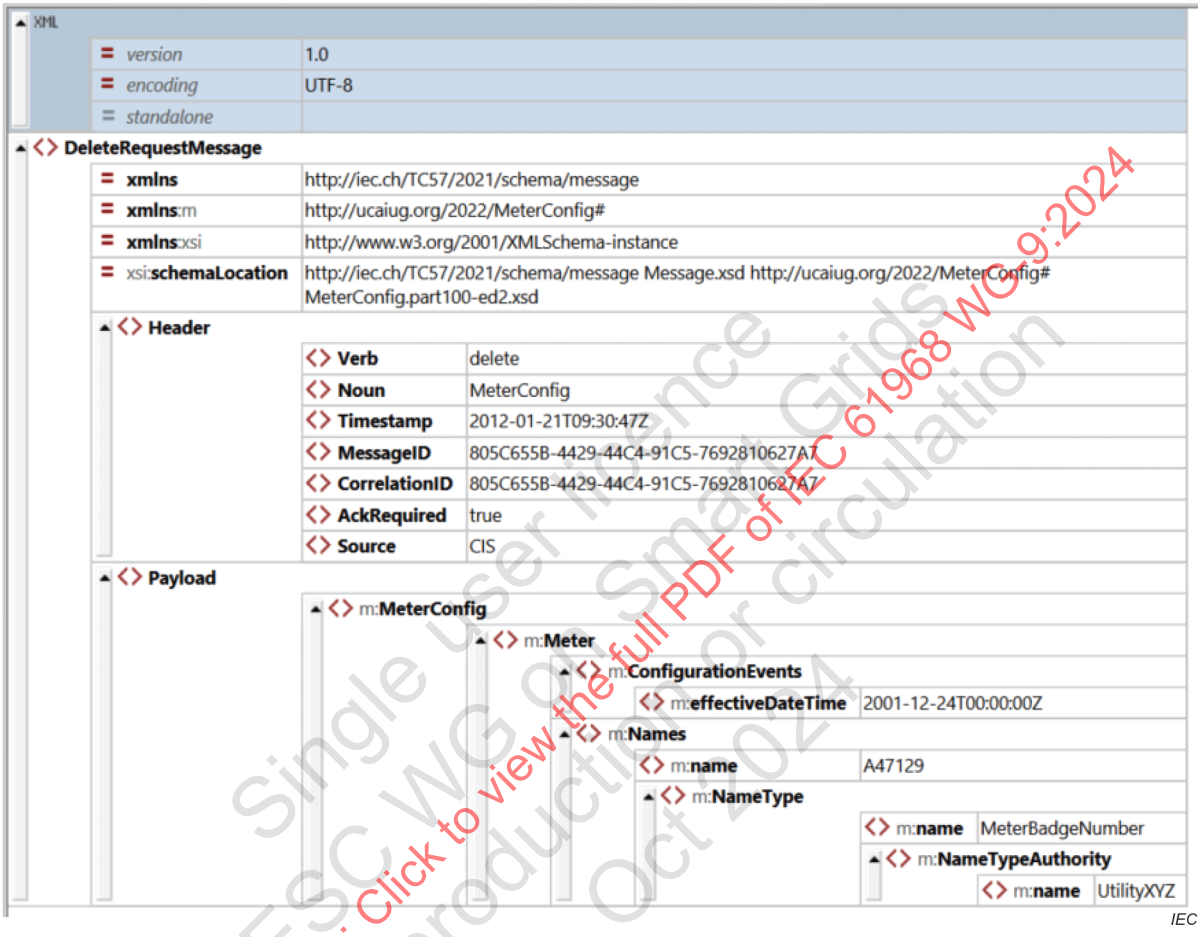


Figure J.13 reproduced with the permission of UCAIug.

Figure J.13 – Delete MeterConfig – Step 1

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single User Licence
IEC WG on Smart Grids
No reproduction or circulation
Oct 2024

J.2.15 Delete MeterConfig – Step 2

The second step for deleting a meter is illustrated in Figure J.14.

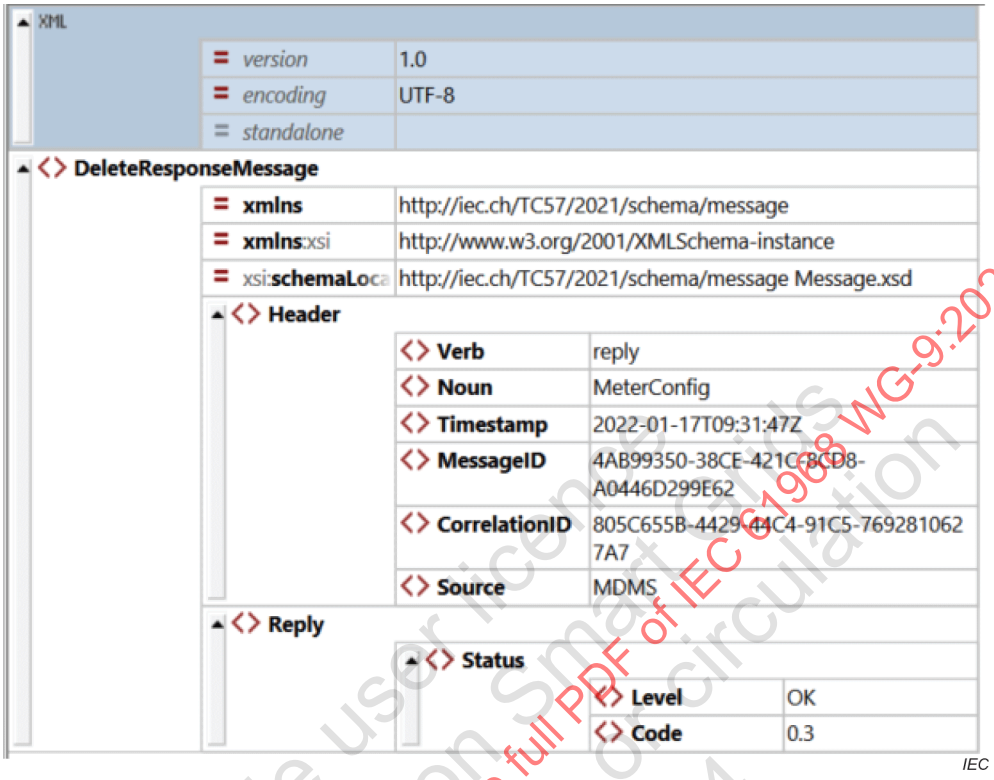


Figure J.14 reproduced with the permission of UCAIug.

Figure J.14 – Delete MeterConfig – Step 2

Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024
IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024

J.2.16 Delete MeterConfig – Step 3

The third step for deleting a meter is illustrated in Figure J.15.

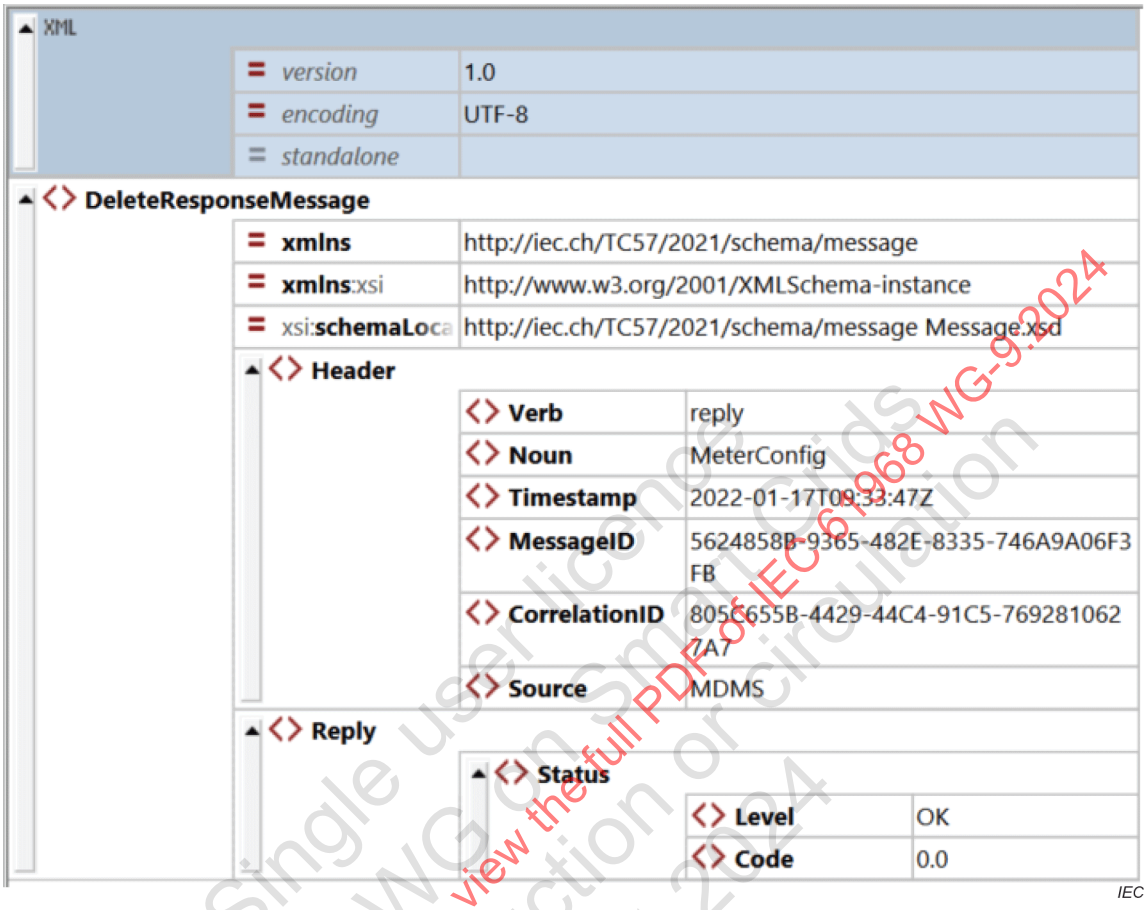


Figure J.15 reproduced with the permission of UCAIug.

Figure J.15 – Delete MeterConfig – Step 3

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESG WG on Smart Grids
No reproduction or circulation
Oct 2024

J.2.17 Delete MeterConfig – Step 4

The fourth step for deleting a meter is illustrated in Figure J.16.

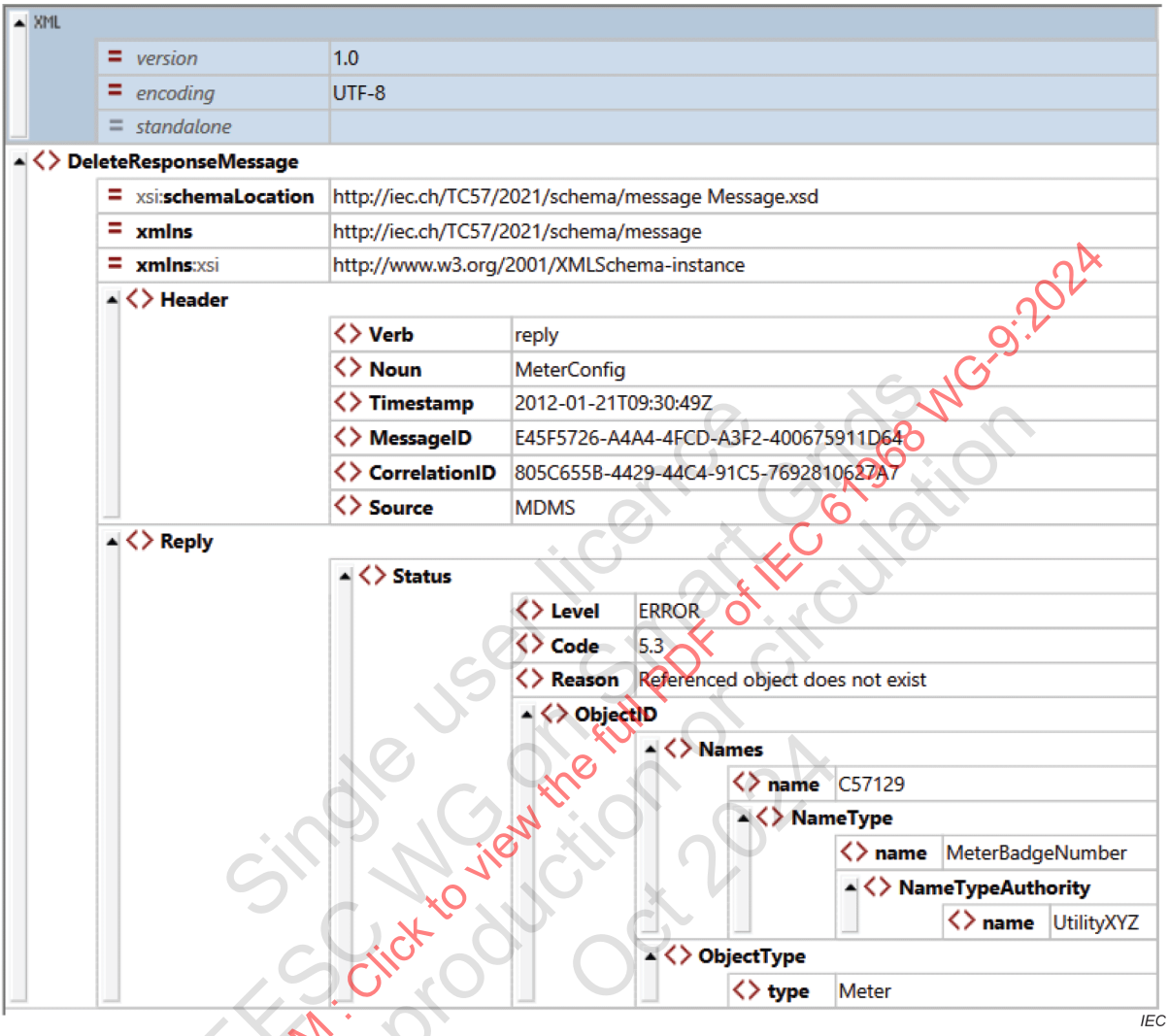


Figure J.16 reproduced with the permission of UCAIug.

Figure J.16 – Delete MeterConfig – Step 4

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
FESC WG on Smart Grids
No reproduction or circulation
Oct 2024

J.2.18 Create UsagePointConfig – Step 1

The first step for instantiating a usage point using a UsagePointConfig message is illustrated in Figure J.17.

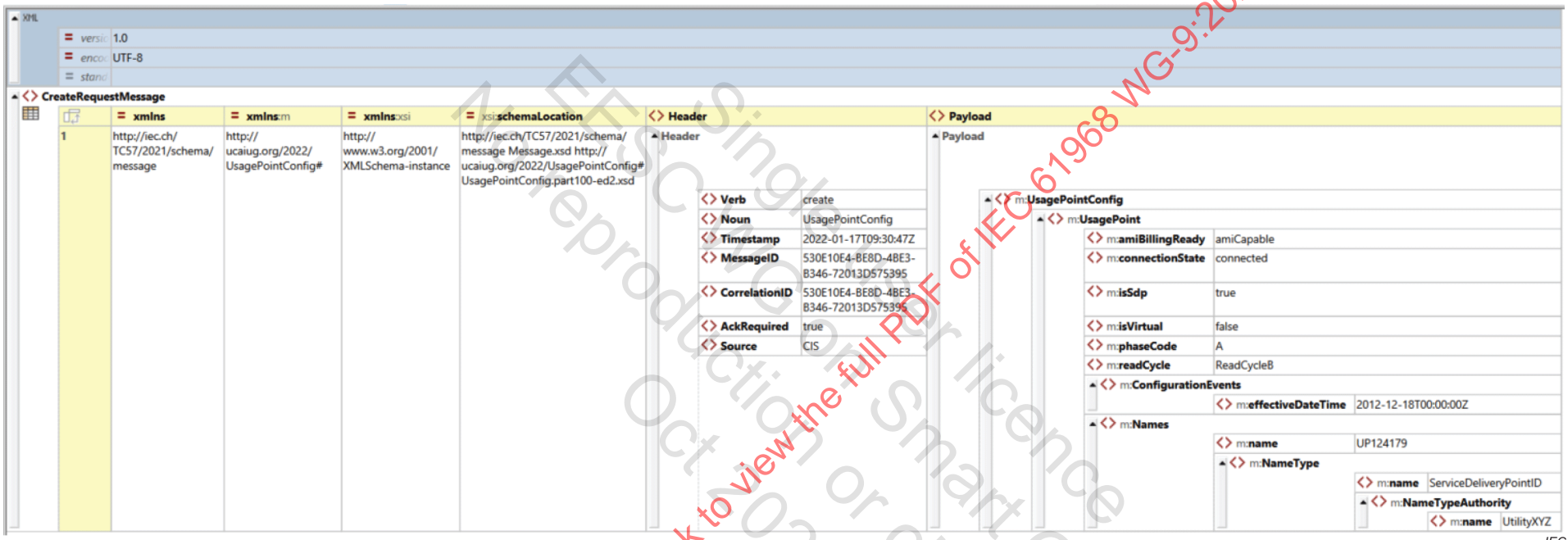


Figure J.17 reproduced with the permission of UCAIug.

Figure J.17 – Create UsagePointConfig – Step 1

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
EESC Copyright Smart Grids
Single user licence
Not reproduction or circulation
Oct 2024

J.2.19 Create UsagePointConfig – Step 2

The second step for instantiating a usage point using a UsagePointConfig message is illustrated in Figure J.18.

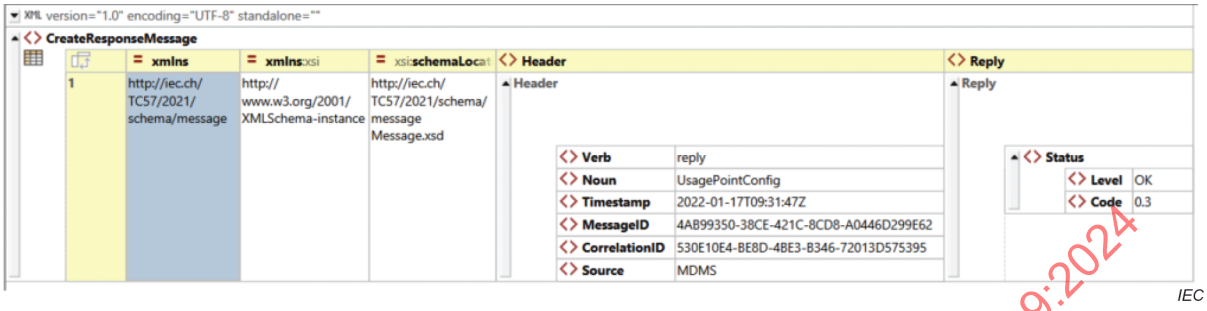


Figure J.18 reproduced with the permission of UCAIug.

Figure J.18 – Create UsagePointConfig – Step 2

J.2.20 Create UsagePointConfig – Step 3

The third step for instantiating a usage point using a UsagePointConfig message is illustrated in Figure J.19.

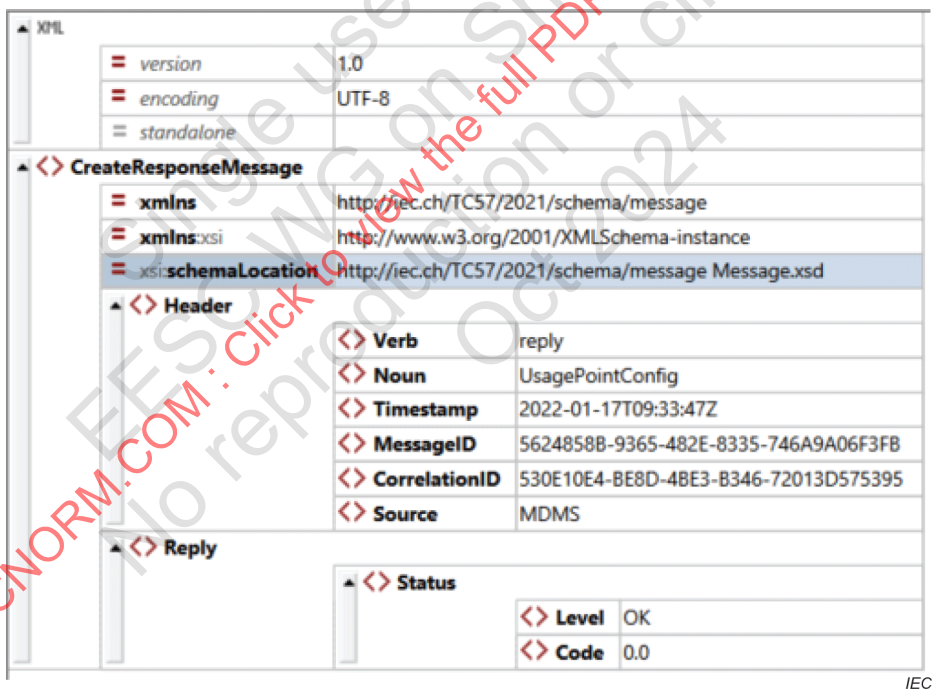


Figure J.19 reproduced with the permission of UCAIug.

Figure J.19 – Create UsagePointConfig – Step 3

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESG WG on Smart Grids
No reproduction or circulation
Oct 2024

J.2.21 Create UsagePointConfig – Step 4

The fourth step for instantiating a usage point using a UsagePointConfig message is illustrated in Figure J.20.

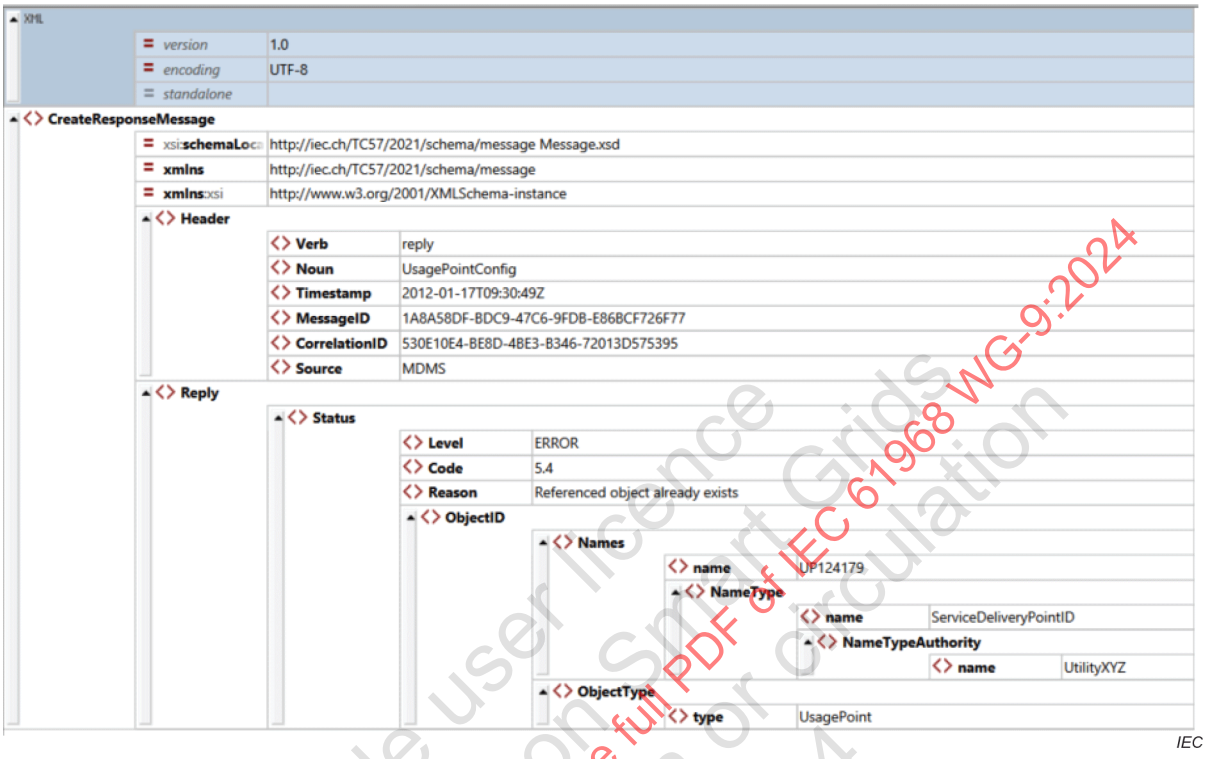


Figure J.20 reproduced with the permission of UCAIug.

Figure J.20 – Create UsagePointConfig – Step 4

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

J.2.22 Create MasterDataLinkageConfig – Step 1

The first step in creating linkages to reflect a meter installation is shown in Figure J.21.

This use case links the previously created Meter with the previously created UsagePoint (reflecting a meter installation).

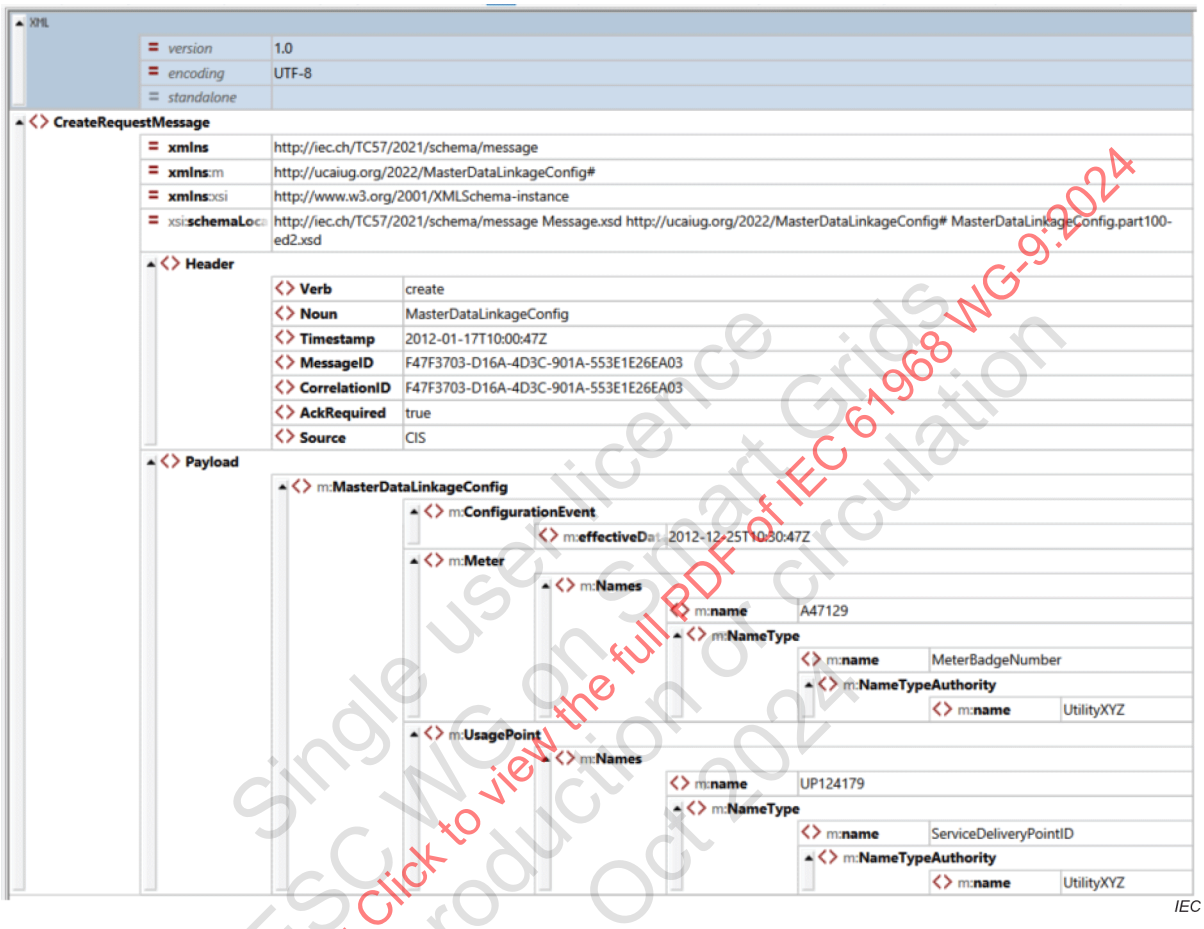


Figure J.21 reproduced with the permission of UCAIug.

Figure J.21 – Create MasterDataLinkageConfig – Step 1

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence
FESC WG on Smart Grids
No reproduction or circulation
Oct 2024

J.2.23 Create MasterDataLinkageConfig – Step 1

The second step in creating linkages to reflect a meter installation is shown in Figure J.22.

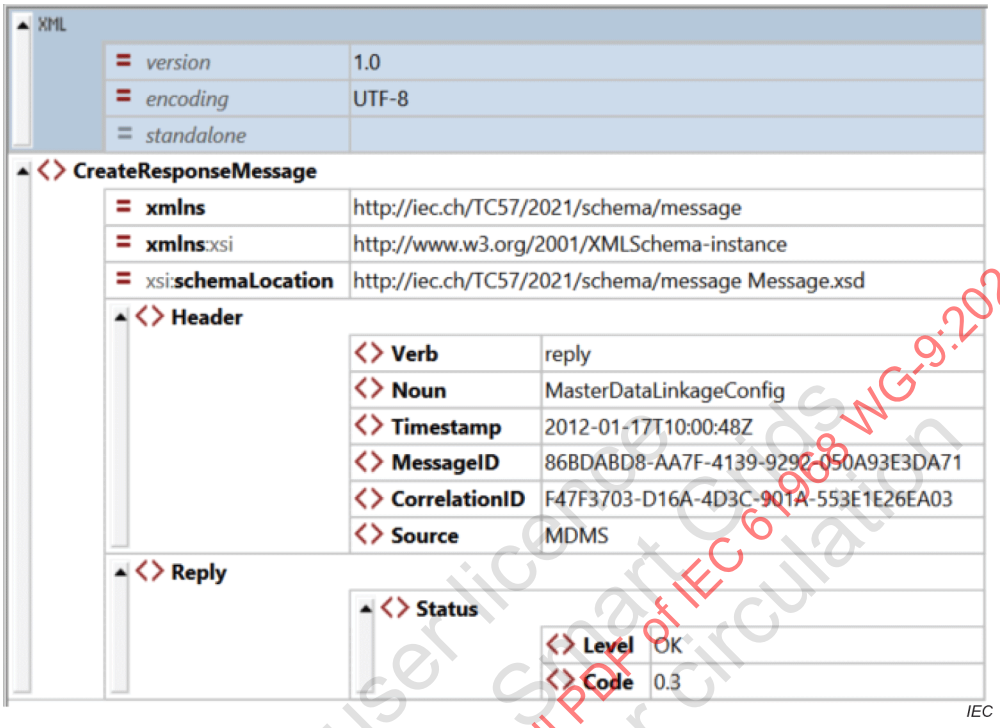


Figure J.22 reproduced with the permission of UCAIug.

Figure J.22 – Create MasterDataLinkageConfig – Step 2

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024 WG-9:2024
Single user licence for EESC WG on Smart Grids No reproduction or circulation Oct 2024

J.2.24 Create MasterDataLinkageConfig – Step 3

The third step in creating linkages to reflect a meter installation is shown in Figure J.23.

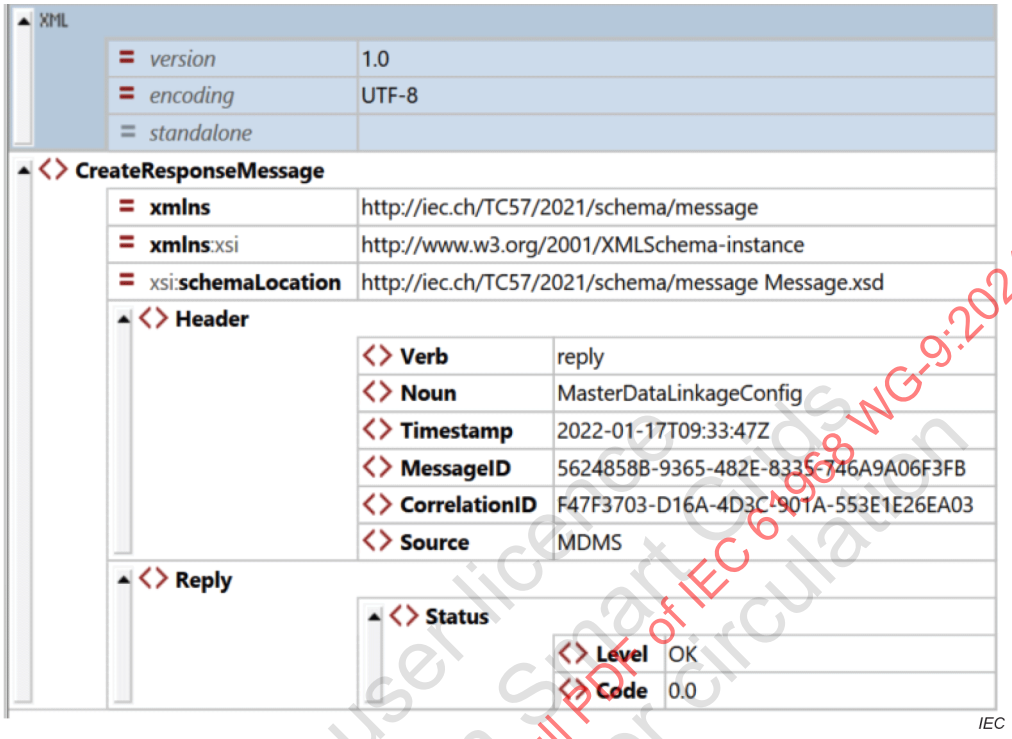


Figure J.23 reproduced with the permission of UCAIug.

Figure J.23 – Create MasterDataLinkageConfig – Step 3

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

J.2.25 Create MasterDataLinkageConfig – Step 4

The fourth step in creating linkages to reflect a meter installation is shown in Figure J.24.

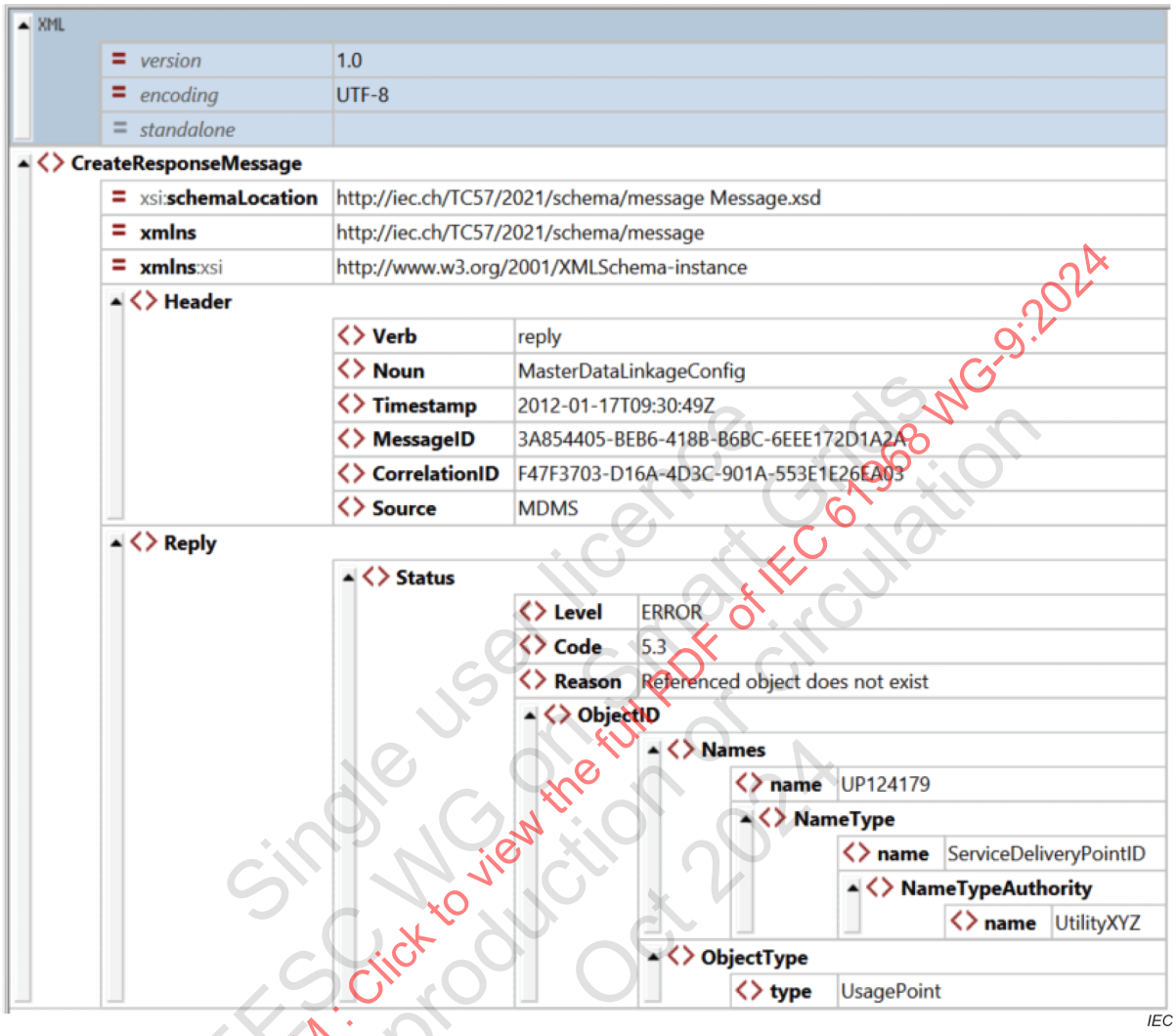


Figure J.24 reproduced with the permission of UCAIug.

Figure J.24 – Create MasterDataLinkageConfig – Step 4

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
FESC WG on Smart Grids
No reproduction or circulation
Oct 2024

J.2.26 Delete MasterDataLinkageConfig – Step 1

The first step in destroying linkages is shown in Figure J.25. This reflects a meter removal.

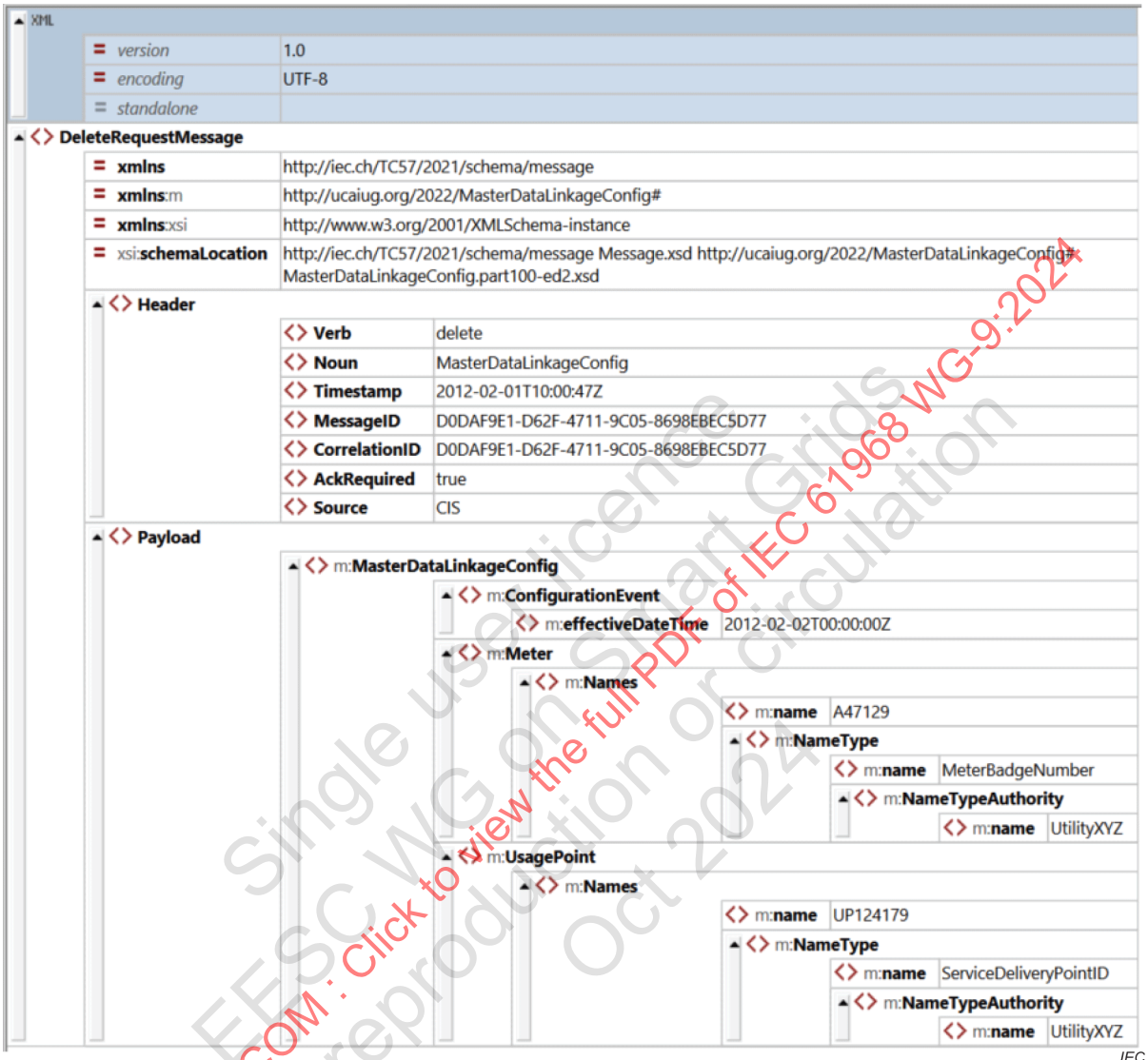


Figure J.25 reproduced with the permission of UCAIug.

Figure J.25 – Delete MasterDataLinkageConfig – Step 1

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

J.2.27 Delete MasterDataLinkageConfig – Step 2

The second step in destroying linkages is shown in Figure J.26.

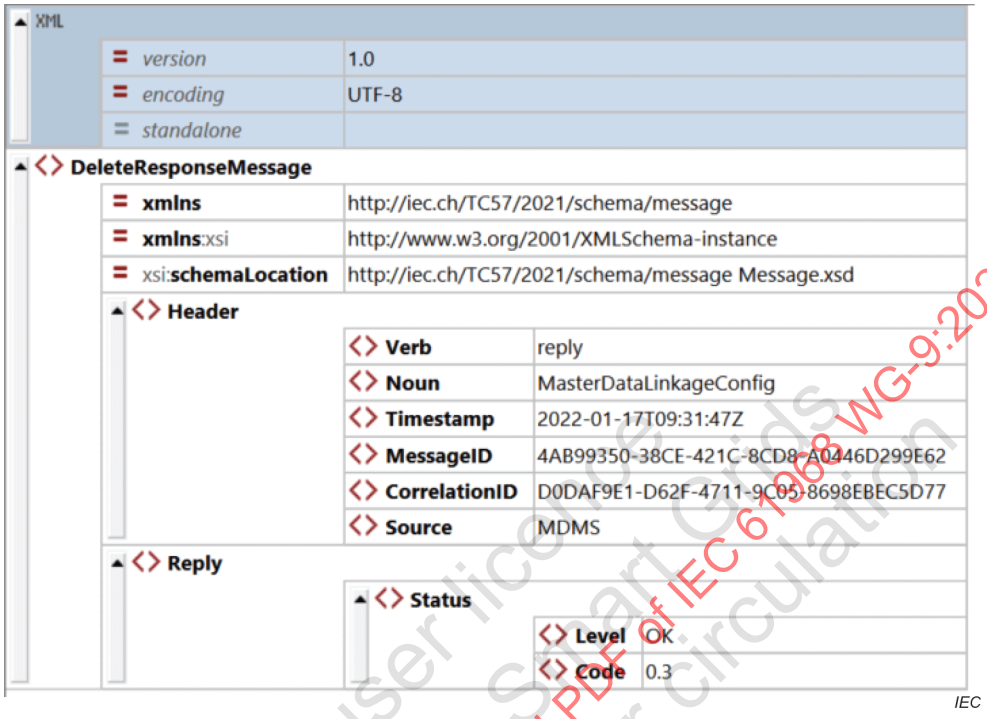


Figure J.26 reproduced with the permission of UCAIug.

Figure J.26 – Delete MasterDataLinkageConfig – Step 2

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

J.2.28 Delete MasterDataLinkageConfig – Step 3

The third step in destroying linkages is shown in Figure J.27

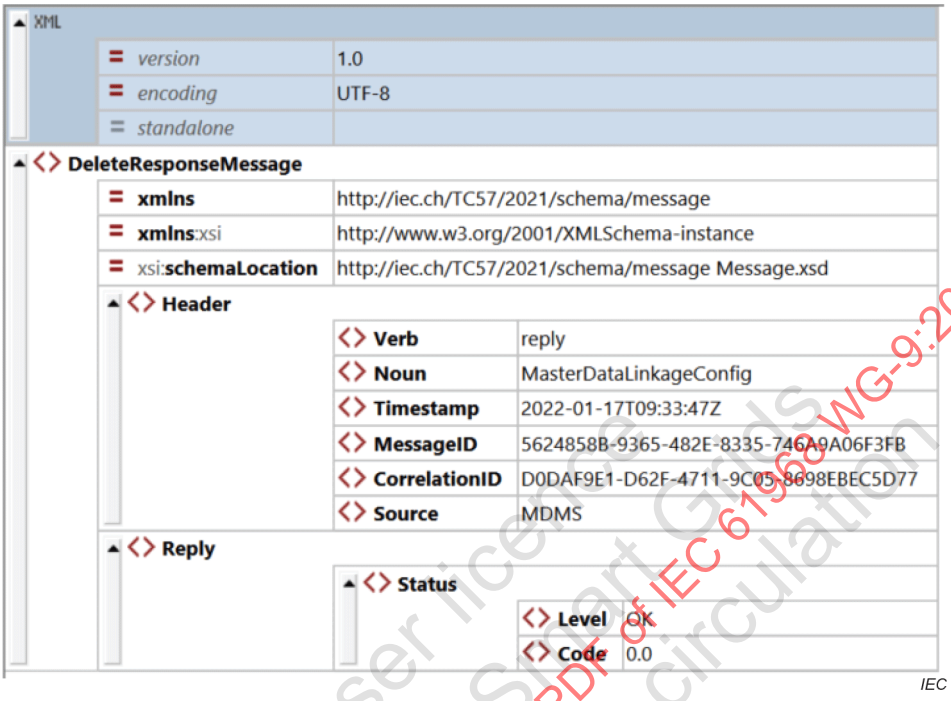


Figure J.27 reproduced with the permission of UCAIug.

Figure J.27 – Delete MasterDataLinkageConfig – Step 3

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

J.2.29 Delete MasterDataLinkageConfig – Step 4

The fourth step in destroying linkages is shown in Figure J.28.

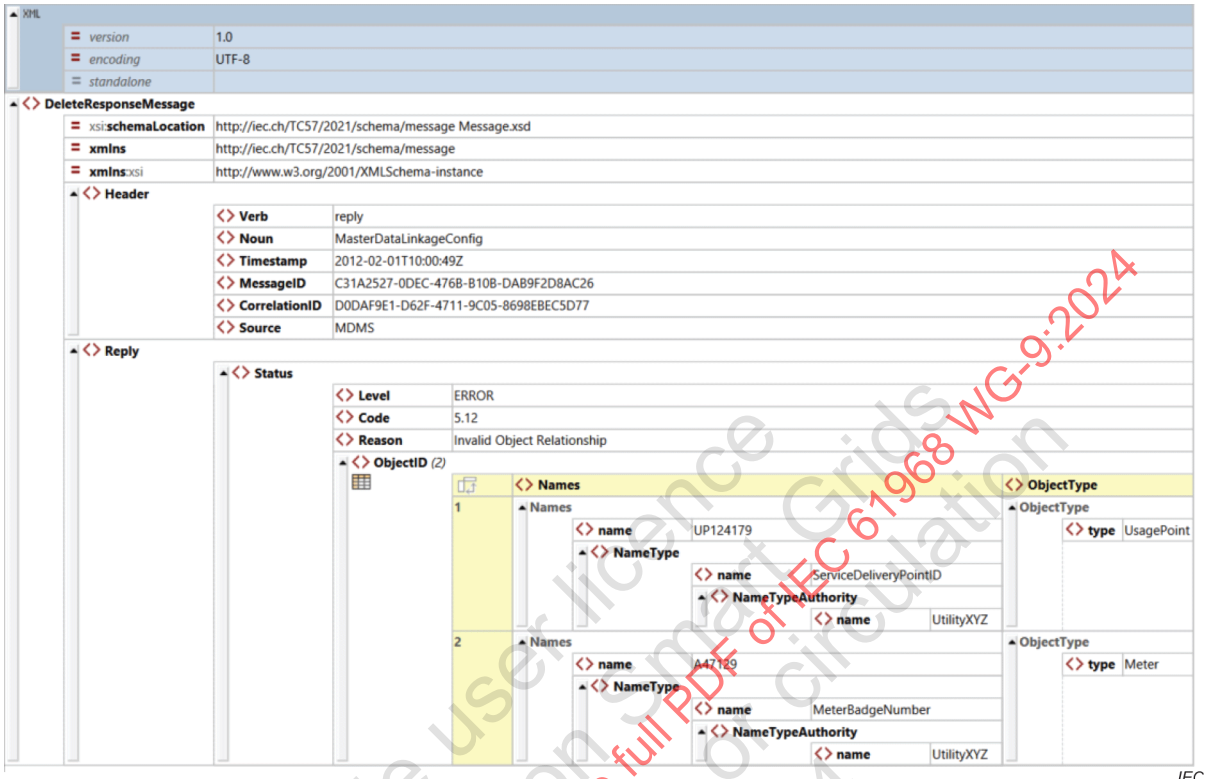


Figure J.28 reproduced with the permission of UCAIug.

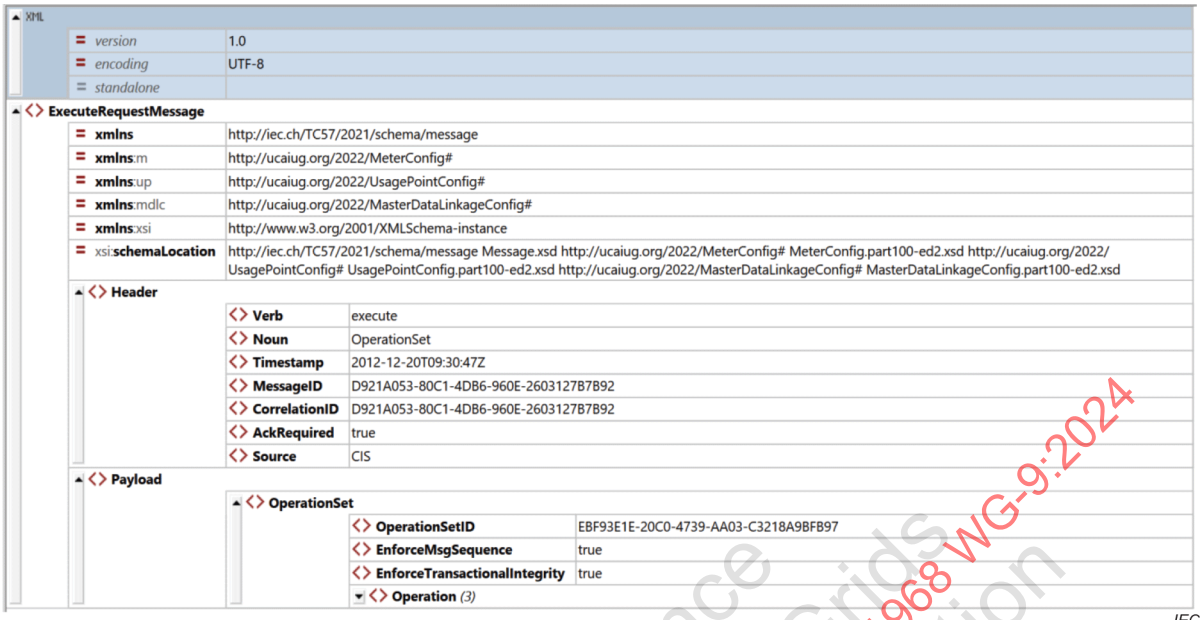
Figure J.28 – Delete MasterDataLinkageConfig – Step 4

J.2.30 Execute OperationSet – Step 1

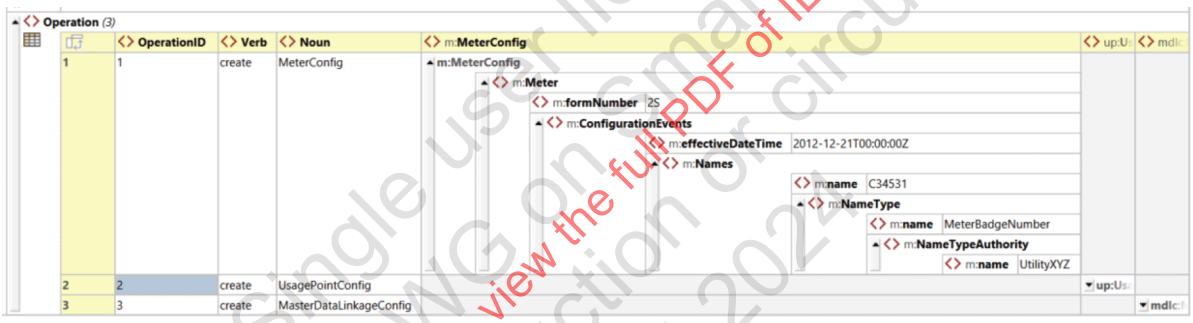
This use case utilizes an Operation Set to first create a Meter, then create a UsagePoint, and then link the Meter and the UsagePoiint (reflecting a meter installation). In essence, it performs the same functions as several of the previous use cases, but does so in a single message. This example uses the appropriate Booleans to ensure that the steps are executed in the prescribed order and that all three steps shall succeed or the entire transaction shall fail.

The first step in this process is depicted in Figure J.29. This figure is large with the ExecuteRequestMessage shown in a segment above the Operation payload. The Operation payload consists of three elements, each of which are expanded in turn in the segments which follow.

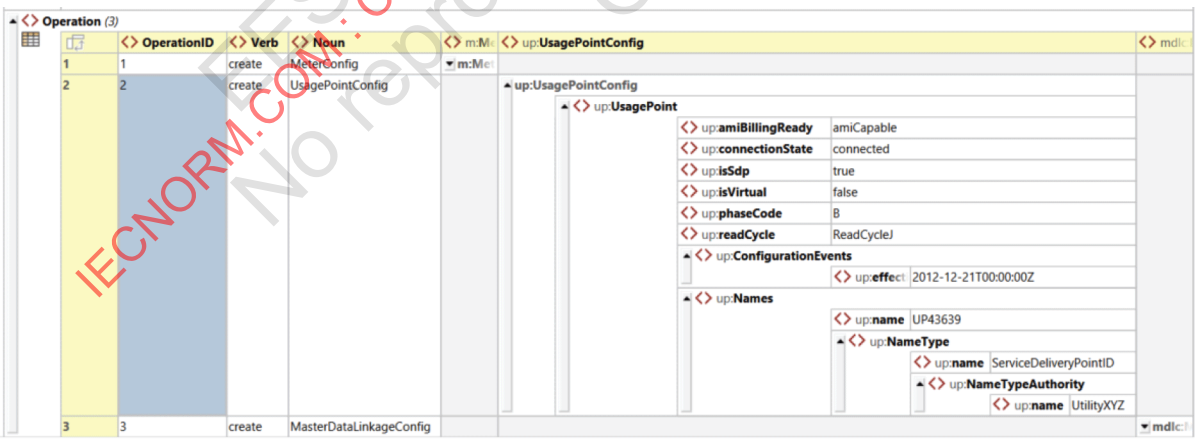
IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEC WG on Smart Grids
Non-reproduction or circulation
Oct 2024



IEC



IEC



IEC

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEC WG on Smart Grids
No reproduction or circulation
Oct 2024

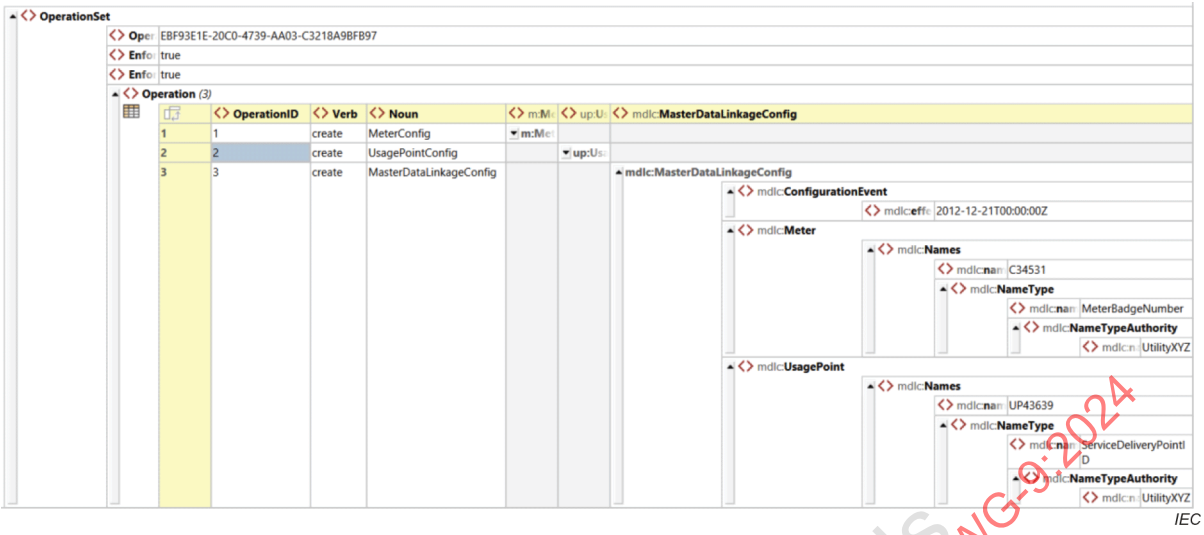


Figure J.29 reproduced with the permission of UCAIug.

Figure J.29 – Execute OperationSet – Step 1

J.2.31 Execute OperationSet – Step 2

The second step for executing the OperationSet is illustrated in Figure J.30.

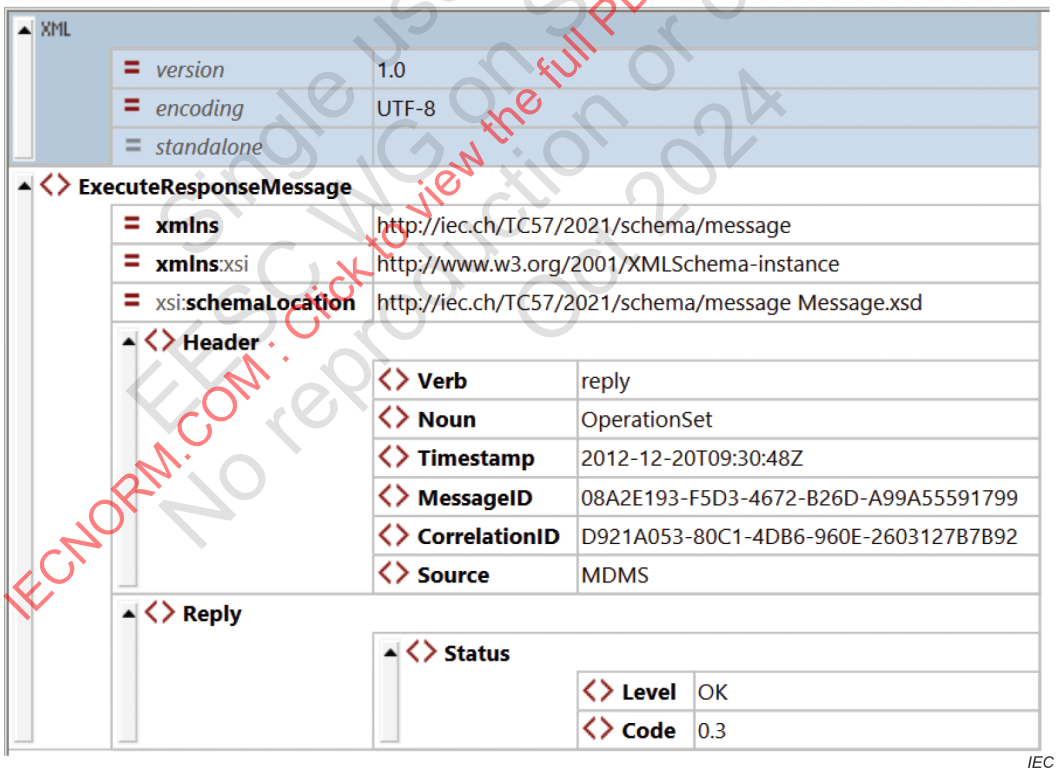


Figure J.30 reproduced with the permission of UCAIug.

Figure J.30 – Execute OperationSet – Step 2

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
003 2024

J.2.32 Execute OperationSet – Step 3

The third step for executing the OperationSet is illustrated in Figure J.31.

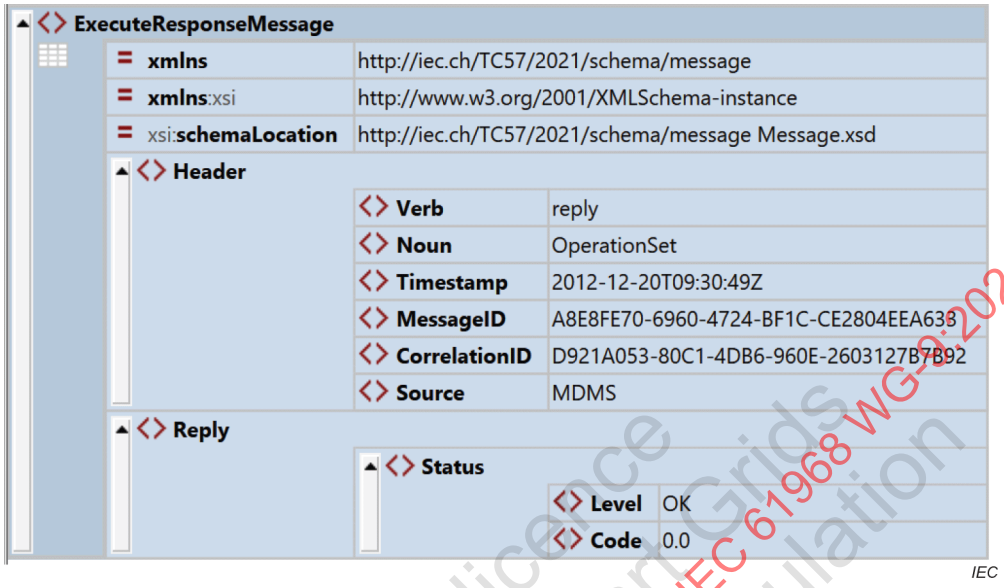


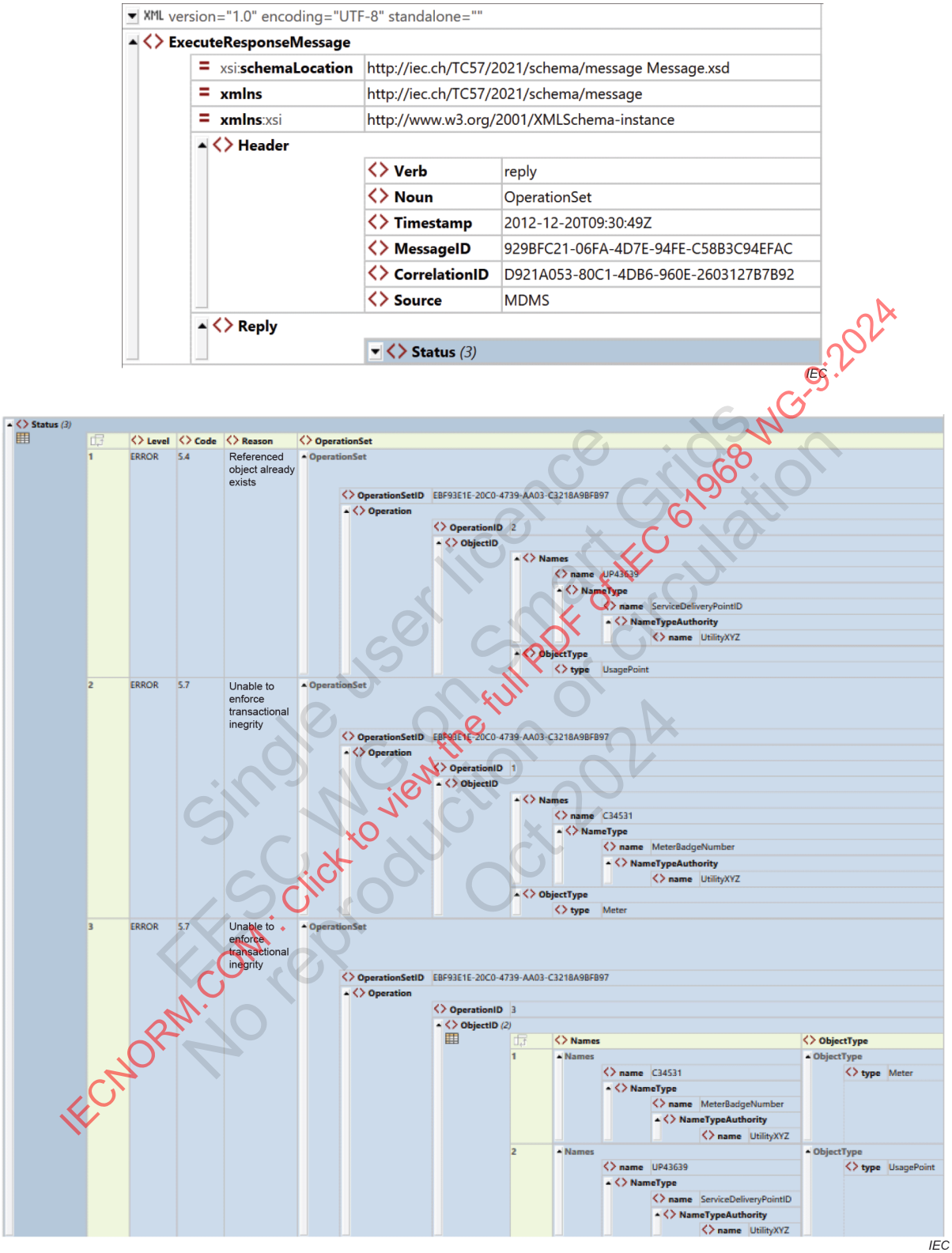
Figure J.31 is reproduced with the permission of UCAIug.

Figure J.31 – Execute OperationSet – Step 3

J.2.33 Execute OperationSet – Step 4

The third step for executing the OperationSet is illustrated in Figure J.32. This figure is a large one with the status element collapsed in the top segment, and shown expanded in the bottom segment.

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024



IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

Figure J.32 reproduced with the permission of UCAIug.

Figure J.32 – Execute OperationSet – Step 4

J.2.34 Change ObjectNamesConfig

ObjectNamesConfig has been deprecated. Please refer to IEC 61968-100:2022.

Annex K
(normative)

EUMED Metering UML Model

K.1 EUMED Metering profile and associated European regulation

K.1.1 The EUMED Metering profile

The European Union has released its implementing regulation on interoperability requirements and non-discriminatory and transparent procedures for access to metering and consumption data[2]. This Annex K proposes a customized profile of IEC 61968-9:2023 supporting implementing act requirements. Additional supporting information can be found in Annex L and Annex M. This customized profile is called the EUMED (EUropean My Energy Data) Metering profile. Annex K, Annex L, and Annex M are intended to stand together and operate independent from the other Annexes in this document. These three annexes will appear to be similar to the others, but have been modified specifically for EUMED Metering purposes. Some of the more significant modifications include:

– The profiling methodology is based on IEC 62361-103 Standard Profiling.

– The profiling tool used is MODSARUS©[3], a licence free tool[4] and Sparx Systems Enterprise Architect third party extension.

– Only a subset of IEC 61968-9:2024 functionality is supported by the EUMED Metering profile.

– The use of IEC 61968-100:2022 to carry EUMED Metering profile messages is recommended but not required.

– The CIM UML models used are:

  - Input UML Model:

    iec61970cim17v40_iec61968cim13v13b_iec62325cim03v17b_CIM100.1.1.1.eap

  - Output UML Model

    20220609_EUMEDMetering_iec61970cim17v40_iec61968cim13v13b_iec62325cim03v17b_CIM100.1.1.1.eap

The output UML Model contains the EUMED metering contextual model with several packages created by the MODSARUS© tool. A future implementation guide will describe the tool usage.

The reader should also note that the CIM Name, NameType, and NameTypeAuthority classes have been utilized in the EUMED Metering profile in a way specific to the European regulation.

K.1.2 The Associated European regulation

European Commission develops Implementing Acts (IAs) that further define data interoperability requirements and procedures as stated in Articles 20, 23 and 24 of the Electricity Directive (EU) 2019/944:

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
IEC VG on Smart Grids
Single user licence
No reproduction or circulation
Oct 2024

---

2 https://energy.ec.europa.eu/publications/implementing-regulation-interoperability-requirements-and-non-discriminatory-and-transparent_en

3 Modsarus© is the trade name of a product supplied by Sparx Systems. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.

4 https://sparxsystems.com/products/3rdparty.html#modsarus

– Article 24(1) states: *"In order to promote competition in the retail market and to avoid excessive administrative costs for the eligible parties, Member States shall facilitate the full interoperability of energy services within the Union."*

– Article 24(2) states: *"The Commission shall adopt, by means of implementing acts, interoperability requirements and non-discriminatory and transparent procedures for access to data referred to in Article 23(1)."*

– Article 23(1) states *"When laying down the rules regarding the management and exchange of data, Member States or, where a Member State has so provided, the designated competent authorities shall specify the rules on the access to data of the final customer by eligible parties in accordance with this Article and the applicable Union legal framework. For the purpose of this Directive, data shall be understood to include metering and consumption data as well as data required for customer switching, demand response and other services."*

IEC 62325-451-10 was published as an IEC standard in 2020 and is named the "EUMED (EUropean My Energy Data) Market profile". The "EUMED Metering profile" complements the "EUMED Market profile" as explained in IEC 62325-451-10.

K.2 EUMED Metering global view

A global view of EUMED Metering model is given in this Clause K.2. It can be broadly decomposed in 5 groups of Entities (EUMED Metering entities are generally represented as UML CIM classes with possible restrictions).

– **Root group**: composed of MeterReadingSet class. MeterReadingSet is not a CIM class (pure virtual root). Its purpose is to encapsulate a set of MeterReadings (container of measured values), UsagePoints (points related to the measurements) and ReadingTypes (characterization of the kind of the measured values). If UsagePoint and ReadingType are implicit, they may be omitted and only MeterReadings are given. But, if UsagePoint and ReadingType are present, they are supposed to be referred to by MeterReadings resp. by IntervalBlocks. In case of multiple UsagePoints and ReadingTypes, this means that the value container may contain measured values related to several UsagePoints and several ReadingTypes.

– **Meter Reading group**: composed of MeterReading, Meter, Customer and IntervalBlock classes. MeterReading is a CIM class (restriction on attributes: isCoincidentTrigger attribute is not used) giving the period of measurement (valuesInterval) for a given point (reference to UsagePoint). It has optional and limited capabilities of identification for outside reference (either mRID or name inherited from Identified object). It may be further characterized by Meter (reference to the physical device) and Customer (reference to the category/kind). IntervalBlock is a CIM class with no capabilities of identification for outside reference. Its only purpose is to allow reference to ReadingType and access to individual readings.

– **Interval Reading group**: composed of IntervalReading and ReadingQuality classes. IntervalReading is the CIM class used to contain the measured value and the time interval of the measurement (value and timePeriod inherited from BaseReading) or the timestamp of the measurement (timestamp inherited from MeasurementValue). It may be associated to several reading quality attributes (association to ReadingQuality). It has optional and limited capabilities of identification for outside reference (either mRID or name inherited from Identified object).

– **Usage Point group**: composed of UsagePoint, UsagePointLocation, Name, NameType and NameTypeAuthority classes. UsagePoint is a CIM class but none of its 20 owned attributes is used. Its purpose is to identify points related to the measurements (using either mRID or name) optionally characterized by a location. mRID (inherited from IdentifiedObject) is the only allowed attribute in the specialization (name, aliasName or description are not allowed). Name / NameType / NameTypeAuthority (association inherited from IdentifiedObject) is restricted to one (this is an alternative way to identify the UsagePoint). Usage point is related to a set of measured values (referenced at the MeterReading level).

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single User License
IEC WG Personal Grids
No reproduction or circulation
Oct 2024

– **Reading Type group**: composed of ReadingType, Name, NameType and NameTypeAuthority classes. This is the full CIM class (no restriction on owned attributes). The only restrictions are related to identification or naming capabilities (either mRID or name should be used). mRID (inherited from IdentifiedObject) is the only allowed attribute in the specialization (name, aliasName or description not allowed). Name / NameType / NameTypeAuthority (association inherited from IdentifiedObject) is restricted to one (this is an alternative way to identify the ReadingType). 16 attributes that permit to characterize a set of measured values (referenced at the IntervalBlock level).

The list of EUMED Metering Entities derived from CIM Classes is given in Table K.1.

Table K.1 – Entities of the EUMED Metering Model

Reprinted with the permission of UCAIug.

Name	Description
MeterReadingSet	Root of the message.
MeterReading	Set of values obtained from the meter.
Meter	Physical asset that performs the metering role of the usage point. Used for measuring consumption and detection of events.
Customer	Organisation receiving services from service supplier.
IntervalBlock	Time sequence of readings of the same reading type. Contained interval readings may need conversion through the application of an offset and a scalar defined in associated pending.
IntervalReading	Data captured at regular intervals of time. Interval data could be captured as incremental data, absolute data, or relative data. The source for the data is usually a tariff quantity or an engineering quantity. Data is typically captured in time-tagged, uniform, fixed-length intervals of 5 min, 10 min, 15 min, 30 min, or 60 min. NOTE Interval Data is sometimes also called "Interval Data Readings" (IDR).
ReadingQuality	Quality of a specific reading value or interval reading value. Note that more than one quality may be applicable to a given reading. Typically not used unless problems or unusual conditions occur (i.e., quality for each reading is assumed to be good unless stated otherwise in associated reading quality type). It can also be used with the corresponding reading quality type to indicate that the validation has been performed and succeeded.
UsagePoint	Logical or physical point in the network to which readings or events may be attributed. Used at the place where a physical or virtual meter may be located; however, it is not required that a meter be present.
UsagePointLocation	Location of an individual usage point.
ReadingType	Detailed description for a type of a reading value. Values in attributes allow for the creation of recommended codes to be used for identifying reading value types as follows: <macroPeriod>.<aggregate>.<measuringPeriod>.<accumulation>. <flowDirection>.<commodity>.<measurementKind>. <interharmonic.numerator>.<interharmonic.denominator>. <argument.numerator>.<argument.denominator>.<tou>.<cpp>. <consumptionTier>.<phases>.<multiplier>.<unit>.<currency>.
Name	The Name class provides the means to define any number of human readable names for an object. A name is **not** to be used for defining inter-object relationships. For inter-object relationships instead use the object identification 'mRID'.
NameType	Type of name. Possible values for attribute 'name' are implementation dependent but standard profiles may specify types. An enterprise may have multiple IT systems each having its own local name for the same object, e.g. a planning system may have different names from an EMS. An object may also have different names within the same IT system, e.g. localName as defined in CIM version 14. The definition from CIM14 is: The localName is a human readable name of the object. It is a free text name local to a node in a naming hierarchy similar to a file directory structure. A power system related naming hierarchy may be: Substation, VoltageLevel, Equipment etc. Children of the same parent in such a hierarchy have names that typically are unique among them.
NameTypeAuthority	Authority responsible for creation and management of names of a given type; typically an organization or an enterprise system.

The structure of the EUMED Metering model is given in Figure K.1.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Smart Energy Grids
EEBUS Initiative
No reproduction 2025

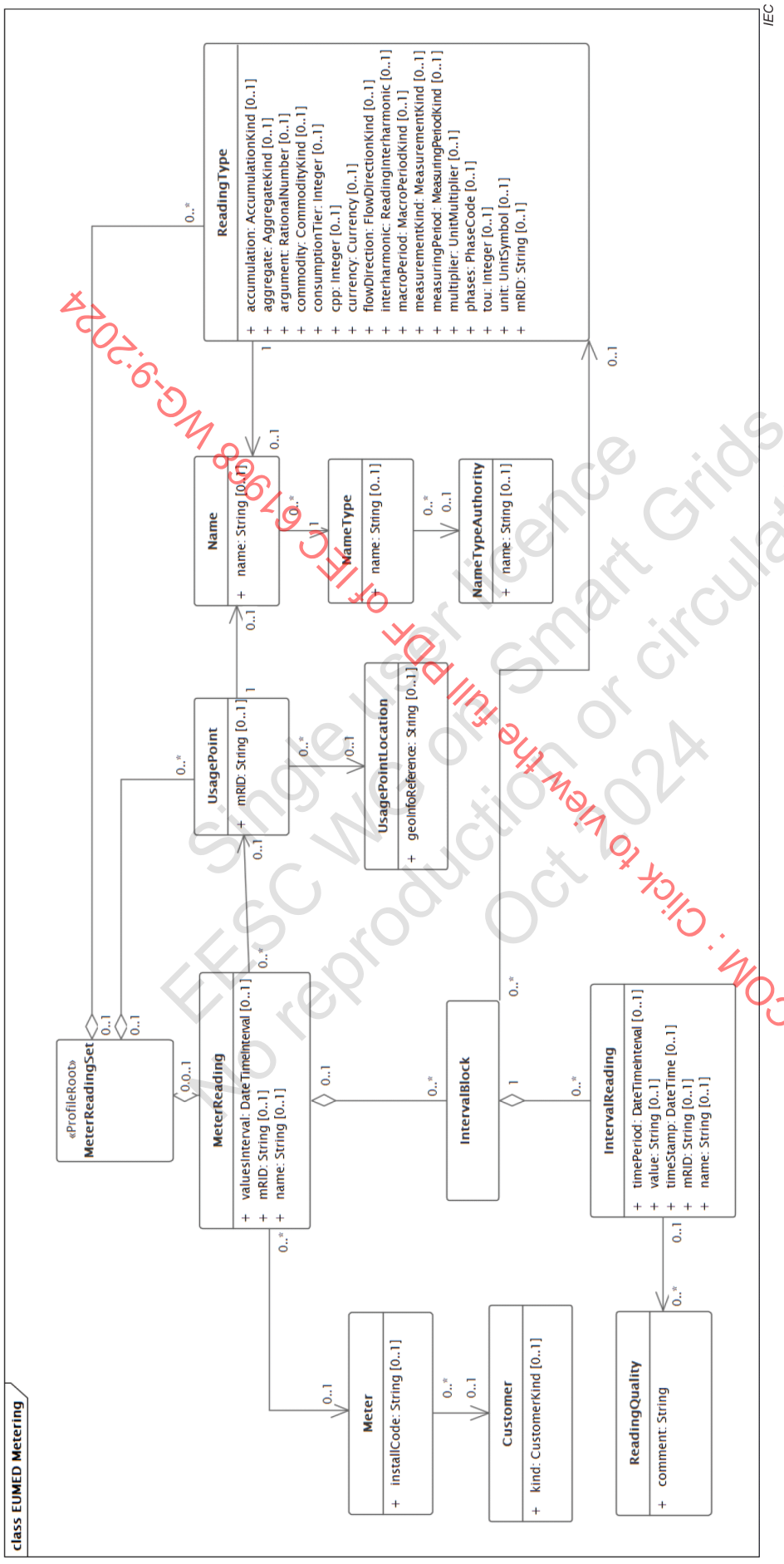


Figure K.1 – EUMED Metering Class diagram

Figure K.1 reproduced with the permission of the UCAIug.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single User Licence
EESC Web of Smart Grids
No reproduction or circulation
Oct 2024

K.3 EUMED Metering Entities

K.3.1 General

EUMED Metering Entities are detailed in Clause K.3. Specific data types used in these entities are detailed in Clause K.4 ‘EUMED Metering Data Types’.

K.3.2 MeterReadingSet Entity

The MeterReadingSet is the root of the message. It has no attributes. It has associations to other classes.

Table K.2 shows all association ends of MeterReadingSet with other classes.

Table K.2 – Association ends of EUMED Metering ENTITIES::MeterReadingSet with other classes

Reprinted with the permission of UCAIug.

mult from	name	mult to	type	description
0..1	MeterReading	0..*	MeterReading	All meter readings contained in this meter reading set.
0..1	UsagePoint	0..*	UsagePoint	All usage points contained in this meter reading set.
0..1	ReadingType	0..*	ReadingType	All reading types contained in this meter reading set.

K.3.3 MeterReading Entity

Set of values obtained from the meter.

Table K.3 shows all attributes of MeterReading.

Table K.3 – Attributes of EUMED Metering ENTITIES::MeterReading

Reprinted with the permission of UCAIug.

name	type	mult	description
valuesInterval	DateTimeInterval	0..1	Date and time interval of the data items contained within this meter reading.
mRID	String	0..1	Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended. For CIMXML data files in RDF syntax conforming to IEC 61970-552, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.
name	String	0..1	The name is any free human readable and possibly non unique text naming the object.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESG WG on Smart Grids
No reproduction or circulation
Oct 2024

Table K.4 shows all association ends of MeterReading with other classes.

Table K.4 – Association ends of EUMED Metering ENTITIES:: MeterReading with other classes

Reprinted with the permission of UCAIug.

mult from	name	mult to	type	description
0..*		0..1	MeterReadingSet	
0..*	UsagePoint	0..1	UsagePoint	Usage point from which this meter reading (set of values) has been obtained.
0..1	IntervalBlock	0..*	IntervalBlock	All interval blocks contained in this meter reading.
0..*	Meter	0..1	Meter	Meter providing this reading.

K.3.4 Meter Entity

Physical asset that performs the metering role of the usage point. Used for measuring consumption and detection of events.

Table K.5 shows all attributes of Meter.

Table K.5 – Attributes of EUMED Metering ENTITIES::Meter

Reprinted with the permission of UCAIug.

name	type	mult	description
installCode	String	0..1	Installation code.

Table K.6 shows all association ends of Meter with other classes.

Table K.6 – Association ends of EUMED Metering ENTITIES::Meter with other classes

Reprinted with the permission of UCAIug.

mult from	name	mult to	type	description
0..1	MeterReadings	0..*	MeterReading	All meter readings provided by this meter.
0..*	Customer	0..1	Customer	Customer owning this end device.

K.3.5 Customer Entity

Organisation receiving services from service supplier.

Table K.7 shows all attributes of Customer.

Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024
IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024

Table K.7 – Attributes of EUMED Metering ENTITIES::Customer

Reprinted with the permission of UCAIug.

name	type	mult	description
kind	CustomerKind	0..1	Kind of customer.

See K.4.6 for EUMED CustomerKind enumerations.

Table K.8 shows all association ends of Customer with other classes.

Table K.8 – Association ends of EUMED Metering ENTITIES:: Customer with other classes

Reprinted with the permission of UCAIug.

mult from	name	mult to	type	description
0..1	EndDevices	0..*	Meter	All end devices of this customer.

K.3.6 IntervalBlock Entity

Time sequence of readings of the same reading type. Contained interval readings may need conversion through the application of an offset and a scalar defined in associated pending.

Table K.9 shows all association ends of IntervalBlock with other classes.

Table K.9 – Association ends of Metering::IntervalBlock with other classes

Reprinted with the permission of UCAIug.

mult from	name	mult to	type	description
0..*	MeterReading	0..1	MeterReading	Meter reading containing this interval block.
0..*	ReadingType	0..1	ReadingType	Type information for interval reading values contained in this block.
1..1	IntervalReading	0..*	IntervalReading	Interval reading contained in this block.

K.3.7 IntervalReading Entity

Data captured at regular intervals of time. Interval data could be captured as incremental data, absolute data, or relative data. The source for the data is usually a tariff quantity or an engineering quantity. Data is typically captured in time-tagged, uniform, fixed-length intervals of 5 min, 10 min, 15 min, 30 min, or 60 min.

NOTE Interval Data is sometimes also called "Interval Data Readings" (IDR).

Table K.10 shows all attributes of IntervalReading.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
FESGWG on Smart Grids
No reproduction or circulation
Oct 2024

Table K.10 – Attributes of EUMED Metering ENTITIES::IntervalReading

Reprinted with the permission of UCAIug.

name	type	mult	description
timePeriod	DateTimeInterval	0..1	Start and end of the period for those readings whose type has a time attribute such as 'billing', seasonal' or 'forTheSpecifiedPeriod'.
value	String	0..1	Value of this reading.
timeStamp	DateTime	0..1	The time when the value was last updated.
mRID	String	0..1	Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended. For CIMXML data files in RDF syntax conforming to IEC 61970-552, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.
name	String	0..1	The name is any free human readable and possibly non unique text naming the object.

Table K.11 shows all association ends of IntervalReading with other classes.

Table K.11 – Association ends of EUMED Metering ENTITIES:: IntervalReading with other classes

Reprinted with the permission of UCAIug.

mult from	name	mult to	type	description
0..*	IntervalBlocks	1..1	IntervalBlock	All blocks containing this interval reading.
0..1	ReadingQualities	0..*	ReadingQuality	All qualities of this reading.

K.3.8 ReadingQuality Entity

The ReadingQuality Entity provides quality information for a specific reading value or interval reading value. Note that more than one quality may be applicable for a given reading. The ReadingQuality is typically not used unless problems or unusual conditions occur (i.e., quality for each reading is assumed to be good unless stated otherwise in associated reading quality type). It can also be used with the corresponding reading quality type to indicate that the validation has been performed and succeeded.

Table K.12 shows all attributes of ReadingQuality.

Table K.12 – Attributes of EUMED Metering ENTITIES::ReadingQuality

Reprinted with the permission of UCAIug.

name	type	mult	description
comment	String	1..1	Elaboration on the quality code.

Table K.13 shows all association ends of ReadingQuality with other classes.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence only, copying and networking prohibited
IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
No reproduction or circulation
Oct 2024

Table K.13 – Association ends of EUMED Metering ENTITIES:: ReadingQuality with other classes

Reprinted with the permission of UCAIug.

mult from	name	mult to	type	description
0..*	Reading	0..1	IntervalReading	Reading value to which this quality applies.

K.3.9 UsagePoint Entity

The UsagePoint is a logical or physical point in the network to which readings or events may be attributed. It is used to identify the place where a physical or virtual meter may be located; however, it is not required that a meter actually be present.

Table K.14 shows all attributes of UsagePoint.

Table K.14 – Attributes of EUMED Metering ENTITIES::UsagePoint

Reprinted with the permission of UCAIug.

name	type	mult	description
mRID	String	0..1	Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended. For CIMXML data files in RDF syntax conforming to IEC 61970-552, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.

Table K.15 shows all association ends of UsagePoint with other classes.

Table K.15 – Association ends of EUMED Metering ENTITIES:: UsagePoint with other classes

Reprinted with the permission of UCAIug.

mult from	name	mult to	type	description
0..*		0..1	MeterReadingSet	
0..*	UsagePointLocation	0..1	UsagePointLocation	Location of this usage point.
1..1	Names	0..1	Name	All names of this identified object.
0..1	MeterReadings	0..*	MeterReading	All meter readings obtained from this usage point.

K.3.10 UsagePointLocation Entity

Location of an individual usage point.

Table K.16 shows all attributes of UsagePointLocation.

IECNORM.COM : Click to view the full PDF of IEC 61968 WG-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

Table K.16 – Attributes of EUMED Metering ENTITIES::UsagePointLocation

Reprinted with the permission of UCAIug.

name	type	mult	description
geoInfoReference	String	0..1	(if applicable) Reference to geographical information source, often external to the utility.

Table K.17 shows all association ends of UsagePointLocation with other classes.

Table K.17 – Association ends of EUMED Metering ENTITIES:: UsagePointLocation with other classes

Reprinted with the permission of UCAIug.

mult from	name	mult to	type	description
0..1	UsagePoints	0..*	UsagePoint	All usage points at this location.

K.3.11 ReadingType Entity

Detailed description for a type of a reading value. Values in attributes allow for the creation of recommended codes to be used for identifying reading value types as follows:

Table K.18 shows all attributes of ReadingType.

Table K.18 – Attributes of EUMED Metering ENTITIES::ReadingType

Reprinted with the permission of UCAIug.

name	type	mult	description
accumulation	AccumulationKind	0..1	Accumulation behaviour of a reading over time, usually 'measuringPeriod', to be used with individual endpoints (as opposed to 'macroPeriod' and 'aggregate' that are used to describe aggregations of data from individual endpoints). NOTE See K.4.2 for AccumulationKind enumerations specified in the EUMED profile.
aggregate	AggregateKind	0..1	Salient attribute of the reading data aggregated from individual endpoints. This is mainly used to define a mathematical operation carried out over 'macroPeriod', but may also be used to describe an attribute of the data when the 'macroPeriod' is not defined. NOTE See K.4.3 for AggregateKind enumerations specified in the EUMED profile.
argument	RationalNumber	0..1	Argument used to introduce numbers into the unit of measure description where they are needed (e.g., 4 where the measure needs an argument such as CEMI(n=4)). Most arguments used in practice however will be integers (i.e., 'denominator'=1). Value 0 in 'numerator' and 'denominator' means not applicable. NOTE See K.4.13 for RationalNumber enumerations specified in the EUMED profile.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESG WG on Smart Grids
No reproduction or circulation
Oct 2024

name	type	mult	description
commodity	CommodityKind	0..1	Commodity being measured. NOTE See K.4.4 for CommodityKind enumerations specified in the EUMED profile.
consumptionTier	integer	0..1	In case of common flat-rate pricing for power, in which all purchases are at a given rate, 'consumptionTier'=0. Otherwise, the value indicates the consumption tier, which can be used in conjunction with TOU or CPP pricing. Consumption tier pricing refers to the method of billing in which a certain "block" of energy is purchased/sold at one price, after which the next block of energy is purchased at another price, and so on, all throughout a defined period. At the start of the defined period, consumption is initially zero, and any usage is measured against the first consumption tier ('consumptionTier'=1). If this block of energy is consumed before the end of the period, energy consumption moves to be reconed against the second consumption tier ('consumptionTier'=2), and so on. At the end of the defined period, the consumption accumulator is reset, and usage within the 'consumptionTier'=1 restarts.
cpp	Integer	0..1	Critical peak period (CPP) bucket the reading value is attributed to. Value 0 means not applicable. Even though CPP is usually considered a specialised form of time of use 'tou', this attribute is defined explicitly for flexibility.
currency	Currency	0..1	Metering-specific currency. NOTE See K.4.5 for currency enumerations specified in the EUMED profile.
flowDirection	FlowDirectionKind	0..1	Flow direction for a reading where the direction of flow of the commodity is important (for electricity measurements this includes current, energy, power, and demand). NOTE See K.4.8 for FlowDirectionKind enumerations specified in the EUMED profile.
interharmonic	ReadingInterharmonic	0..1	Indication of a "harmonic" or "interharmonic" basis for the measurement. Value 0 in 'numerator' and 'denominator' means not applicable. NOTE See K.4.8 for interharmonic enumerations specified in the EUMED profile..
macroPeriod	MacroPeriodKind	0..1	Time period of interest that reflects how the reading is viewed or captured over a long period of time. NOTE See K.4.9 for macroPeriodKind enumerations specified in the EUMED profile.
measurementKind	MeasurementKind	0..1	Identifies "what" is being measured, as refinement of 'commodity'. When combined with 'unit', it provides detail to the unit of measure. For example, 'energy' with a unit of measure of 'kWh' indicates to the user that active energy is being measured, while with 'kVAh' or 'kVArh', it indicates apparent energy and reactive energy, respectively. 'power' can be combined in a similar way with various power units of measure: Distortion power ('distortionVoltAmperes') with 'kVA' is different from 'power' with 'kVA'. NOTE See K.4.10 for measurementKind enumerations specified in the EUMED profile.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence only, copying and networking prohibited.
IEC Central Office
No reproduction or distribution permitted.
Copyright 2024

name	type	mult	description
measuringPeriod	MeasuringPeriodKind	0..1	Time attribute inherent or fundamental to the reading value (as opposed to 'macroPeriod' that supplies an "adjective" to describe aspects of a time period with regard to the measurement). It refers to the way the value was originally measured and not to the frequency at which it is reported or presented. For example, an hourly interval of consumption data would have value 'hourly' as an attribute. However in the case of an hourly sampled voltage value, the meterReadings schema would carry the 'hourly' interval size information. It is common for meters to report demand in a form that is measured over the course of a portion of an hour, while enterprise applications however commonly assume the demand (in kW or kVAr) normalised to 1 hour. The system that receives readings directly from the meter therefore shall perform this transformation before publishing readings for use by the other enterprise systems. The scalar used is chosen based on the block size (not any sub-interval size). NOTE See K.4.11 for measuringPeriod enumerations specified in the EUMED profile.
multiplier	UnitMultiplier	0..1	Metering-specific multiplier. NOTE See K.4.15 for power of ten multipliers supported in the EUMED profile.
phases	PhaseCode	0..1	Metering-specific phase code. NOTE See K.4.12 for phase code enumerations specified in the EUMED profile..
tou	Integer	0..1	Time of use (TOU) bucket the reading value is attributed to. A value of "0" means that TOU is not applicable to this measurement.
unit	UnitSymbol	0..1	Metering-specific unit. NOTE See K.4.16 for unit of measure enumerations specified in the EUMED profile.
mRID	String	0..1	Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended. For CIMXML data files in RDF syntax conforming to IEC 61970-552, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG or Smart Grid
No reproduction or circulation
Oct 2024

Table K.19 shows all association ends of ReadingType with other classes.

Table K.19 – Association ends of EUMED Metering ENTITIES:: ReadingType with other classes

Reprinted with the permission of UCAIug.

mult from	name	mult to	type	description
0..1	IntervalBlocks	0..*	IntervalBlock	All blocks containing interval reading values with this type information.
0..*		0..1	MeterReadingSet	
1..1	Names	0..1	Name	All names of this identified object.

K.3.12 Name Entity

The Name class provides the means to define any number of human readable names for an object. A name is not to be used for defining inter-object relationships. For inter-object relationships instead use the object identification 'mRID'.

Table K.20 shows all attributes of Name.

Table K.20 – Attributes of EUMED Metering ENTITIES::Name

Reprinted with the permission of UCAIug.

name	type	mult	description
name	String	0..1	Any free text that name the object.

Table K.21 shows all association ends of Name with other classes.

Table K.21 – Association ends of EUMED Metering ENTITIES::Name with other classes

Reprinted with the permission of UCAIug.

mult from	name	mult to	type	description
0..1	IdentifiedObject	1..1	ReadingType	Identified object that this name designates.
0..1	IdentifiedObject	1..1	UsagePoint	Identified object that this name designates.
0..*	NameType	1..1	NameType	Type of this name.

K.3.13 NameType Entity

Type of name. Possible values for attribute 'name' are implementation dependent but standard profiles may specify types. An enterprise may have multiple IT systems each having its own local name for the same object, e.g. a planning system may have different names from an EMS. An object may also have different names within the same IT system, e.g. localName as defined in CIM version 14. The definition from CIM14 is:

The localName is a human readable name of the object. It is a free text name local to a node in a naming hierarchy similar to a file directory structure. A power system related naming hierarchy may be: Substation, VoltageLevel, Equipment etc. Children of the same parent in such a hierarchy have names that typically are unique among them.

Table K.22 shows all attributes of NameType.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEEE SCWG on Smart Grids
No reproduction or circulation
Oct 2024

Table K.22 – Attributes of EUMED Metering ENTITIES::NameType

Reprinted with the permission of UCAIug.

name	type	mult	description
name	String	0..1	Name of the name type.

Table K.23 shows all association ends of NameType with other classes.

Table K.23 – Association ends of EUMED Metering ENTITIES:: NameType with other classes

Reprinted with the permission of UCAIug.

mult from	name	mult to	type	description
1..1	Names	0..*	Name	All names of this type.
0..*	NameTypeAuthority	0..1	NameTypeAuthority	Authority responsible for managing names of this type.

K.3.14 NameTypeAuthority Entity

Authority responsible for creation and management of names of a given type; typically an organization or an enterprise system.

Table K.24 shows all attributes of NameTypeAuthority.

Table K.24 – Attributes of EUMED Metering ENTITIES::NameTypeAuthority

Reprinted with the permission of UCAIug.

name	type	mult	description
name	String	0..1	Name of the name type authority.

Table K.25 shows all association ends of NameTypeAuthority with other classes.

Table K.25 – Association ends of EUMED Metering ENTITIES:: NameTypeAuthority with other classes

Reprinted with the permission of UCAIug.

mult from	name	mult to	type	description
0..1	NameTypes	0..*	NameType	All name types managed by this authority.

Table K.26 shows all association ends of MeterReadingSet with other classes.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESG WG on Smart Grids
No reproduction or circulation
Oct 2024

Table K.26 – Association ends of EUMED Metering ENTITIES:: MeterReadingSet with other classes

Reprinted with the permission of UCAIug.

mult from	name	mult to	type	description
0..1		0..*	ReadingType	
0..1		0..*	MeterReading	
0..1		0..*	UsagePoint	

K.4 EUMED Metering Datatypes

K.4.1 General

Table K.27 gives the list of the EUMED Metering datatypes.

Table K.27 – Datatypes of EUMED Metering Model

Reprinted with the permission of UCAIug.

Name	Description
AccumulationKind	Kind of accumulation behaviour for read / measured values from individual end points.
AggregateKind	Kind of aggregation for read / measured values from multiple end points.
CommodityKind	Code for commodity classification of readings of Reading Type.
Currency	Monetary currencies. ISO 4217 standard including 3-character currency code.
CustomerKind	Kind of customer.
DateTime	Date and time as "yyyy-mm-ddThh:mm:ss.sss", which conforms with ISO 8601. UTC time zone is specified as "yyyy-mm-ddThh:mm:ss.sssZ". A local timezone relative UTC is specified as "yyyy-mm-ddThh:mm:ss.sss-hh:mm". The second component (shown here as "ss.sss") could have any number of digits in its fractional part to allow any kind of precision beyond seconds.
DateTimeInterval	Interval of date and time. Duration is not included because it can be derived from the start and the end.
FlowDirectionKind	Direction associated with current related readings.
MacroPeriodKind	Kind of macro period for calculations on read / measured values.
MeasurementKind	Name of physical measurement.
MeasuringPeriodKind	Kind of period for reading / measuring values.
PhaseCode	An unordered enumeration of phase identifiers. Allows designation of phases for both transmission and distribution equipment, circuits and loads. The enumeration, by itself, does not describe how the phases are connected together or connected to ground. Ground is not explicitly denoted as a phase. Residential and small commercial loads are often served from single-phase, or split-phase, secondary circuits. For the example of s12N, phases 1 and 2 refer to hot wires that are 180 degrees out of phase, while N refers to the neutral wire. Through single-phase transformer connections, these secondary circuits may be served from one or two of the primary phases A, B, and C. For three-phase loads, use the A, B, C phase codes instead of s12N. The integer values are from IEC 61968-9 to support revenue metering applications.
RationalNumber	Rational number = 'numerator' / 'denominator'.
ReadingInterharmonic	Interharmonics are represented as a rational number 'numerator' / 'denominator', and harmonics are represented using the same mechanism and identified by 'denominator'=1.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EEBus WG Smart Grids
No reproduction or circulation
2024

Name	Description
UnitMultiplier	The unit multipliers defined for the CIM. When applied to unit symbols that already contain a multiplier, both multipliers are used. For example, to exchange kilograms using unit symbol of kg, one uses the "none" multiplier, to exchange metric ton (Mg), one uses the "k" multiplier.
UnitSymbol	The units defined for usage in the CIM.

K.4.2 AccumulationKind enumeration Datatype

Kind of accumulation behaviour for read / measured values from individual end points.

Table K.28 shows all literals of AccumulationKind.

Table K.28 – Literals of EUMED Metering DATA TYPES::AccumulationKind

Reprinted with the permission of UCAIug.

literal	description
none	Not applicable, or implied by the unit of measure.
bulkQuantity	A value from a register which represents the bulk quantity of a commodity. This quantity is computed as the integral of the commodity usage rate. This value is typically used as the basis for the dial reading at the meter, and as a result, will roll over upon reaching a maximum dial value. NOTE 1 With the metering system, the roll-over behaviour typically implies a roll-under behavior so that the value presented is always a positive value (e.g. unsigned integer or positive decimal.) However, when communicating data between enterprise applications a negative value might occur in a case such as net metering. NOTE 2 A 'bulkQuantity' refers primarily to the dial reading and not the consumption over a specific period of time.
continuousCumulative	The sum of the previous billing period values and the present period value. NOTE 'continuousCumulative' is commonly used in conjunction with 'demand', and it would represent the cumulative sum of the previous billing period maximum demand values (as occurring with each demand reset) summed with the present period maximum demand value (which has yet to be reset.)
cumulative	The sum of the previous billing period values. NOTE 'cumulative' is commonly used in conjunction with "demand." Each demand reset causes the maximum demand value for the present billing period (since the last demand reset) to accumulate as an accumulative total of all maximum demands. So instead of 'zeroing' the demand register, a demand reset has the effect of adding the present maximum demand to this accumulating total.
deltaData	The difference between the value at the end of the prescribed interval and the beginning of the interval. This is used for incremental interval data. NOTE One common application would be for load profile data, another use might be to report the number of events within an interval (such as the number of equipment energisations within the specified period of time.)
indicating	As if a needle is swung out on the meter face to a value to indicate the current value. NOTE An 'indicating' value is typically measured over hundreds of milliseconds or greater, or may imply a "pusher" mechanism to capture a value. Compare this to 'instantaneous' which is measured over a shorter period of time.
summation	A form of accumulation which is selective with respect to time. NOTE 'summation' could be considered a specialisation of 'bulkQuantity' as it selectively accumulates pulses over a timing pattern (while 'bulkQuantity' accumulates pulses all of the time).

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single User Licence
FESCO WG 9 Standards
No reproduction or circulation
2024

literal	description
timeDelay	A form of computation which introduces a time delay characteristic to the data value.
instantaneous	Typically measured over the fastest period of time allowed by the definition of the metric (usually milliseconds or tens of milliseconds.) NOTE 'instantaneous' was moved to attribute #3 in IEC 61968-9:2013, from attribute #1 in IEC 61968-9:2009.
latchingQuantity	When this description is applied to a metered value, it implies that the value is a time-independent cumulative quantity much like a 'bulkQuantity', except that it latches upon the maximum value upon reaching that value. Any additional accumulation (positive or negative) is discarded until a reset occurs. NOTE A 'latchingQuantity' may also occur in the downward direction – upon reaching a minimum value. The terms 'maximum' or 'minimum' (for 'aggregate') will usually be included when this type of accumulation behaviour is present. When this description is applied to an encoded value (UOM= 'Code'), it implies that the value has one or more bits which are latching. The condition that caused the bit to be set may have long since evaporated. In either case, the timestamp that accompanies the value may not coincide with the moment the value was initially set. In both cases a system will need to perform an operation to clear the latched value.
boundedQuantity	A time-independent cumulative quantity much like a 'bulkQuantity' or a 'latchingQuantity', except that the accumulation stops at the maximum or minimum values. When the maximum is reached, any additional positive accumulation is discarded, but negative accumulation may be accepted (thus lowering the counter.) Likewise, when the negative bound is reached, any additional negative accumulation is discarded, but positive accumulation is accepted (thus increasing the counter.)

K.4.3 AggregateKind enumeration Datatype

Kind of aggregation for read / measured values from multiple end points.

Table K.29 shows all literals of AggregateKind.

Table K.29 – Literals of EUMED Metering DATA TYPES::AggregateKind

Reprinted with the permission of UCAIug.

literal	description
none	Not applicable.
average	The value represents average.
excess	The value represents an amount over which a threshold was exceeded.
highThreshold	The value represents a programmed high threshold.
lowThreshold	The value represents a programmed low threshold.
maximum	The highest value observed.
minimum	The smallest value observed.
nominal	The nominal value.
normal	The normal value.
secondMaximum	The second highest value observed.
secondMinimum	The second smallest value observed.
thirdMaximum	The third highest value observed.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence only, Smart Grid Standards
FESSG WG 9 Smart Grid Standards
No reproduction or circulation
Oct 2024

literal	description
fourthMaximum	The fourth highest value observed.
fifthMaximum	The fifth highest value observed.
sum	The accumulated sum.

K.4.4 CommodityKind enumeration Datatype

Kind of commodity being measured.

Table K.30 shows all literals of CommodityKind.

Table K.30 – Literals of EUMED Metering DATA TYPES::CommodityKind

Reprinted with the permission of UCAIug.

literal	description
none	Not Applicable
electricitySecondaryMetered	All types of metered quantities. This type of reading comes from the meter and represents a "secondary" metered value.
electricityPrimaryMetered	It is possible for a meter to be outfitted with an external VT and/or CT. The meter might not be aware of these devices, and the display not compensate for their presence. Ultimately, when these scalars are applied, the value that represents the service value is called the "primary metered" value. The "index" in sub-category 3 mirrors those of sub-category 0.
communication	A measurement of the communication infrastructure itself.
air	
insulativeGas	(SF6 is found separately below.)
insulativeOil	
naturalGas	
propane	
potableWater	Drinkable water
steam	Water in steam form, usually used for heating.
wasteWater	(Sewerage)
heatingFluid	This fluid is likely in liquid form. It is not necessarily water or water based. The warm fluid returns cooler than when it was sent. The heat conveyed may be metered.
coolingFluid	The cool fluid returns warmer than when it was sent. The heat conveyed may be metered.
nonpotableWater	Reclaimed water – possibly used for irrigation but not sufficiently treated to be considered safe for drinking.
nox	Nitrous Oxides NOX
so2	Sulfur Dioxide SO2
ch4	Methane CH4
co2	Carbon Dioxide CO2
carbon	
hch	Hexachlorocyclohexane HCH
pfc	Perfluorocarbons PFC
sf6	Sulfurhexafluoride SF6
tvLicence	Television
internet	Internet service
refuse	trash

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESG WG on Smart Grids
No reproduction or circulation
Oct 2024

K.4.5 Currency enumeration Datatype

Monetary currencies which are potentially used by EUMED are described in Table K.31. Table K.31 extends Table C.28, and also calls upon the ISO 4217 standard to supply the 3-character currency code as well as the numeric code used in the ReadingTypeID.

Table K.31 – Literals of EUMED Metering DATA TYPES::Currency

literal	description
AED	United Arab Emirates dirham.
AFN	Afghan afghani.
ALL	Albanian lek.
AMD	Armenian dram.
ANG	Netherlands Antillean guilder.
AOA	Angolan kwanza.
ARS	Argentine peso.
AUD	Australian dollar.
AWG	Aruban florin.
AZN	Azerbaijani manat.
BAM	Bosnia and Herzegovina convertible mark.
BBD	Barbados dollar.
BDT	Bangladeshi taka.
BGN	Bulgarian lev.
BHD	Bahraini dinar.
BIF	Burundian franc.
BMD	Bermudian dollar (customarily known as Bermuda dollar).
BND	Brunei dollar.
BOB	Boliviano.
BOV	Bolivian Mvdol (funds code).
BRL	Brazilian real.
BSD	Bahamian dollar.
BTN	Bhutanese ngultrum.
BWP	Botswana pula.
BYR	Belarusian ruble.
BZD	Belize dollar.
CAD	Canadian dollar.
CDF	Congolese franc.
CHF	Swiss franc.
CLF	Unidad de Fomento (funds code), Chile.
CLP	Chilean peso.
CNY	Chinese yuan.
COP	Colombian peso.
COU	Unidad de Valor Real.
CRC	Costa Rican colon.
CUC	Cuban convertible peso.
CUP	Cuban peso.
CVE	Cape Verde escudo.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESG WG on Smart Grids
No reproduction or circulation
Oct 2024

literal	description
CZK	Czech koruna.
DJF	Djiboutian franc.
DKK	Danish krone.
DOP	Dominican peso.
DZD	Algerian dinar.
EEK	Estonian kroon.
EGP	Egyptian pound.
ERN	Eritrean nakfa.
ETB	Ethiopian birr.
EUR	Euro.
FJD	Fiji dollar.
FKP	Falkland Islands pound.
GBP	Pound sterling.
GEL	Georgian lari.
GHS	Ghanaian cedi.
GIP	Gibraltar pound.
GMD	Gambian dalasi.
GNF	Guinean franc.
GTQ	Guatemalan quetzal.
GYD	Guyanese dollar.
HKD	Hong Kong dollar.
HNL	Honduran lempira.
HRK	Croatian kuna.
HTG	Haitian gourde.
HUF	Hungarian forint.
IDR	Indonesian rupiah.
ILS	Israeli new sheqel.
INR	Indian rupee.
IQD	Iraqi dinar.
IRR	Iranian rial.
ISK	Icelandic króna.
JMD	Jamaican dollar.
JOD	Jordanian dinar.
JPY	Japanese yen.
KES	Kenyan shilling.
KGS	Kyrgyzstani som.
KHR	Cambodian riel.
KMF	Comoro franc.
KPW	North Korean won.
KRW	South Korean won.
KWD	Kuwaiti dinar.
KYD	Cayman Islands dollar.
KZT	Kazakhstani tenge.
LAK	Lao kip.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESC WG on Smart Grids
No reproduction or circulation
Oct 2024

literal	description
LBP	Lebanese pound.
LKR	Sri Lanka rupee.
LRD	Liberian dollar.
LSL	Lesotho loti.
LTL	Lithuanian litas.
LVL	Latvian lats.
LYD	Libyan dinar.
MAD	Moroccan dirham.
MDL	Moldovan leu.
MGA	Malagasy ariary.
MKD	Macedonian denar.
MMK	Myanma kyat.
MNT	Mongolian tugrik.
MOP	Macanese pataca.
MRO	Mauritanian ouguiya.
MUR	Mauritian rupee.
MVR	Maldivian rufiyaa.
MWK	Malawian kwacha.
MXN	Mexican peso.
MYR	Malaysian ringgit.
MZN	Mozambican metical.
NAD	Namibian dollar.
NGN	Nigerian naira.
NIO	Cordoba oro.
NOK	Norwegian krone.
NPR	Nepalese rupee.
NZD	New Zealand dollar.
OMR	Omani rial.
PAB	Panamanian balboa.
PEN	Peruvian nuevo sol.
PGK	Papua New Guinean kina.
PHP	Philippine peso.
PKR	Pakistani rupee.
PLN	Polish zloty.
PYG	Paraguayan guaraní.
QAR	Qatari rial.
RON	Romanian new leu.
RSD	Serbian dinar.
RUB	Russian rouble.
RWF	Rwandan franc.
SAR	Saudi riyal.
SBD	Solomon Islands dollar.
SCR	Seychelles rupee.
SDG	Sudanese pound.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
EESCWA on Smart Grids
No reproduction or circulation
Oct 2024

literal	description
SEK	Swedish krona/kronor.
SGD	Singapore dollar.
SHP	Saint Helena pound.
SLL	Sierra Leonean leone.
SOS	Somali shilling.
SRD	Surinamese dollar.
STD	São Tomé and Príncipe dobra.
SYP	Syrian pound.
SZL	Lilangeni.
THB	Thai baht.
TJS	Tajikistani somoni.
TMT	Turkmenistani manat.
TND	Tunisian dinar.
TOP	Tongan pa'anga.
TRY	Turkish lira.
TTD	Trinidad and Tobago dollar.
TWD	New Taiwan dollar.
TZS	Tanzanian shilling.
UAH	Ukrainian hryvnia.
UGX	Ugandan shilling.
USD	United States dollar.
UYU	Uruguayan peso.
UZS	Uzbekistan som.
VEF	Venezuelan bolívar fuerte.
VND	Vietnamese Dong.
VUV	Vanuatu vatu.
WST	Samoan tala.
XAF	CFA franc BEAC.
XCD	East Caribbean dollar.
XOF	CFA Franc BCEAO.
XPF	CFP franc.
YER	Yemeni rial.
ZAR	South African rand.
ZMK	Zambian kwacha.
ZWL	Zimbabwe dollar.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence EESCWG on Smart Grids No reproduction or circulation Oct 2024

K.4.6 CustomerKind enumeration Datatype

Kind of customer.

Table K.32 shows all literals of CustomerKind.

Table K.32 – Literals of EUMED Metering DATA TYPES::CustomerKind

Reprinted with the permission of UCAIug.

literal	description
residential	Residential customer.
residentialAndCommercial	Residential and commercial customer.
residentialAndStreetlight	Residential and streetlight customer.
residentialStreetlightOthers	Residential streetlight or other related customer.
residentialFarmService	Residential farm service customer.
commercialIndustrial	Commercial industrial customer.
pumpingLoad	Pumping load customer.
windMachine	Wind machine customer.
energyServiceSupplier	Customer as energy service supplier.
energyServiceScheduler	Customer as energy service scheduler.
internalUse	Internal use customer.
enterprise	
regionalOperator	
subsidiary	
other	Other kind of customer.

K.4.7 DateTimeInterval compound Datatype

Interval between two date and time points, where the interval includes the start time but excludes end time.

Table K.33 shows all attributes of DateTimeInterval.

Table K.33 – Attributes of EUMED Metering DATA TYPES::DateTimeInterval

Reprinted with the permission of UCAIug.

name	type	mult	description
end	DateTime	0..1	End date and time of this interval. The end date and time where the interval is defined up to, but excluded.
start	DateTime	0..1	Start date and time of this interval. The start date and time is included in the defined interval.

K.4.8 FlowDirectionKind enumeration Datatype

Kind of flow direction for reading/measured values proper to some commodities such as, for example, energy, power, demand.

Table K.34 shows all literals of FlowDirectionKind.

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence
IEEE SWG on Smart Grids
No reproduction or circulation
Oct 2024

Table K.34 – Literals of EUMED Metering DATA TYPES::FlowDirectionKind

Reprinted with the permission of UCAIug.

literal	description
none	Not Applicable (N/A)
forward	"Delivered," or "Imported" as defined in IEC TS 61968-2. Forward Active Energy is a positive kWh value as one would naturally expect to find as energy is supplied by the utility and consumed at the service. Forward Reactive Energy is a positive VArh value as one would naturally expect to find in the presence of inductive loading. In polyphase metering, the forward energy register is incremented when the sum of the phase energies is greater than zero:
lagging	Typically used to describe that a power factor is lagging the reference value. NOTE 1 When used to describe VA, "lagging" describes a form of measurement where reactive power is considered in all four quadrants, but real power is considered only in quadrants I and IV. NOTE 2 When used to describe power factor, the term "Lagging" implies that the PF is negative. The term "lagging" in this case takes the place of the negative sign. If a signed PF value is to be passed by the data producer, then the direction of flow enumeration zero (none) should be used in order to avoid the possibility of creating an expression that employs a double negative. The data consumer should be able to tell from the sign of the data if the PF is leading or lagging. This principle is analogous to the concept that "Reverse" energy is an implied negative value, and to publish a negative reverse value would be ambiguous. NOTE 3 Lagging power factors typically indicate inductive loading.
leading	Typically used to describe that a power factor is leading the reference value. NOTE Leading power factors typically indicate capacitive loading.
net	|Forward| – |Reverse|, See IEC TS 61968-2. NOTE In some systems, the value passed as a "net" value could become negative. In other systems the value passed as a "net" value is always a positive number, and rolls-over and rolls-under as needed.
q1plusQ2	Reactive positive quadrants. (The term "lagging" is preferred.)
q1plusQ3	Quadrants 1 and 3
q1plusQ4	Quadrants 1 and 4 usually represent forward active energy
q1minusQ4	Q1 minus Q4
q2plusQ3	Quadrants 2 and 3 usually represent reverse active energy
q2plusQ4	Quadrants 2 and 4
q2minusQ3	Q2 minus Q3
q3plusQ4	Reactive negative quadrants. (The term "leading" is preferred.)
q3minusQ2	Q3 minus Q2
quadrant1	Q1 only
quadrant2	Q2 only
quadrant3	Q3 only
quadrant4	Q4 only

IECNORM.COM : Click to view the full PDF of IEC 61968-9:2024
Single user licence only, copying and networking prohibited.
No reproduction or circulation.