

INTERNATIONAL STANDARD



**Service diagnostic interface for consumer electronics products and networks –
Implementation for ECHONET**

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

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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Implementation for ECHONET**

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CONTENTS

FOREWORD.....	33
INTRODUCTION.....	35
1 Scope.....	36
2 Normative references	36
3 Terms, definitions and abbreviated terms	36
3.1 Terms and definitions.....	36
3.2 Abbreviated terms.....	37
4 Different types of service diagnostics	38
4.1 Stand-alone products.....	38
4.2 Facilities or household appliances network	38
4.3 Remote diagnosis	38
5 SDI requirements.....	38
5.1 General.....	38
5.2 Hardware	38
5.2.1 Tester hardware	38
5.2.2 Facilities or household appliances network	38
5.2.3 DUT hardware	38
5.3 Software	39
5.3.1 General	39
5.3.2 Tester software.....	39
5.3.3 DUT software requirements for the SDI	39
6 Tester software requirements	39
6.1 Reading the property diagnostic unit.....	39
6.2 General information (product identification).....	40
6.3 Diagnosis information	40
7 Control protocol 1st	40
7.1 General.....	40
7.2 Frame format.....	40
7.2.1 General.....	40
7.2.2 ECHONET headers (EHD).....	41
7.2.3 Source/Destination ECHONET address (SEA/DEA)	43
7.2.4 ECHONET byte counter (EBC).....	44
7.2.5 ECHONET data (EDATA).....	44
7.2.6 Object message header (OHD)	44
7.2.7 ECHONET objects (EOJ).....	45
7.2.8 ECHONET property (EPC).....	46
7.2.9 ECHONET service (ESV).....	47
7.2.10 ECHONET property value data (EDT)	62
7.2.11 Compound ECHONET Service (CpESV)	62
7.2.12 Processing target property counter (OPC)	68
7.2.13 Property data counter (PDC).....	69
8 Control protocol 2nd	69
8.1 General.....	69
8.2 Frame format	69
8.2.1 General	69
8.2.2 ECHONET Lite Header (ELHD).....	70

8.2.3	Transaction ID (TID)	71
8.2.4	ECHONET Lite Data (ELDATA)	71
8.2.5	ECHONET Objects (EOJ)	71
8.2.6	ECHONET Lite Service (ELSV).....	72
8.2.7	ECHONET property (EPC).....	80
8.2.8	ECHONET Lite Property data counter (ELPDC)	81
9	ECHONET objects: detailed specifications.....	82
9.1	Basic concept	82
9.2	ECHONET properties: basic specifications.....	83
9.2.1	General	83
9.2.2	ECHONET property value data types	83
9.2.3	Property value range	83
9.2.4	Required class properties	84
9.2.5	Array	84
9.3	Device object super class specifications	85
9.3.1	General	85
9.3.2	Overview of device object super class specifications.....	85
9.3.3	Operation status property	89
9.3.4	Installation location property	89
9.3.5	Standard version information property	91
9.3.6	Identification number property	91
9.3.7	Measured instantaneous power consumption property	92
9.3.8	Measured cumulative energy consumption property.....	92
9.3.9	Manufacturer's fault code property	92
9.3.10	Current limit setting property.....	93
9.3.11	Fault status property	93
9.3.12	Fault description property	93
9.3.13	Manufacturer code property	95
9.3.14	Business facility code property	95
9.3.15	Product code property	96
9.3.16	Production number property.....	96
9.3.17	Production date property	96
9.3.18	Power-saving operation setting property	96
9.3.19	Remote control setting property	96
9.3.20	Current time setting property	98
9.3.21	Current date setting property	98
9.3.22	Power limit setting property	98
9.3.23	Cumulative operating time property	98
9.3.24	Property map property	99
9.4	Temperature sensor class specifications	100
9.4.1	General	100
9.4.2	Operation status property	100
9.4.3	Measured temperature value property.....	100
9.5	Humidity sensor class specifications	100
9.5.1	General	100
9.5.2	Operation status property	101
9.5.3	Measured value of relative humidity property	101
9.6	Illuminance sensor class specifications	101
9.6.1	General	101

9.6.2	Operation status property	101
9.6.3	Measured illuminance value 1 property	101
9.6.4	Measured illuminance value 2 property	102
9.7	Human detection sensor class specifications	102
9.7.1	General	102
9.7.2	Operation status property	102
9.7.3	Detection threshold level property	102
9.7.4	Human detection status property	102
9.8	Electric energy sensor class specifications	103
9.8.1	General	103
9.8.2	Operation status property	104
9.8.3	Cumulative amounts of electric energy property	104
9.8.4	Small-capacity sensor instantaneous electric power property	104
9.8.5	Medium-capacity sensor instantaneous electric power property	104
9.8.6	Large-capacity sensor instantaneous electric power property	104
9.8.7	Cumulative amounts of electric energy measurement log property	104
9.8.8	Effective voltage value property	104
9.9	Open/close sensor class specifications	105
9.9.1	General	105
9.9.2	Operation status property	105
9.9.3	Degree-of-opening detection status 1 property	105
9.9.4	Detection threshold level property	106
9.9.5	Degree-of-opening detection status 2 property	106
9.10	Current sensor class specifications	106
9.10.1	General	106
9.10.2	Operation status property	106
9.10.3	Measured current value 1 property	107
9.10.4	Rated voltage property to be measured property	107
9.10.5	Measured current value 2 property	107
9.11	Air speed sensor class specifications	107
9.11.1	General	107
9.11.2	Operation status property	107
9.11.3	Measured value of air speed property	108
9.11.4	Air flow direction property	108
9.12	Water flow rate sensor class specifications	108
9.12.1	General	108
9.12.2	Operation status property	108
9.12.3	Cumulative flow rate property	108
9.12.4	Flow rate property	109
9.13	Rain sensor class specifications	109
9.13.1	General	109
9.13.2	Operation status property	109
9.13.3	Detection threshold level property	109
9.13.4	Rain detection status property	109
9.14	Home air conditioner class specifications	110
9.14.1	General	110
9.14.2	Operation status property	119
9.14.3	Power-saving operation setting property	120
9.14.4	Operation mode setting property	120

9.14.5	Automatic temperature control setting property	120
9.14.6	Normal/high-speed/silent operation setting property	120
9.14.7	Set temperature value property	120
9.14.8	Set value of relative humidity in dehumidifying mode property	121
9.14.9	Set temperature value in cooling mode property	121
9.14.10	Set temperature value in heating mode property	121
9.14.11	Set temperature value in dehumidifying mode property	121
9.14.12	Rated power consumption property	122
9.14.13	Measured value of current consumption property	122
9.14.14	Measured value of room relative humidity property	122
9.14.15	Measured value of room temperature property	122
9.14.16	Set temperature value of user remote control property	122
9.14.17	Measured cooled air temperature property	123
9.14.18	Measured outdoor air temperature property	123
9.14.19	Relative temperature setting property	123
9.14.20	Air flow rate setting property	123
9.14.21	Automatic control of air flow direction setting property	123
9.14.22	Automatic swing of air flow setting property	124
9.14.23	Air flow direction (vertical) setting property	124
9.14.24	Air flow direction (horizontal) setting property	124
9.14.25	Special state property	125
9.14.26	Non-priority state property	126
9.14.27	Ventilation function setting property	126
9.14.28	Humidifier function setting property	126
9.14.29	Ventilation air flow rate setting property	126
9.14.30	Degree of humidification setting property	127
9.14.31	Mounted air cleaning method property	127
9.14.32	Air purifier function setting property	127
9.14.33	Mounted air refresh method property	128
9.14.34	Air refresher function setting property	129
9.14.35	Mounted self-cleaning method property	129
9.14.36	Self-cleaning function setting property	130
9.14.37	Special function setting property	131
9.14.38	Operation status of components property	131
9.14.39	Thermostat setting override function property	132
9.14.40	Air purification mode setting property	132
9.14.41	Buzzer property	132
9.14.42	ON timer-based reservation setting property	132
9.14.43	ON timer setting (time) property	133
9.14.44	ON timer setting (relative time)	133
9.14.45	OFF timer-based reservation setting property	133
9.14.46	OFF timer setting (time) property	133
9.14.47	OFF timer setting (relative time) property	133
9.15	Ventilation fan class specifications	134
9.15.1	General	134
9.15.2	Operation status property	134
9.15.3	Ventilation automatic setting property	134
9.15.4	Set value of ventilation air flow rate property	134
9.16	Air purifier class specifications	135

9.16.1	General	135
9.16.2	Operation status property	135
9.16.3	Filter change notice property	136
9.16.4	Air flow rate setting property	136
9.16.5	Smoke (cigarette) detection status property	136
9.16.6	Optical catalyst operation setting property	136
9.16.7	Air pollution detection status property	136
9.17	Humidifier class specifications	136
9.17.1	General	136
9.17.2	Operation status property	138
9.17.3	Humidifying setting 1 property	138
9.17.4	Humidifying setting 2 property	138
9.17.5	Measured value of relative humidity property	138
9.17.6	Reservation setting of OFF timer property	138
9.17.7	Relative time value set of OFF timer property	139
9.17.8	Ion emission setting property	139
9.17.9	Implemented ion emission method property	139
9.17.10	Special operation mode setting property	139
9.17.11	Water amount level property	139
9.18	Package-type commercial air conditioner (indoor unit) class specifications	140
9.18.1	General	140
9.18.2	Operation status property	141
9.18.3	Operation mode setting property	141
9.18.4	Temperature setting property	142
9.18.5	Measured indoor unit temperature property	142
9.18.6	Thermostat state property	142
9.18.7	Current function (automatic operation mode) property	142
9.18.8	Group information property	142
9.18.9	Power consumption range for indoor units property	143
9.19	Package-type commercial air conditioner (outdoor unit) class specifications	143
9.19.1	General	143
9.19.2	Operation status property	144
9.19.3	Rated power consumption of outdoor unit property	144
9.19.4	Measured outdoor unit temperature property	144
9.19.5	Special state property	145
9.19.6	Group information property	145
9.19.7	Measured power consumption of outdoor unit property	145
9.19.8	Possible power savings for outdoor units property	145
9.19.9	Settings restricting power consumption of outdoor units property	145
9.19.10	Minimum power consumption for restricted outdoor unit property	146
9.20	Electric storage heater class specifications	146
9.20.1	General	146
9.20.2	Operation status property	149
9.20.3	Temperature setting property	149
9.20.4	Rated power consumption property	149
9.20.5	Measured indoor temperature property	149
9.20.6	Measured outdoor temperature property	150
9.20.7	Air flow rate setting property	150
9.20.8	Fan operation status property	150

9.20.9	Heat storage operation status property	150
9.20.10	Heat storage temperature setting property	150
9.20.11	Measured stored heat temperature property	150
9.20.12	Daytime heat storage setting property	151
9.20.13	Daytime heat storage ability property	151
9.20.14	Midnight power duration setting property	151
9.20.15	Midnight power start time setting property	151
9.20.16	Radiation method property	151
9.20.17	Child lock setting property	151
9.20.18	Fan timer 1 setting property	151
9.20.19	Fan timer 1 ON time setting property	152
9.20.20	Fan timer 1 OFF time setting property	152
9.20.21	Fan timer 2 setting property	152
9.20.22	Fan timer 2 ON time setting property	152
9.20.23	Fan timer 2 OFF time setting property	152
9.21	Gas heat pump-type commercial air conditioner (indoor unit) class specifications	152
9.21.1	General	152
9.21.2	Operation status property	154
9.21.3	Operation mode setting property	154
9.21.4	Temperature setting value property	154
9.21.5	Measured temperature value of indoor unit property	154
9.21.6	Thermo status property	154
9.21.7	Operation mode status during automatic operation property	154
9.21.8	Group information property	155
9.21.9	Power consumption range for indoor units property	155
9.22	Gas heat pump-type commercial air conditioner (outdoor unit) class specifications	155
9.22.1	General	155
9.22.2	Operation status (inherited from the super class property) property	157
9.22.3	Measured temperature value of outdoor unit property	157
9.22.4	Measured cumulative gas consumption property	157
9.22.5	Group information property	157
9.22.6	Time slot operation factor setting property	157
9.22.7	Allowable operation factor property	158
9.23	Range hood class specifications	158
9.23.1	General	158
9.23.2	Operation status property	161
9.23.3	Range hood automatic setting property	161
9.23.4	Ventilation air flow rate setting property	161
9.23.5	Lighting operation setting property	161
9.23.6	Light source colour setting property	161
9.23.7	Brightness level setting property	161
9.23.8	Lighting mode setting property	162
9.23.9	When in coloured lighting mode RGB setting property	162
9.23.10	Measured value of indoor temperature property	162
9.23.11	Measured value of outdoor temperature property	162
9.23.12	Measured value of supply air temperature property	162
9.23.13	Measured value of cooking temperature property	163

9.23.14	Measured value of indoor relative humidity property	163
9.23.15	Measured value of outdoor air humidity property	163
9.23.16	Human detection threshold level setting property	163
9.23.17	Human detection status property	163
9.23.18	Measured value of CO ₂ concentration property	163
9.23.19	Gas detection threshold level setting property	163
9.23.20	Gas detection status property	164
9.23.21	Error detection mode property	164
9.24	Electrically operated shade class specifications	164
9.24.1	General	164
9.24.2	Operation status property	167
9.24.3	Fault description property	167
9.24.4	Timer operation setting property	167
9.24.5	Wind detection status property	167
9.24.6	Sunlight detection status property	167
9.24.7	Opening (extension) speed setting property	167
9.24.8	Closing (retraction) speed setting property	167
9.24.9	Operation time property	168
9.24.10	Automatic operation setting property	168
9.24.11	Open/close (extension/retraction) operation setting property	168
9.24.12	Degree-of-opening property	168
9.24.13	Shade angle setting property	168
9.24.14	Open/close (extension/retraction) speed property	168
9.24.15	Electric lock setting property	168
9.24.16	Remote operation setting status property	169
9.24.17	Selective opening (extension) operation setting property	169
9.24.18	Open/closed (extended/retracted) status property	169
9.24.19	One-time opening (extension) speed setting property	169
9.24.20	One-time closing (retraction) speed setting property	169
9.25	Electrically operated rain sliding door/shutter class specifications	169
9.25.1	General	169
9.25.2	Operation status property	172
9.25.3	Fault description property	172
9.25.4	Timer operation setting property	172
9.25.5	Opening speed setting property	172
9.25.6	Closing speed setting property	172
9.25.7	Operation time setting property	172
9.25.8	Open/close operation setting property	172
9.25.9	Degree-of-opening setting property	172
9.25.10	Blind angle setting property	173
9.25.11	Opening/closing speed setting property	173
9.25.12	Electric lock setting property	173
9.25.13	Remote operation setting status property	173
9.25.14	Selective degree-of-opening setting property	173
9.25.15	Open/closed status property	173
9.25.16	Slit degree-of-opening property	173
9.25.17	One-time opening speed setting property	174
9.25.18	One-time closing speed setting property	174
9.26	Electric water heater class specifications	174

9.26.1	General	174
9.26.2	Operation status property	181
9.26.3	Automatic water heating setting property	181
9.26.4	Automatic water temperature control setting property	181
9.26.5	Water heater status property	182
9.26.6	Water heating temperature setting property	182
9.26.7	Manual water heating stop days setting property	182
9.26.8	Relative time setting value for manual water heating OFF property	182
9.26.9	Tank operation mode setting property	182
9.26.10	Daytime reheating permission setting property	182
9.26.11	Measured temperature of water in water heater property	182
9.26.12	Alarm status property	182
9.26.13	Hot water supply status property	183
9.26.14	Relative time setting for keeping bath temperature property	183
9.26.15	Temperature of supplied water setting property	183
9.26.16	Bath water temperature setting property	183
9.26.17	Hot water volume setting property	184
9.26.18	Measured amount of water remaining in tank property	184
9.26.19	Tank capacity property	184
9.26.20	Automatic bath water heating mode setting property	184
9.26.21	Manual bath reheating operation setting property	184
9.26.22	Manual bath hot water addition function setting property	184
9.26.23	Manual lukewarm water temperature lowering function setting property	184
9.26.24	Bath water volume setting 1 property	185
9.26.25	Bath water volume setting 2 property	185
9.26.26	Bathroom priority setting property	185
9.26.27	Bath operation status monitor property	185
9.26.28	Bath water volume setting 3 property	185
9.26.29	Bath water volume setting 4 property	185
9.26.30	Bath water volume setting 4 – Maximum settable level property	186
9.26.31	Sound volume setting property	186
9.26.32	Mute setting property	186
9.26.33	Remaining hot water volume property	186
9.26.34	Surplus electric energy prediction value property	186
9.26.35	Rated power consumption of HP unit in wintertime property	187
9.26.36	Rated power consumption of HP unit in in-between seasons property	187
9.26.37	Rated power consumption of HP unit in summertime property	187
9.26.38	ON timer reservation setting property	187
9.26.39	ON timer setting property	187
9.26.40	Participation in energy shift property	187
9.26.41	Standard time to start heating property	188
9.26.42	Number of energy shifts property	189
9.26.43	Daytime heating shift time 1 property (D1 of Figure 63 and D1 of Figure 64)	189
9.26.44	Expected electric energy at daytime heating shift time 1 property (C1 of Figure 63 and C1 of Figure 64)	189
9.26.45	Consumption of electric energy per hour 1 property	190
9.26.46	Daytime heating shift time 2 property (D2 of Figure 63 and D2 of Figure 64)	190

9.26.47	Expected electric energy at daytime heating shift time 2 property (C2 of Figure 64).....	191
9.26.48	Consumption of electric energy per hour 2 property	191
9.27	Electric toilet seat class (warm-water washing toilet seat, heating toilet seat, etc.) specifications	193
9.27.1	General	193
9.27.2	Operation status property	195
9.27.3	Temperature level of toilet seat property	195
9.27.4	Heater setting of toilet seat property	195
9.27.5	Temporal halt setting of toilet seat heating property.....	195
9.27.6	Temporal halt start time of toilet seat heating property.....	195
9.27.7	Temporal halt time duration of toilet seat heating property.....	195
9.27.8	Temperature level setting of room heating property	196
9.27.9	Room heating setting property	196
9.27.10	Room heating status property	196
9.27.11	Start time of room heating property.....	196
9.27.12	Duration time of room heating property	196
9.27.13	Special operation mode setting property	196
9.27.14	Human detection status property	196
9.27.15	Seating detection status property.....	196
9.28	Electric lock class specifications	197
9.28.1	General	197
9.28.2	Operation status property	198
9.28.3	Lock setting 1 property	198
9.28.4	Lock setting 2 property	198
9.28.5	Lock status of door guard property	198
9.28.6	Door open/closed status property	198
9.28.7	Occupant/non-occupant status property	198
9.28.8	Alarm status property	198
9.28.9	Automatic lock mode setting property	198
9.28.10	Battery level property.....	199
9.29	Instantaneous water heater class specifications.....	199
9.29.1	General	199
9.29.2	Operation status property	202
9.29.3	Water heating status property.....	202
9.29.4	Set value of hot water temperature property	202
9.29.5	Hot water warmer setting property	202
9.29.6	Duration of automatic operation setting property.....	202
9.29.7	Remaining automatic operation time property	203
9.29.8	Set value of bath temperature property	203
9.29.9	Bath water heater status property	203
9.29.10	Bath automatic mode setting property.....	203
9.29.11	Bath additional boil-up operation setting property	203
9.29.12	Bath hot water adding operation setting property	204
9.29.13	Bath water temperature lowering operation setting property.....	204
9.29.14	Bath hot water volume setting 1 property	204
9.29.15	Bath hot water volume setting 2 property	204
9.29.16	Bath hot water volume setting 3 property	204
9.29.17	Bath hot water volume setting 4 property	204

9.29.18	Bath hot water volume setting 4 – Maximum settable level property	205
9.29.19	Bathroom priority setting property	205
9.29.20	Shower hot water supply status property	205
9.29.21	Kitchen hot water heating status property	205
9.29.22	Hot water warmer ON timer reservation setting property	205
9.29.23	Bath operation status monitor property	205
9.29.24	Set value of hot water warmer ON timer time property	205
9.29.25	ON timer reservation setting property	206
9.29.26	Set value of ON timer time property	206
9.29.27	Set value of ON timer relative time property	206
9.29.28	Sound volume setting property	206
9.29.29	Mute setting property	206
9.30	Bathroom heater and dryer class specifications	207
9.30.1	General	207
9.30.2	Operation status property	211
9.30.3	Operation setting property	211
9.30.4	Ventilation operation setting property	212
9.30.5	Bathroom pre-warmer operation setting property	212
9.30.6	Bathroom heater operation setting property	212
9.30.7	Bathroom dryer operation setting property	213
9.30.8	Cool air circulation operation setting property	213
9.30.9	Mist sauna operation setting property	214
9.30.10	Water mist operation settings property	214
9.30.11	Measured relative bathroom humidity property	214
9.30.12	Measured bathroom temperature property	215
9.30.13	Human body detection status property	215
9.30.14	Filter cleaning reminder sign setting property	215
9.30.15	Ventilation air flow rate setting property	215
9.30.16	ON timer-based reservation setting 1 property	215
9.30.17	ON timer-based reservation setting 2 property	216
9.30.18	ON timer setting (time) property	216
9.30.19	ON timer setting (relative time) property	216
9.30.20	OFF timer-based reservation setting property	216
9.30.21	OFF timer setting (time) property	217
9.30.22	OFF timer setting (relative time) property	217
9.31	Household solar power generation class specifications	217
9.31.1	General	217
9.31.2	Operation status property	224
9.31.3	Identification number property	224
9.31.4	Current time setting property	224
9.31.5	Current date setting property	225
9.31.6	Output power control setting 1 property	225
9.31.7	Output power control setting 2 property	225
9.31.8	Function to control purchase of excess electricity setting property	225
9.31.9	Output power controlling schedule property	225
9.31.10	Next access date and time property	226
9.31.11	Type for function to control purchase of excess electricity property	226
9.31.12	Output power change time setting value property	226
9.31.13	Upper limit clip setting value property	226

9.31.14	Operation power factor setting value property	226
9.31.15	FIT contract type property	226
9.31.16	Self-consumption type property	226
9.31.17	Capacity approved by equipment property	227
9.31.18	Conversion coefficient property	227
9.31.19	System interconnection status property	227
9.31.20	Output power restraint status property	227
9.31.21	Measured instantaneous amount of electricity generated property	228
9.31.22	Measured cumulative amount of electricity generated property	228
9.31.23	Resetting cumulative amount of electric energy generated property	228
9.31.24	Measured cumulative amount of electric energy sold property	228
9.31.25	Resetting cumulative amount of electric energy sold property	228
9.31.26	Power generation output limit setting 1 property	228
9.31.27	Power generation output limit setting 2 property	228
9.31.28	Limit setting for the amount of electricity sold property	228
9.31.29	Rated power generation output (system interconnected) property	228
9.31.30	Rated power generation output (independent) property	229
9.32	Floor heater class specifications	229
9.32.1	General	229
9.32.2	Operation status property	231
9.32.3	Measured instantaneous power consumption property	231
9.32.4	Measured cumulative energy consumption property	231
9.32.5	Temperature setting 1 property	232
9.32.6	Temperature setting 2 property	232
9.32.7	Temperature setting 2 – Maximum settable level property	232
9.32.8	Measured room temperature property	232
9.32.9	Measured floor temperature property	233
9.32.10	Zone change setting property	233
9.32.11	Special operation setting property	233
9.32.12	Daily timer setting property	233
9.32.13	Daily timer setting 1 property / Daily timer setting 2 property	233
9.32.14	Rated power consumption property	234
9.32.15	Power consumption measurement method property	235
9.32.16	ON timer reservation setting property	235
9.32.17	Time set by ON timer property	235
9.32.18	Relative ON timer setting property	235
9.32.19	OFF timer reservation setting property	235
9.32.20	Time set by OFF timer property	236
9.32.21	Relative OFF timer setting property	236
9.33	Fuel cell class specifications	236
9.33.1	General	236
9.33.2	Operation status property	238
9.33.3	Measured temperature of water in water heater property	238
9.33.4	Rated power generation output property	239
9.33.5	Heating value of hot water storage tank property	239
9.33.6	Measured instantaneous power generation output property	239
9.33.7	Measured cumulative energy generation output property	239
9.33.8	Cumulative energy generation output reset setting property	239
9.33.9	Measured instantaneous gas consumption property	239

9.33.10	Measured cumulative gas consumption property	239
9.33.11	Cumulative gas consumption reset setting property	239
9.33.12	Power generation setting property	239
9.33.13	Power generation status property	240
9.33.14	Measured in-house instantaneous power consumption property	240
9.33.15	Measured in-house cumulative energy consumption property	240
9.33.16	In-house cumulative energy consumption reset property	240
9.33.17	System interconnection status property	240
9.33.18	Power generation request time setting property	240
9.33.19	Designated power generation status property	241
9.33.20	Measured remaining hot water amount property	241
9.33.21	Tank capacity property	241
9.34	Storage battery class specifications	241
9.34.1	General	241
9.34.2	Operation status property	252
9.34.3	Identification number property	252
9.34.4	Current time setting property	252
9.34.5	Current date setting property	252
9.34.6	AC effective capacity (charging) property	253
9.34.7	AC effective capacity (discharging) property	253
9.34.8	AC chargeable capacity property	253
9.34.9	AC dischargeable capacity property	253
9.34.10	AC chargeable electric energy property	253
9.34.11	AC dischargeable electric energy property	253
9.34.12	AC charge upper limit setting property	254
9.34.13	AC discharge lower limit setting property	254
9.34.14	AC cumulative charging electric energy property	254
9.34.15	AC cumulative discharging electric energy property	254
9.34.16	AC charge amount target value property	254
9.34.17	AC discharge amount target value property	255
9.34.18	Charging method property	255
9.34.19	Discharging method property	256
9.34.20	Minimum/maximum charging electric power property	258
9.34.21	Minimum/maximum discharging electric power property	258
9.34.22	Minimum/maximum charging current property	258
9.34.23	Minimum/maximum discharging current property	258
9.34.24	Re-interconnection permission setting property	258
9.34.25	Operation permission setting property	259
9.34.26	Independent operation permission setting property	259
9.34.27	Working operation status property	259
9.34.28	AC rated electric energy property	259
9.34.29	Rated electric energy property	259
9.34.30	Rated capacity property	259
9.34.31	Rated voltage property	259
9.34.32	Measured instantaneous charging/discharging electric power property	259
9.34.33	Measured instantaneous charging/discharging current property	260
9.34.34	Measured instantaneous charging/discharging voltage property	260
9.34.35	Measured cumulative discharging electric energy property	260
9.34.36	Measured cumulative discharging electric energy resetting property	260

9.34.37	Measured cumulative charging electric energy property	260
9.34.38	Measured cumulative charging electric energy reset setting property	260
9.34.39	Operation mode setting property	260
9.34.40	System interconnection status property	261
9.34.41	Minimum/maximum charging electric power (independent) property	261
9.34.42	Minimum/maximum discharging electric power (independent) property	261
9.34.43	Minimum/maximum charging current (independent) property	261
9.34.44	Minimum/maximum discharging current (independent) property	261
9.34.45	Charging/discharging amount setting 1 property	262
9.34.46	Charging/discharging amount setting 2 property	262
9.34.47	Remaining stored electricity 1 property	262
9.34.48	Remaining stored electricity 2 property	262
9.34.49	Remaining stored electricity 3 property	262
9.34.50	Battery state of health property	262
9.34.51	Battery type property	263
9.34.52	Charging amount setting 1 property	263
9.34.53	Discharging amount setting 1 property	263
9.34.54	Charging amount setting 2 property	263
9.34.55	Discharging amount setting 2 property	263
9.34.56	Charging electric power setting property	263
9.34.57	Discharging electric power setting property	263
9.34.58	Charging current setting property	264
9.34.59	Discharging current setting property	264
9.34.60	Rated voltage (independent) property	264
9.35	Electric vehicle charger/discharger class specifications	264
9.35.1	General	264
9.35.2	Operation status property	275
9.35.3	Dischargeable capacity of vehicle mounted battery 1 property	276
9.35.4	Dischargeable capacity of vehicle mounted battery 2 property	276
9.35.5	Remaining dischargeable capacity of vehicle mounted battery 1 property	276
9.35.6	Remaining dischargeable capacity of vehicle mounted battery 2 property	276
9.35.7	Remaining dischargeable capacity of vehicle mounted battery 3 property	276
9.35.8	Rated charge capacity property	276
9.35.9	Rated discharge capacity property	276
9.35.10	Vehicle connection and chargeable/dischargeable status property	277
9.35.11	Minimum/maximum charging electric power property	277
9.35.12	Minimum/maximum discharging electric power property	277
9.35.13	Minimum/maximum charging current property	278
9.35.14	Minimum/maximum discharging current property	278
9.35.15	Charger/discharger type property	278
9.35.16	Vehicle connection confirmation property	279
9.35.17	Used capacity of vehicle mounted battery 1 (total battery capacity) property	279
9.35.18	Used capacity of vehicle mounted battery 2 property	279
9.35.19	Rated voltage property	280
9.35.20	Measured instantaneous charging/discharging electric power	280
9.35.21	Measured instantaneous charging/discharging current property	280

9.35.22	Measured instantaneous charging/discharging voltage property	280
9.35.23	Measured cumulative amount of discharging electric energy property	280
9.35.24	Cumulative amount of discharging electric energy reset setting	280
9.35.25	Measured cumulative amount of charging electric energy property	280
9.35.26	Cumulative amount of charging electric energy reset setting property	280
9.35.27	Operation mode setting property	281
9.35.28	System interconnection status property	282
9.35.29	Charging method property	282
9.35.30	Discharging method property	283
9.35.31	Purchasing electric power setting property	284
9.35.32	Re-interconnection permission setting property	285
9.35.33	Charging/discharging electric power setting property	285
9.35.34	Working operation status property	286
9.35.35	Remaining stored electricity of vehicle mounted battery 1 property	286
9.35.36	Remaining stored electricity of vehicle mounted battery 2 property	286
9.35.37	Remaining stored electricity of vehicle mounted battery 3 (charging rate) property	286
9.35.38	Charging amount setting 1 property	287
9.35.39	Charging amount setting 2 property	287
9.35.40	Charging electric power setting property	287
9.35.41	Discharging electric power setting property	287
9.35.42	Charging current setting property	287
9.35.43	Discharging current setting property	287
9.35.44	Rated voltage (independent status) property	287
9.35.45	Chargeable capacity of vehicle mounted battery property	288
9.35.46	Remaining chargeable capacity of vehicle mounted battery property	288
9.35.47	Vehicle ID property	288
9.35.48	Discharging amount setting property	288
9.35.49	Maintenance status property	289
9.36	Engine cogeneration class specifications	289
9.36.1	General	289
9.36.2	Operation status property	291
9.36.3	Measured hot water temperature of water heater property	291
9.36.4	Rated power generation output property	291
9.36.5	Heating value of hot water storage tank property	291
9.36.6	Measured instantaneous power generation output property	292
9.36.7	Measured cumulative energy generation output property	292
9.36.8	Cumulative energy generation output reset setting property	292
9.36.9	Measured instantaneous gas consumption property	292
9.36.10	Measured cumulative gas consumption property	292
9.36.11	Cumulative gas consumption reset setting property	292
9.36.12	Power generation setting property	292
9.36.13	Power generation status property	292
9.36.14	Measured in-house instantaneous power consumption property	292
9.36.15	Measured in-house cumulative energy consumption property	293
9.36.16	In-house cumulative energy consumption reset property	293
9.36.17	System interconnection status property	293
9.36.18	Measured remaining hot water amount property	293
9.36.19	Tank capacity property	293

9.37	Water flowmeter class specifications.....	293
9.37.1	General	293
9.37.2	Operation status property	295
9.37.3	Water flowmeter classification property.....	295
9.37.4	Owner classification property.....	296
9.37.5	Measured cumulative amount of flowing water property	296
9.37.6	Unit for measured cumulative amounts of flowing water property	296
9.37.7	Historical data of measured cumulative amounts of flowing water property	296
9.37.8	Detection of abnormal value in metering data property	296
9.37.9	Security data information property	297
9.37.10	ID number setting property	297
9.37.11	Verification expiration information property	297
9.37.12	Historical data of measured cumulative amounts of flowing water 2 property	297
9.38	Power distribution board metering class specifications.....	297
9.38.1	General	297
9.38.2	Operation status property	317
9.38.3	Measured cumulative amount of electric energy (normal and reverse directions) property.....	317
9.38.4	Unit for cumulative amounts of electric energy property.....	318
9.38.5	Historical data of measured cumulative amounts of electric energy (normal and reverse directions) property	318
9.38.6	Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved (normal and reverse directions) property	318
9.38.7	Measured instantaneous electric power property	319
9.38.8	Measured instantaneous currents property	319
9.38.9	Measured instantaneous voltages property.....	319
9.38.10	Measurement channels 1 to 32 property	319
9.38.11	Master rated capacity property	320
9.38.12	Number of measurement channels (simplex) property.....	320
9.38.13	Channel range specification for cumulative amount of electric energy consumption measurement (simplex) property	320
9.38.14	Measured cumulative amount of electric energy consumption list (simplex) property.....	320
9.38.15	Channel range specification for instantaneous current measurement (simplex) property.....	321
9.38.16	Measured instantaneous current list (simplex) property	321
9.38.17	Channel range specification for instantaneous power consumption measurement (simplex) property.....	322
9.38.18	Measured instantaneous power consumption list (simplex) property	322
9.38.19	Number of measurement channels (duplex) property	322
9.38.20	Channel range specification for cumulative amount of electric energy consumption measurement (duplex) property.....	323
9.38.21	Measured cumulative amount of electric energy consumption list (duplex) property	323
9.38.22	Channel range specification for instantaneous current measurement (duplex) property	323
9.38.23	Measured instantaneous current list (duplex) property	324
9.38.24	Channel range specification for instantaneous power consumption measurement (duplex) property	324

9.38.25	Measured instantaneous power consumption list (duplex) property	325
9.39	Low-voltage smart electric meter class specifications	325
9.39.1	General	325
9.39.2	Operation status property	332
9.39.3	Coefficient property	332
9.39.4	Number of effective digits for cumulative amounts of electric energy property	332
9.39.5	Measured cumulative amount of electric energy (normal direction) property	333
9.39.6	Unit for measured cumulative amounts of electric energy (normal and reverse directions) property	333
9.39.7	Historical data of measured cumulative amounts of electric energy 1 (normal direction) property	333
9.39.8	Measured cumulative amounts of electric energy (reverse direction) property	334
9.39.9	Historical data of measured cumulative amounts of electric energy 1 (reverse direction) property	334
9.39.10	Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved 1 property	335
9.39.11	Measured instantaneous electric power property	335
9.39.12	Measured instantaneous currents property	335
9.39.13	Cumulative amounts of electric energy measured at fixed time (normal direction) property	335
9.39.14	Cumulative amounts of electric energy measured at fixed time (reverse direction) property	336
9.39.15	Historical data of measured cumulative amounts of electric energy 2 (normal and reverse directions) property	337
9.39.16	Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved 2 property	337
9.40	Smart gas meter class specifications	338
9.40.1	General	338
9.40.2	Operation status property	342
9.40.3	Gas meter classification setting property	342
9.40.4	Owner classification setting property	342
9.40.5	Measured cumulative gas consumption property	343
9.40.6	Unit for measured cumulative gas consumption property	343
9.40.7	Historical data of measured cumulative gas consumption property	344
9.40.8	Day setting for which the historical data of measured cumulative gas consumption shall be retrieved property	344
9.40.9	Detection of abnormal value in metering data property	344
9.40.10	Security data information property	344
9.40.11	Valve closure by the Centre property	345
9.40.12	Permission from the Centre to reopen the valve closed by the Centre property	345
9.40.13	Emergency closure of shutoff valve property	345
9.40.14	Shutoff valve status property	345
9.40.15	Historical data of shutoff reasons property	345
9.40.16	ID number setting property	345
9.40.17	Verification expiration setting property	345
9.40.18	Measured cumulative gas consumption information with date and time property	345
9.40.19	Historical information of cumulative gas consumption property	346

9.41	High-voltage smart electric energy meter class specifications	347
9.41.1	General	347
9.41.2	Operation status property	357
9.41.3	Coefficient property	357
9.41.4	Multiplying factor for coefficient property	357
9.41.5	Fixed date property	357
9.41.6	Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved property	357
9.41.7	Measured cumulative amount of active electric energy property	358
9.41.8	Cumulative amounts of active electric energy at fixed time property	358
9.41.9	Measurement data of cumulative amount of active electric energy for power factor measurement	359
9.41.10	Number of effective digits for cumulative amount of active electric energy property	359
9.41.11	Unit for cumulative amounts of active electric energy property	360
9.41.12	Historical data of measured cumulative amount of active electric energy property	360
9.41.13	Monthly maximum electric power demand property	360
9.41.14	Cumulative maximum electric power demand property	361
9.41.15	Electric power demand at fixed time (30-min average electric power) property	362
9.41.16	Number of effective digits of electric power demand property	362
9.41.17	Unit of electric power demand property	362
9.41.18	Historical data of measured electric power demand property	363
9.41.19	Unit of cumulative maximum electric power demand property	363
9.41.20	Measurement data of reactive electric energy consumption (lag) for power factor measurement property	364
9.41.21	Measurement data of cumulative amount of reactive electric energy consumption (lag) at fixed time for power factor measurement property	364
9.41.22	Number of effective digits for measurement data of cumulative amount of reactive electric energy consumption (lag) for power factor measurement property	365
9.41.23	Unit of measurement data of cumulative amount of reactive electric energy consumption (lag) property	365
9.41.24	Historical data of measurement data of cumulative amount of reactive electric energy consumption (lag) for power factor measurement property	366
9.42	Kerosene meter class specifications	366
9.42.1	General	366
9.42.2	Operation status property	367
9.42.3	Measured cumulative amount of kerosene consumption property	367
9.42.4	History of measured cumulative amounts of kerosene consumption property	367
9.43	Smart kerosene meter class specifications	367
9.43.1	General	367
9.43.2	Operation status property	371
9.43.3	Owner category setting property	371
9.43.4	Measured cumulative kerosene consumption property	371
9.43.5	Units for measured cumulative kerosene consumption property	372
9.43.6	Historical information of cumulative kerosene consumption property	372
9.43.7	Collection date setting for history of cumulative kerosene consumption property	372

9.43.8	Meter reading data abnormality detection status property	373
9.43.9	Security data information property	373
9.43.10	Residual volume control warning level property	373
9.43.11	Residual volume control warning level 1 property	373
9.43.12	Residual volume control warning level 2 property	373
9.43.13	Residual volume control warning level 3 property	373
9.43.14	Slight leak timer value (kerosene flow rate continuation) property	374
9.43.15	ID number setting property	374
9.43.16	Verification expiration setting property	374
9.43.17	Measured cumulative kerosene consumption information with date and time property	374
9.43.18	Historical information of cumulative kerosene consumption property	374
9.44	Smart electric energy meter for sub-metering class specifications	375
9.44.1	General	375
9.44.2	Operation status property	383
9.44.3	Current time setting property	383
9.44.4	Current date setting property	383
9.44.5	Electric power coefficient property	383
9.44.6	Unit for measured cumulative amount of electric energy (normal and reverse directions) property	383
9.44.7	Number of effective digits for cumulative amount of electric energy property	383
9.44.8	Electric current coefficient property	383
9.44.9	Voltage coefficient property	384
9.44.10	Day on which the historical data of measured cumulative amount of electric energy is to be retrieved property	384
9.44.11	Measured cumulative amount of electric energy (normal direction) property	384
9.44.12	Historical data of measured cumulative amount of electric energy (normal direction) property	384
9.44.13	Measured cumulative amount of electric energy (reverse direction) property	385
9.44.14	Historical data of measured cumulative amount of electric energy (reverse direction) property	385
9.44.15	Measured instantaneous electric power property	386
9.44.16	Measured instantaneous currents property	386
9.44.17	Measured instantaneous voltages property	386
9.44.18	Cumulative amount of electric energy measured at a fixed time (normal direction) property	387
9.44.19	Cumulative amount of electric energy measured at a fixed time (reverse direction) property	387
9.45	Distributed generator's electric energy meter class specifications	388
9.45.1	General	388
9.45.2	Operation status property	399
9.45.3	Current date setting property	400
9.45.4	Device type property	400
9.45.5	Device ID property	400
9.45.6	Tolerance property	400
9.45.7	Number of days to retain historical data of measured cumulative amount of electric energy property	400
9.45.8	Unit for cumulative amount of electric energy property	400

9.45.9	Day on which the historical data of measured cumulative amount of electric energy is to be retrieved property	400
9.45.10	Identification number of device to be metered property	401
9.45.11	Current hour, minute, and second setting property	401
9.45.12	Time synchronization status property	401
9.45.13	Measured cumulative amount of electric energy (AC input) property	401
9.45.14	Historical data of measured cumulative amount of electric energy (AC input) property	402
9.45.15	Measured cumulative amount of electric energy (AC output) property	402
9.45.16	Historical data of measured cumulative amount of electric energy (AC output) property	402
9.45.17	Measured cumulative amount of electric energy (independent output) property	402
9.45.18	Historical data of measured cumulative amount of electric energy (independent output) property	403
9.45.19	Cumulative amount of electric energy measured at fixed time (AC input) property	403
9.45.20	Cumulative amount of electric energy measured at fixed time (AC output) property	404
9.45.21	Cumulative amount of electric energy measured at fixed time (independent output) property	404
9.45.22	Measured instantaneous electric power (AC input/output) property	404
9.45.23	Measured instantaneous electric power (independent output) property	404
9.46	General light class specifications	405
9.46.1	General	405
9.46.2	Operation status property	408
9.46.3	Illuminance level property	408
9.46.4	Light colour setting property	408
9.46.5	Illuminance level step setting property	409
9.46.6	Light colour step setting property	409
9.46.7	Maximum specifiable values property	410
9.46.8	Maximum value of settable level for night lighting property	410
9.46.9	Lighting mode setting property	410
9.46.10	Illuminance level setting for main lighting property	410
9.46.11	Illuminance level step setting for main lighting property	411
9.46.12	Illuminance level setting for night lighting property	411
9.46.13	Illuminance level step setting for night lighting property	411
9.46.14	Light colour setting for main lighting property	412
9.46.15	Light colour level step setting for main lighting property	412
9.46.16	Light colour setting for night lighting property	412
9.46.17	Light colour level step setting for night lighting property	413
9.46.18	Lighting mode status in automatic mode property	413
9.46.19	RGB setting for colour lighting property	413
9.46.20	ON timer reservation setting property	413
9.46.21	ON timer setting property	413
9.46.22	OFF timer reservation setting property	414
9.46.23	OFF timer setting property	414
9.47	Mono functional lighting class specifications	414
9.47.1	General	414
9.47.2	Operation status property	414
9.47.3	Illuminance level setting property	414

9.48	Lighting for solid light-emitting source class specifications	415
9.48.1	General	415
9.48.2	Operation status property	416
9.48.3	Number of light sources property	416
9.48.4	List of the light source operation status property	416
9.48.5	List of the light source optical output setting values property	417
9.48.6	List of light source colour temperature setting values property	418
9.48.7	ON timer reservation setting property	418
9.48.8	ON timer setting property	419
9.48.9	OFF timer reservation setting property	419
9.48.10	OFF timer setting property	419
9.49	Electric vehicle charger class specifications	419
9.49.1	General	419
9.49.2	Operation status property	424
9.49.3	Rated charge capacity property	424
9.49.4	Vehicle connection and chargeable status property	424
9.49.5	Minimum/maximum charging electric power property	424
9.49.6	Minimum/maximum charging current property	424
9.49.7	Charger type property	425
9.49.8	Vehicle connection confirmation property	425
9.49.9	Used capacity of vehicle-mounted battery 1 property	426
9.49.10	Rated voltage property	426
9.49.11	Measured instantaneous charging electric power property	426
9.49.12	Measured cumulative amount of charging electric energy property	426
9.49.13	Cumulative amount of charging electric energy reset setting property	426
9.49.14	Operating mode setting property	426
9.49.15	Remaining stored electricity of vehicle-mounted battery 1 property	426
9.49.16	Remaining stored electricity of vehicle-mounted battery 3 property	426
9.49.17	Charging electric power setting property	427
9.49.18	Charging current setting property	427
9.49.19	Chargeable capacity of vehicle mounted battery property	427
9.49.20	Remaining chargeable capacity of vehicle mounted battery property	427
9.49.21	Vehicle ID property	427
9.49.22	Charging amount setting property	428
9.50	Household small wind turbine power generation class specifications	428
9.50.1	General	428
9.50.2	Operation status property	430
9.50.3	System interconnection status property	430
9.50.4	Measured instantaneous amount of electricity generated property	430
9.50.5	Measured cumulative amount of electricity generated property	430
9.50.6	Resetting cumulative amount of electricity generated property	430
9.50.7	Measured cumulative amount of electricity sold property	430
9.50.8	Resetting cumulative amount of electricity sold property	430
9.50.9	Power generation output limit setting 1 property	431
9.50.10	Power generation output limit setting 2 property	431
9.50.11	Limit setting for the amount of electricity sold property	431
9.50.12	Rated power property	431
9.50.13	Measured wind speed property	431
9.50.14	Rated wind speed property	431

9.50.15	Cut-in wind speed property	431
9.50.16	Cut-out wind speed property	431
9.50.17	Extreme wind speed property	432
9.50.18	Braking status property	432
9.51	Lighting system class specifications	432
9.51.1	General	432
9.51.2	Operation status property	433
9.51.3	Illuminance level setting property	434
9.51.4	Scene control setting property	434
9.51.5	Number that can assign scene control setting property	434
9.52	Extended lighting system class specifications	434
9.52.1	General	434
9.52.2	Operation status property	436
9.52.3	Illuminance level setting property	436
9.52.4	Scene control setting property	436
9.52.5	Number that can assign scene control setting property	437
9.52.6	Power consumption rate list property	437
9.52.7	Power consumption when fully lit property	437
9.52.8	Possible power savings property	437
9.52.9	Power consumption limit setting property	437
9.52.10	Automatic operation controlling setting property	438
9.52.11	Fading control change time setting property	439
9.53	Multiple input PCS class specifications	439
9.53.1	General	439
9.53.2	Operation status property	441
9.53.3	Identification number property	441
9.53.4	Current time setting property	442
9.53.5	Current date setting property	442
9.53.6	System interconnection status property	442
9.53.7	Measured cumulative amount of electric energy (normal direction) property	442
9.53.8	Measured cumulative amount of electric energy (reverse direction) property	442
9.53.9	Measured instantaneous electric power property	442
9.53.10	List of connected devices property	442
9.54	Hybrid water heater class specifications	443
9.54.1	General	443
9.54.2	Operation status property	445
9.54.3	Automatic water heating setting property	446
9.54.4	Water heating status property	446
9.54.5	Heater status property	446
9.54.6	Hot water supply mode setting for auxiliary heat source machine property	446
9.54.7	Heater mode setting for auxiliary heat source machine property	446
9.54.8	Linkage mode setting for solar power generation property	446
9.54.9	Solar power generations utilization time property	446
9.54.10	Hot water supply status property	447
9.54.11	Measured amount of hot water remaining in tank property	447
9.54.12	Tank capacity property	447
9.55	Refrigerator class specifications	448

9.55.1	General	448
9.55.2	Operation status property	453
9.55.3	Door open/close status property	453
9.55.4	Door open warning property.....	454
9.55.5	Refrigerator compartment door status.....	454
9.55.6	Freezer compartment door status property	454
9.55.7	Ice compartment door status property.....	454
9.55.8	Vegetable compartment door status property	454
9.55.9	Multi-refrigerating mode compartment door status property	454
9.55.10	Maximum allowable temperature setting level property	454
9.55.11	Refrigerator compartment temperature setting property	455
9.55.12	Freezer compartment temperature setting property.....	455
9.55.13	Ice compartment temperature setting property	455
9.55.14	Vegetable compartment temperature setting property	455
9.55.15	Multi-refrigerating mode compartment temperature setting property.....	455
9.55.16	Refrigerator compartment temperature level setting property	456
9.55.17	Freezer compartment temperature level setting property	456
9.55.18	Ice compartment temperature level setting property.....	456
9.55.19	Vegetable compartment temperature level setting property.....	456
9.55.20	Multi-refrigerating mode compartment temperature level setting property	457
9.55.21	Measured refrigerator compartment temperature property	457
9.55.22	Measured freezer compartment temperature property.....	457
9.55.23	Measured ice compartment temperature property	457
9.55.24	Measured vegetable compartment temperature property.....	457
9.55.25	Measured multi-refrigerating mode compartment temperature property.....	457
9.55.26	Compressor rotation speed property	458
9.55.27	Measured electric current consumption property	458
9.55.28	Rated power consumption property.....	458
9.55.29	Quick freeze function setting property.....	458
9.55.30	Quick refrigeration function setting property.....	458
9.55.31	Icemaker setting property	459
9.55.32	Icemaker operation status property.....	459
9.55.33	Icemaker tank status property.....	459
9.55.34	Refrigerator compartment humidification function setting property	459
9.55.35	Vegetable compartment humidification function setting property	459
9.55.36	Deodorization function setting property.....	459
9.56	Microwave oven class specifications	459
9.56.1	General	459
9.56.2	Operation status property	466
9.56.3	Door open/close status property	466
9.56.4	Heating status property.....	466
9.56.5	Heating setting property.....	467
9.56.6	Heating mode setting property	467
9.56.7	Automatic heating setting property.....	468
9.56.8	Automatic heating level setting property	468
9.56.9	Automatic heating menu setting property	469
9.56.10	Oven mode setting property.....	470
9.56.11	Oven preheating setting property	470
9.56.12	Fermenting mode setting property	470

9.56.13	Chamber temperature setting property	471
9.56.14	Food temperature setting property	471
9.56.15	Heating time setting property	471
9.56.16	Remaining heating time setting property	472
9.56.17	Microwave heating power setting property	472
9.56.18	Prompt message setting property	472
9.56.19	Accessories to combination microwave oven setting property	473
9.56.20	Display character string setting property	475
9.56.21	Two-stage microwave heating setting (duration) property	475
9.56.22	Two-stage microwave heating setting (heating power) property	475
9.57	Washer and dryer class specifications	476
9.57.1	General	476
9.57.2	Operation status property	489
9.57.3	Door/cover open/close status property	489
9.57.4	Washer and dryer setting property	489
9.57.5	Washer and dryer cycle setting 1 property	489
9.57.6	Washer and dryer cycle setting 2 property	492
9.57.7	Drying cycle setting property	494
9.57.8	Washer and dryer cycle option list 1 property	495
9.57.9	Washer and dryer cycle option list 2 property	495
9.57.10	Washer and dryer cycle option list 3 property	495
9.57.11	Water flow rate setting property	496
9.57.12	Rotation speed for spin drying setting property	496
9.57.13	Degree of drying setting property	497
9.57.14	Remaining washing time property	497
9.57.15	Remaining drying time	497
9.57.16	Elapsed time on the ON timer property	497
9.57.17	Pre-soaking time setting property	497
9.57.18	Current stage of washer and dryer cycle property	498
9.57.19	Water volume setting 1 property	499
9.57.20	Water volume setting 2 property	500
9.57.21	Washing time setting property	500
9.57.22	Number of times of rinsing property	501
9.57.23	Rinsing process setting property	501
9.57.24	Spin drying time setting property	501
9.57.25	Drying time setting property	502
9.57.26	Warm water setting property	502
9.57.27	Bathtub water recycle setting property	502
9.57.28	Wrinkling minimization setting property	503
9.57.29	Time remaining to complete washer and dryer cycle property	503
9.57.30	Door/cover lock setting property	503
9.57.31	Washer and dryer cycle property	503
9.57.32	ON timer reservation setting property	505
9.57.33	ON timer setting property	505
9.57.34	Relative time-based ON timer setting	505
9.58	Clothes dryer class specifications	505
9.58.1	General	505
9.58.2	Operation status property	506
9.58.3	Door/cover open/close status property	506

9.58.4	Drying setting property	507
9.58.5	Drying status property	507
9.58.6	Remaining drying time property	507
9.58.7	ON timer reservation setting property	507
9.58.8	ON timer setting property.....	507
9.58.9	Relative time-based ON timer setting property	507
9.59	Cooking heater class specifications	507
9.59.1	General	507
9.59.2	Operation status property	510
9.59.3	Heating status property.....	510
9.59.4	Heating setting property.....	511
9.59.5	All stop setting property	511
9.59.6	Heating power setting property	512
9.59.7	Heating temperature setting property	512
9.59.8	Heating modes of stoves setting property	512
9.59.9	Relative time settings of OFF timers property	513
9.59.10	Child lock setting property	513
9.59.11	Radiant heater lock setting property	513
9.60	Commercial showcase class specifications	514
9.60.1	General	514
9.60.2	Operation status property	516
9.60.3	Operation mode setting property.....	516
9.60.4	Measured value of discharge temperature property.....	516
9.60.5	Internal lighting operation status property	517
9.60.6	External lighting operation status property	517
9.60.7	Compressor operation status property	517
9.60.8	Measured value of internal temperature property	517
9.60.9	Freezing capability value property	517
9.60.10	Defrosting heater power consumption property	517
9.60.11	Fan motor power consumption property	517
9.60.12	Heater mode property	517
9.60.13	Group information property	517
9.60.14	Showcase type information property	518
9.60.15	Door type information property	518
9.60.16	Showcase configuration information property.....	518
9.60.17	Type of lighting inside the showcase property.....	518
9.60.18	Type of lighting outside the case property.....	518
9.60.19	Illuminance level setting of lighting inside the showcase property	518
9.60.20	Illuminance level setting of lighting outside the case property	518
9.60.21	Temperature setting of inside the case property	518
9.60.22	Showcase shape information property	518
9.60.23	Temperature range information for inside the case property	518
9.61	Commercial showcase outdoor unit class specifications.....	519
9.61.1	General	519
9.61.2	Operation status property	519
9.61.3	Exceptional status property	519
9.61.4	Operation mode setting property.....	520
9.61.5	Measured value of outdoor air temperature property.....	520
9.61.6	Compressor operation status property	520

9.61.7	Group information property	520
9.62	Dishwasher and dryer class specifications	520
9.62.1	General	520
9.62.2	Operation status property	532
9.62.3	ON timer reservation setting property	532
9.62.4	ON timer setting property.....	532
9.62.5	Relative time-based ON timer setting property	532
9.62.6	Door/cover open/close setting property.....	532
9.62.7	Door/cover lock setting property	532
9.62.8	Operation status setting property	532
9.62.9	Dish-washing method setting property	533
9.62.10	Drying method setting property	533
9.62.11	Storing method setting property	534
9.62.12	Dish-washing method setting acceptable information property	534
9.62.13	Drying method setting acceptable information property	535
9.62.14	Storing method setting acceptable information property	535
9.62.15	Prewashing time setting property	535
9.62.16	Highest water temperature setting for prewashing property.....	536
9.62.17	Washing time setting property.....	536
9.62.18	Highest water temperature setting for washing property.....	536
9.62.19	Number of times of rinsing setting property.....	537
9.62.20	Rinsing mode setting property	537
9.62.21	Highest water temperature setting for hot water rinsing property.....	537
9.62.22	Dish-washing water volume setting property	538
9.62.23	Dish-washing water pressure setting property	538
9.62.24	Dish-washing level setting property	538
9.62.25	Drying time setting property.....	539
9.62.26	Highest air temperature setting for hot air drying property.....	539
9.62.27	Drying air flow rate setting property	539
9.62.28	Drying level setting property	540
9.62.29	Storing time setting property	540
9.62.30	Operation setting information property	541
9.62.31	Operation transition status property	542
9.62.32	Remaining time on the ON timer property	544
9.62.33	Remaining time of prewashing property	544
9.62.34	Remaining time of washing property	544
9.62.35	Remaining time of rinsing property	545
9.62.36	Remaining time of dish-washing property.....	545
9.62.37	Remaining drying time property	545
9.62.38	Remaining time of dish-washing and drying property	545
9.62.39	Storing elapsed time property	545
9.62.40	Used water volume property	545
9.63	Switch class specifications.....	545
9.63.1	General	545
9.63.2	Operation status property	546
9.63.3	Connected device property	546
9.64	Controller class specifications.....	546
9.64.1	General	546
9.64.2	Operation status property	548

9.64.3	Controller ID property	548
9.64.4	Number of devices controlled property	549
9.64.5	Index property	549
9.64.6	Device ID property	549
9.64.7	Device type property	549
9.64.8	Name property	549
9.64.9	Connection status property	550
9.64.10	Business code of the device to be controlled property	550
9.64.11	Product code of the device to be controlled property	550
9.64.12	Manufacture date of the device to be controlled property	550
9.64.13	Registered information renewal date of the device to be controlled property	551
9.64.14	Registered information renewal version information of the device to be controlled property	551
9.64.15	Place to install device to be controlled property	551
9.64.16	Fault status of device to be controlled property	551
9.64.17	Address of installation location property	551
9.64.18	Set property map for device to be controlled property	551
9.64.19	Get property map for device to be controlled property	551
10	Property map description format	552
	Bibliography	553
	Figure 1 – ECHONET frame for plain data format	41
	Figure 2 – EHD detailed specifications	42
	Figure 3 – Configuration of SEA and DEA when an individual address is specified	43
	Figure 4 – Broadcast target stipulation code	43
	Figure 5 – Node group stipulation bit specifications	44
	Figure 6 – OHD detailed specifications	45
	Figure 7 – EOJ detailed specifications	45
	Figure 8 – EPC detailed specifications	47
	Figure 9 – ESV detailed specifications	47
	Figure 10 – EDATA configuration in property value write service	52
	Figure 11 – EDATA configuration in property value read service	52
	Figure 12 – EDATA configuration in property value notification service	53
	Figure 13 – EDATA configuration in property value element-stipulated write service	54
	Figure 14 – EDATA configuration in property value element-stipulated read service	55
	Figure 15 – EDATA configuration in property value element-stipulated notification service	56
	Figure 16 – EDATA configuration in property value element-stipulated addition	57
	Figure 17 – EDATA configuration in property value element-stipulated deletion	58
	Figure 18 – EDATA configuration in property value element-stipulated existence confirmation	59
	Figure 19 – EDATA configuration in property value element addition	60
	Figure 20 – EDATA configuration in property value notification (response required)	60
	Figure 21 – EDATA configuration in property value element-stipulated notification (response required)	61
	Figure 22 – CpESV configuration	62

Figure 23 – Relationship between write request (requiring no response) and write "process-not-possible" response	65
Figure 24 – Relationship between write request (requiring a response), write "accepted" response, and write "process-not-possible" response	66
Figure 25 – Relationship between read request (requiring a response), read "accepted" response, and read "process-not-possible" response	67
Figure 26 – Notification message format	68
Figure 27 – Relationship between property value notification (requiring a response) and property value notification response	68
Figure 28 – Processing target property counter for three requests	69
Figure 29 – Property data counter	69
Figure 30 – ECHONET Lite frame format	70
Figure 31 – Detailed specifications of ELHD1	70
Figure 32 – Detailed specifications of ELHD2	71
Figure 33 – Detailed specifications of EOJ code	71
Figure 34 – ELSV code detailed specifications	72
Figure 35 – ELDATA configuration for property value write service (no response required)	75
Figure 36 – ELDATA configuration for property value write service (response required)	76
Figure 37 – ELDATA configuration for property value read service	77
Figure 38 – ELDATA configuration for property value write and read service	78
Figure 39 – ELDATA configuration for property value notification service	79
Figure 40 – ELDATA configuration for property value notification (response required) service	80
Figure 41 – EPC detailed specifications	81
Figure 42 – ECHONET Lite Property data counter	82
Figure 43 – Example of array elements	84
Figure 44 – Example of property value element deletion	85
Figure 45 – Example of property value element addition	85
Figure 46 – Data structure of "identification number" property	92
Figure 47 – Data structure of "manufacturer's fault code" property	92
Figure 48 – Configuration without "control server"	97
Figure 49 – Configuration with "control server"	97
Figure 50 – Air flow direction (vertical) setting	124
Figure 51 – Air flow direction (horizontal) setting	125
Figure 52 – Mounted air cleaning method	127
Figure 53 – Air purifier function setting	128
Figure 54 – Air refresh method	128
Figure 55 – Air refresher function setting	129
Figure 56 – Self-cleaning method	130
Figure 57 – Self-cleaning function setting	130
Figure 58 – Implemented ion emission method	139
Figure 59 – Implemented special operation modes	139
Figure 60 – Power restriction control of commercial-use package air conditioner (example)	146

Figure 61 – Value of alarm status	183
Figure 62 – Period that writing request is unacceptable	188
Figure 63 – Time to start accumulating hot water shift (daytime single shift)	192
Figure 64 – Time to start accumulating hot water shift (daytime double shift)	193
Figure 65 – An example of household solar power generation configuration	223
Figure 66 – Function to control purchase of excess electricity	224
Figure 67 – An example of capacity approved by equipment	227
Figure 68 – Daily timer setting	234
Figure 69 – Example of the battery configuration	242
Figure 70 – Image of various properties related to electric energy handled in this class	242
Figure 71 – Overview of charging methods	256
Figure 72 – Overview of discharging methods for storage battery if reverse power flow is not allowed	257
Figure 73 – Overview of discharging methods for storage battery if reverse power flow is allowed	257
Figure 74 – Relationship between the properties related to electric energy handled in this class	265
Figure 75 – Operation concept of Charging/Discharging (0x46)	281
Figure 76 – Relationship between properties (transition)	283
Figure 77 – Relationship between properties (no transition)	283
Figure 78 – Operation overview of discharging on designated purchasing electric power	285
Figure 79 – Operation overview of charging on designated purchasing electric power	285
Figure 80 – Data structure of Vehicle ID in electric vehicle charger/discharger class	288
Figure 81 – Current direction in power distribution board	317
Figure 82 – A concept of the distributed generator's electric energy meter class	397
Figure 83 – Measuring points in the distributed generator's electric energy meter class	398
Figure 84 – Node configuration examples	399
Figure 85 – Actual implementation cases from the solid light-emitting source class	416
Figure 86 – Relationship between the properties related to electric energy handled in this class	423
Figure 87 – Data structure of vehicle ID in electric vehicle charger class	427
Figure 88 – Relationship between the properties related to household small wind turbine power generation class	432
Figure 89 – A configuration of lighting system	433
Figure 90 – A configuration of extended lighting system	436
Figure 91 – Explanation for power consumptions	438
Figure 92 – An example of multiple input PCS configuration	441
Figure 93 – Example of a device that operates a heat pump only when supplying hot water	445
Figure 94 – Example of a device that operates a heat pump when supplying hot water and heating	445
Figure 95 – Stove	511
Table 1 – Bit pattern for hop count	42
Table 2 – DEA (broadcast-stipulated) address configuration	43

Table 3 – List of class group codes	46
Table 4 – List of ESV codes for requests	49
Table 5 – List of ESV codes for response/notification.....	50
Table 6 – List of ESV codes for "response-not-possible" responses	51
Table 7 – List of CpESV codes for request/notification.....	64
Table 8 – List of CpESV codes for "accepted" response	64
Table 9 – List of CpESV codes for "process-not-possible" response	64
Table 10 – List of class group codes	72
Table 11 – List of service codes for request.....	74
Table 12 – List of ELSV codes for response/notification.....	74
Table 13 – List of ELSV codes for "response not possible"	75
Table 14 – EPC code allocation table	81
Table 15 – Data types, data sizes, and overflow/underflow codes	84
Table 16 – List of device object super class configuration properties	86
Table 17 – Installation location (space) types and the bit values assigned to them.....	91
Table 18 – Fault-content property value assignments	95
Table 19 – List of temperature sensor properties	100
Table 20 – List of humidity sensor properties	100
Table 21 – List of illuminance sensor properties.....	101
Table 22 – List of human detection sensor properties	102
Table 23 – List of electric energy sensor properties	103
Table 24 – List of open/close sensor properties	105
Table 25 – List of current sensor properties	106
Table 26 – List of air speed sensor properties.....	107
Table 27 – List of water flow rate sensor properties	108
Table 28 – List of rain sensor properties	109
Table 29 – List of home air conditioner properties.....	110
Table 30 – Air flow direction (horizontal) setting.....	125
Table 31 – List of ventilation fan properties.....	134
Table 32 – List of air purifier properties.....	135
Table 33 – List of humidifier properties	137
Table 34 – List of package-type commercial air conditioner (indoor unit) properties	140
Table 35 – List of package-type commercial air conditioner (outdoor unit) properties	143
Table 36 – List of electric storage heater properties.....	147
Table 37 – List of gas heat pump-type commercial air conditioner (indoor unit) properties	153
Table 38 – List of gas heat pump-type commercial air conditioner (outdoor unit) properties	155
Table 39 – List of range hood properties	158
Table 40 – Range hood-specific errors of EPC = 0x88 "fault status".....	164
Table 41 – List of electrically operated shade properties.....	165
Table 42 – List of electrically operated rain sliding door/shutter properties.....	170
Table 43 – List of electric water heater properties	174

Table 44 – Property change according to both heating automatic setting property and energy shift participation status property.....	188
Table 45 – List of electric toilet seat (warm-water washing toilet seat, heating toilet seat, etc.) properties.....	194
Table 46 – List of electric lock properties.....	197
Table 47 – List of household instantaneous water heater properties	199
Table 48 – List of bathroom heater and dryer properties	207
Table 49 – List of household solar power generation properties	218
Table 50 – List of floor heater properties.....	229
Table 51 – List of fuel cell properties	236
Table 52 – List of storage battery properties	243
Table 53 – List of electric vehicle charger/discharger properties	266
Table 54 – List of engine cogeneration properties	289
Table 55 – List of water flowmeter properties.....	294
Table 56 – List of power distribution board metering properties.....	297
Table 57 – List of low-voltage smart electric meter properties	326
Table 58 – List of smart gas meter properties	338
Table 59 – Security data information property.....	344
Table 60 – Historical data of measured cumulative gas consumption (example) corresponding to the transition of cumulative gas consumption	346
Table 61 – List of high-voltage smart electric energy meter properties	347
Table 62 – List of kerosene meter properties	367
Table 63 – List of smart kerosene meter properties.....	368
Table 64 – bit assignment for security data.....	373
Table 65 – Historical data example of measured cumulative kerosene consumption corresponding to the transition of cumulative kerosene consumption	375
Table 66 – List of smart electric energy meter for sub-metering properties.....	376
Table 67 – List of distributed generator's electric energy meter properties	388
Table 68 – List of general light properties	405
Table 69 – List of mono functional lighting properties.....	414
Table 70 – List of lighting for solid light-emitting source properties	415
Table 71 – Examples of the list of the light source operation status when operating Get	417
Table 72 – Examples of the list of the light source operation status when operating Set	417
Table 73 – Examples of the list of the light source optical output setting values when operating Get.....	417
Table 74 – Examples of the list of the light source optical output setting values when operating Set	418
Table 75 – Examples of the list of light source colour temperature setting values when operating Get.....	418
Table 76 – Examples of the list of light source colour temperature setting values when operating Set	418
Table 77 – List of electric vehicle charger properties.....	419
Table 78 – List of household small wind turbine power generation properties.....	428
Table 79 – List of lighting system properties	433
Table 80 – List of extended lighting system properties	434
Table 81 – An example of scene number set.....	437

Table 82 – List of multiple input PCS properties	439
Table 83 – List of hybrid water heater properties	443
Table 84 – List of operations for linkage modes and utilization time	447
Table 85 – List of refrigerator properties	448
Table 86 – List of microwave oven properties	460
Table 87 – Heating status property	467
Table 88 – Automatic heating setting property	468
Table 89 – Automatic heating cycle codes	469
Table 90 – Prompt message codes	473
Table 91 – 2 bytes bitmap definition for each accessory	474
Table 92 – List of washer and dryer properties.....	476
Table 93 – washer and dryer setting property	489
Table 94 – Washer and dryer cycle option list 1 property	495
Table 95 – Washer and dryer cycle option list 2 property	495
Table 96 – Washer and dryer cycle option list 3 property	496
Table 97 – Current stage of washer and dryer cycle property	499
Table 98 – List of clothes dryer properties	506
Table 99 – List of cooking heater properties.....	508
Table 100 – List of commercial showcase properties	514
Table 101 – List of commercial showcase outdoor unit properties	519
Table 102 – List of dishwasher and dryer properties	520
Table 103 – Bitmap definition for dish-washing method setting acceptable information	535
Table 104 – Bitmap definition for drying method setting acceptable information	535
Table 105 – Bitmap definition for storing method setting acceptable information	535
Table 106 – Bitmap definition for each rinsing mode	537
Table 107 – Operation setting information arrangement	542
Table 108 – Pattern of property values	543
Table 109 – Relationship with operation status setting (EPC = 0xB2).....	544
Table 110 – List of switch properties	546
Table 111 – List of controller properties	546
Table 112 – Property map description format.....	552

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SERVICE DIAGNOSTIC INTERFACE FOR CONSUMER
ELECTRONICS PRODUCTS AND NETWORKS –
IMPLEMENTATION FOR ECHONET**

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This fifth edition cancels and replaces the fourth edition published in 2022. This edition constitutes a technical revision.

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

- a) updates of the device object super class specifications for the property configurations shared by all device objects;
- b) modification and addition of the property configurations defined by each object;
- c) addition of new device objects and their property configurations;
- d) updates to Bibliography.

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

Draft	Report on voting
100/4072/CDV	100/4157/RVC

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.

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INTRODUCTION

Consumer products are often repaired by service workshops, which service a wide range of products developed by different manufacturers.

For highly complex products, fault diagnosis becomes increasingly difficult and time consuming.

To facilitate diagnosis, manufacturers often develop built-in diagnostic software that communicates with an external diagnostic unit through a service diagnostic interface (SDI).

To avoid the need for a service workshop to purchase several different diagnostic units from different manufacturers for different products, a standardized SDI is proposed for use by all manufacturers of any products requiring a diagnostic interface. The result will be that only one SDI is needed in the service workshops.

The SDI should be suitable for diagnosis in a facilities or household appliances network in which different products from different manufacturers are connected together. The interface should also allow for future developments.

The standard SDI should:

- be usable in future products,
- be easily connectable to a product or a network,
- be inexpensive,
- not limit product design.

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SERVICE DIAGNOSTIC INTERFACE FOR CONSUMER ELECTRONICS PRODUCTS AND NETWORKS – IMPLEMENTATION FOR ECHONET

1 Scope

This International Standard specifies requirements for service diagnostic software to be implemented in products that incorporate a digital interface. It does not specify requirements for carrying out remote diagnosis or for manufacturer-dependent software.

The Service Diagnostic Interface (SDI) requires an external controller (exclusive or general-purpose/PC) into which service diagnostic software can be loaded. Parts of the controller software are standardized while other parts are proprietary to the manufacturers.

To reach a common approach in servicing all products from all manufacturers, it is necessary to standardize specific items to be tested in products and certain aspects of controllers' diagnostic software.

The SDI is based upon ECHONET specification version 2.11, ECHONET Lite specification version 1.13, and APPENDIX Detailed Requirements for ECHONET Device objects Release Q rev. 1, because this interface will be used in future products. The use of this connection and existing communication protocols enable implementation in products at a low cost, with maximum flexibility and efficiency.

The SDI consists of

- specific hardware and software requirements of the device under test (DUT);
- specific requirements of the controller:
 - the service software;
 - an ECHONET interface;
- the connection between the controller and the DUT.

This document provides the minimal requirements necessary to carry out computerized diagnosis. It covers the standardized software of the controller as well as the standardized software and provisions in the DUT.

2 Normative references

There are no normative references in this document.

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

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

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

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

3.1.1**ECHONET specifications**

specifications designed to enable the use of various kinds of transmission media (for example, power lines, low-power radio frequencies, ETHERNET, Bluetooth®¹)

3.1.2**remote diagnosis**

diagnosis of a product via telephone, Internet, etc.

3.2 Abbreviated terms

CpESV	compound ECHONET service
DEA	destination ECHONET address
DEOJ	destination ECHONET object
DUT	device under test
EBC	ECHONET byte counter
EDATA	ECHONET DATA
EDT	ECHONET property value data
EHD	ECHONET headers
ELDATA	ECHONET Lite DATA
ELHD	ECHONET Lite headers
ELPDC	ECHONET Lite Property data counter
ELSV	ECHONET Lite service
EOJ	ECHONET objects
EPC	ECHONET property
ESV	ECHONET service
EVPS	electric vehicle power system
FIT	feed-in tariff
LSB	least significant bit
MSB	most significant bit
OEM	original equipment manufacturer
OHD	object message header
OPC	processing target property counter
PC	personal computer
PCS	power conditioning system
PDC	property data counter
PEDATA	Plane EDATA (Plane ECHONET data)
ROM	read-only memory
SDI	service diagnostic interface
SEA	source ECHONET address
SEOJ	source ECHONET object
SOC	state of charge
TID	transaction ID
V2H	vehicle to Home

1 ETHERNET is the trademark of a product supplied by Xerox Corporation. Bluetooth is the trademark of a product supplied by Bluetooth SIG, Inc. This information is given for the convenience of users of this standard 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 Different types of service diagnostics

4.1 Stand-alone products

For stand-alone products, a connection is made between the diagnostic controller and the DUT, where the DUT is from any manufacturer and of any type.

4.2 Facilities or household appliances network

In a facilities or household appliances network, a connection is made between the diagnostic controller and a network of facilities or household appliances. Several different facilities or household appliances are interconnected and not all of them are necessarily from the same manufacturer.

In this case, the SDI shall list the products on the network, detect which facilities or appliances are causing problems, and diagnose the product concerned.

4.3 Remote diagnosis

In addition to the configurations described in 4.1 and 4.2, a link can be made (for example, via telephone, the Internet, etc.) between the diagnostic controller in the workshop and a DUT's network at the customer's home. Therefore, if a product has both an ECHONET interface and a remote connection capability, this product should be able to transfer the diagnostic data, as described in this document, through the remote connection.

5 SDI requirements

5.1 General

The SDI consists of

- hardware and software, both in the DUT and in the test equipment ("tester");
- the connection between the tester and the DUT.

The total SDI can be divided into the parts described in 5.2 and 5.3.

5.2 Hardware

5.2.1 Tester hardware

The hardware used for testing shall be a controller-exclusive computer or general-purpose controller (for example, a desktop or laptop PC) provided with at least one suitable network interface which enables transfer of the ECHONET frame, as specified in 7.2, and runs the necessary diagnostic software.

NOTE The minimum requirements for the tester hardware depend on the respective tester platform.

5.2.2 Facilities or household appliances network

For the connection between the tester and the DUT, the facilities or household appliances network shall be used. For diagnosis of the DUT using the network, the tester shall be connected to the facilities or household appliances network that conforms to the requirements of 7.2 or 8.2.

5.2.3 DUT hardware

5.2.3.1 General

The DUT shall be provided with at least one network interface which enables the transfer of the ECHONET frame as specified in 7.2.

5.2.3.2 Facilities or household appliances network

For diagnosis on a network, the tester shall, where possible, be connected to a facilities or household appliances network that conforms to the requirements of 7.1.

5.3 Software

5.3.1 General

The software for the SDI can be divided into two parts (tester and DUT) of which each part again can be divided into mandatory (SDI common) software and non-mandatory (manufacturer-dependent) software.

5.3.2 Tester software

The software platform of the tester shall be able to handle the ECHONET frame as specified in 7.2.

The SDI common software on the tester shall have the following functionalities:

- a) initiate a service of "property value read request", as specified in 7.2.9;
- b) read out the service of "property value read response" and "property value notification" of all products, as specified in 7.2.9;
- c) display a list of all products connected to the facilities or household appliances network to which the tester is connected. On the display shall be listed the
 - manufacturer code property,
 - place-of-business code property,
 - product code property,
 - serial number property,
 - date-of-manufacture property;
- d) display an indication of the fault status property which describes the occurrence of an error in an actual device. The property code used as a property value is 0x41 when an error exists or 0x42 when no error exists and is found to be "OK" or "Not OK" as specified in 9.3.6;
- e) display an indication of the fault content property which describes the content of an error in an actual device as specified in 9.3.6.

5.3.3 DUT software requirements for the SDI

The DUT shall be able to handle the ECHONET frame as specified in 7.2.

In addition, the SDI common software in the DUT shall be able to

- a) run a self-test routine,
- b) receive a service of "property value read request" as specified in 7.2.9 which is initiated by the tester and response a service of "property value read response" as specified in 7.2.9,
- c) initiate a service of "property value notification" as specified in 7.2.9.

6 Tester software requirements

6.1 Reading the property diagnostic unit

The common application shall be able to retrieve and display information from the SDI-compliant devices specified in 6.1 to 6.3.

6.2 General information (product identification)

The manufacturer code property, the place-of-business code property, the product code property and the serial number property shall be read from the DUT and displayed. These property data shall always be available as specified in 9.3. The tester shall display this information for all devices in the system.

NOTE The manufacturer code displayed might not be the same as the name on the physical device.

6.3 Diagnosis information

After start-up of the general information software, the diagnosis information shall be displayed.

7 Control protocol 1st

7.1 General

The ECHONET specifications were designed to enable the use of various kinds of transmission media (for example, power line, low-power radio frequency, ETHERNET, Bluetooth®). Slow transmission speeds discourage large data transfers, and it is desirable to reduce the mounting load on simple devices. In the light of this situation, ECHONET specifies the frame format for the ECHONET communication middleware block to minimize the message size while fulfilling the requirements of the communications layer structure.

7.2 Frame format

7.2.1 General

Figure 1 shows the content of the ECHONET communication middleware frame format. In the ECHONET communication middleware specifications, messages exchanged between ECHONET communications processing blocks are called ECHONET frames. ECHONET frames are roughly divided into two types depending on the specified EHD: the secure message format, of which the EDATA section is enciphered, and the plain message format, of which the EDATA section is not enciphered. The secure message format and the plain message format are subdivided into three formats depending on the specified EHD (see Table 4). Therefore, the following six different message formats are available for ECHONET frames.

a) Plain basic message format

Insecure communication is performed so that one message is used to view or change the contents of one property.

b) Plain compound message format

Insecure communication is performed so that one message is used to view or change the contents of two or more properties.

c) Plain arbitrary message format

Insecure communication is performed so as to exchange information that complies with vendor-unique specifications.

d) Secure basic message format

Secure communication is performed so that one message is used to view or change the contents of one property.

e) Secure compound message format

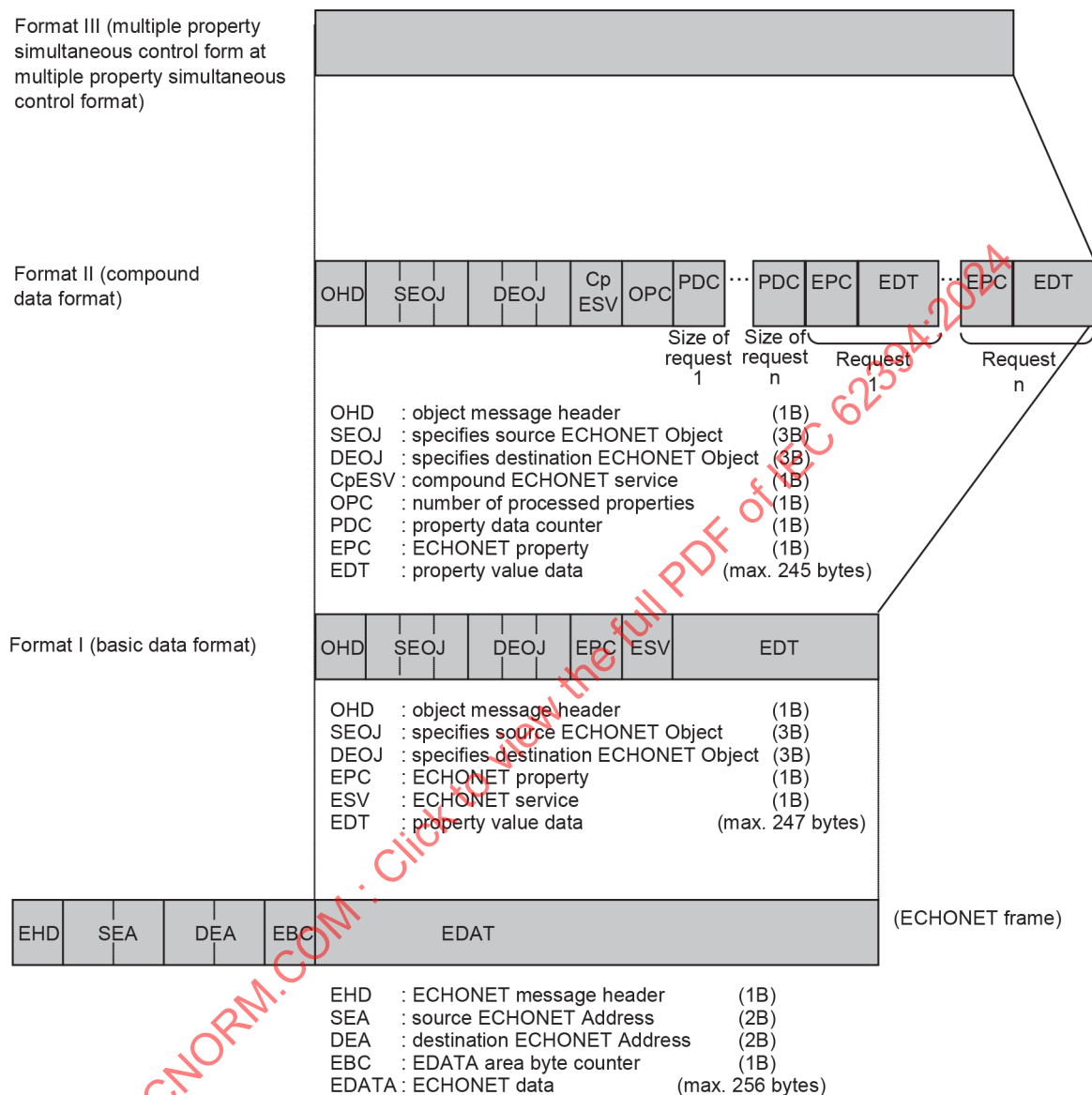
Secure communication is performed so that one message is used to view or change the contents of two or more properties.

f) Secure arbitrary message format

Secure communication is performed so as to exchange information that complies with vendor-unique specifications.

Figure 1 shows the ECHONET frame structure for the plain message format.

Detailed specifications for each message component will be provided in the following subclauses.

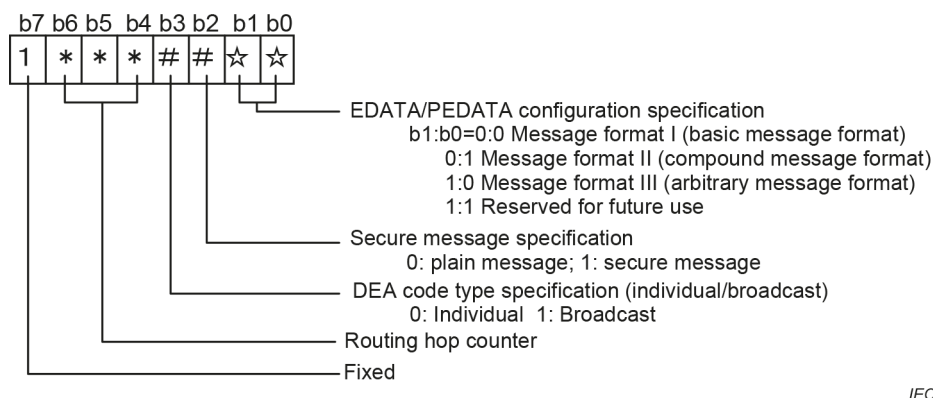


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Figure 1 – ECHONET frame for plain data format

7.2.2 ECHONET headers (EHD)

This subclause provides detailed specifications for the ECHONET header (EHD) shown in Figure 1 and Figure 2.



NOTE When b7 = 0, b0 to b6 will be specified separately (reserved for future use).

Figure 2 – EHD detailed specifications

The combination of b1 and b0 specifies the message format for EDATA/PEDATA. When b1:b0 = 0:0, it indicates Message Format I (basic message format), which allows one message to operate on one property of one object. When b1:b0 = 0:1, it indicates Message Format II (compound message format), which allows one message to operate on two or more properties of one object. When b1:b0 = 1:0, it indicates Message Format III (arbitrary message format), of which EDATA/PEDATA section is in an arbitrary format.

Bit b2 indicates whether the EDATA section is enciphered or not. When b2 = 1, it means that the EDATA section is enciphered. When b2 = 0, it means that the EDATA section is not enciphered.

Bit b3 specifies whether the DEA (destination ECHONET address) shown in Figure 3 is a broadcast address or an individual address. When b3 = 1, this indicates that a broadcast address is stipulated by the DEA code. When b3 = 0, this indicates that an individual address is stipulated by the DEA code. Broadcast address codes are discussed in 7.2.3.

Bits b4, b5, and b6 constitute a routing hop counter, which can be manipulated only by ECHONET routers. When a message received at one subnet of an ECHONET router is forwarded to another subnet, the counter is incremented. For every transmission from an ordinary node, a hop count of 0 is used. The relationship between b4, b5, and b6 and the hop count is shown in Table 1. The number of hops can be set to a value between 0 and 7.

Table 1 – Bit pattern for hop count

b6	b5	b4	Hop count (router passes)
0	0	0	0
0	0	1	1
0	1	0	2
0	1	1	3
1	0	0	4
1	0	1	5
1	1	0	6
1	1	1	7

7.2.3 Source/Destination ECHONET address (SEA/DEA)

This subclause provides detailed specifications for the source ECHONET address (SEA) and destination ECHONET address (DEA) shown in Figure 3. Figure 3 shows the configuration of the source ECHONET address (SEA) and the destination ECHONET address (DEA) prevailing when an individual address is stipulated by setting b3 of EHD to 0.

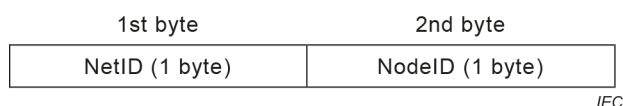


Figure 3 – Configuration of SEA and DEA when an individual address is specified

When b3 of EHD is set to 1 to specify a broadcast, the destination ECHONET address (DEA) becomes a code indicating a broadcast message for a specific ECHONET address group (including a general broadcast). The DEA configuration in this case is shown in Table 2. The broadcast target stipulation code is shown in Figure 4 and Figure 5.

Table 2 – DEA (broadcast-stipulated) address configuration

Broadcast type stipulation code	Broadcast target stipulation code	Remarks
0x00	Specifies the node groups to be targeted for a broadcast within all subnets. For node selection, see Figure 4.	An intra-domain broadcast. In all subnets within a domain, a broadcast is sent to the nodes stipulated by the broadcast target stipulation code.
0x01	Specifies the node groups to be targeted for a broadcast within its own subnet. For node group selection, see Figure 4.	An intra-own-subnet broadcast. In the own subnet, a broadcast is sent to the nodes stipulated by the broadcast target stipulation code.
0x02	All nodes within the subnet having the Net ID code stipulated by the "broadcast target stipulation code" are targeted.	A general broadcast within a specified subnet. A broadcast is sent to all nodes within the subnet stipulated by the broadcast target stipulation code.
0x03~0x7F	Reserved for future use.	
0x80~0xFF	Open to user.	Used when a system manager will manage the system in a collective housing unit or small office building.

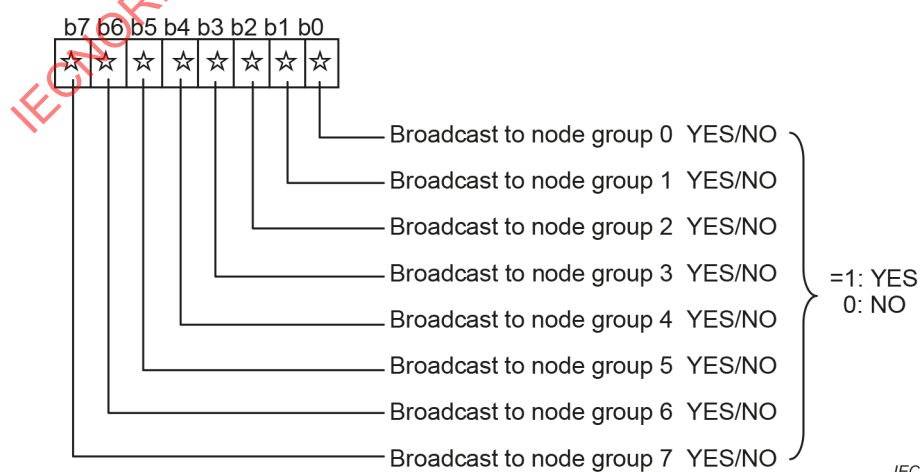


Figure 4 – Broadcast target stipulation code

	0	8	4	C	2	A	6	E	1	9	5	D	3	B	7	F	
0																	Group 0
8																	
4																	Group 1
C																	
2																	Group 2
A																	
6																	Group 3
E																	
1																	Group 4
9																	
5																	Group 5
D																	
3																	Group 6
B																	
7																	Group 7
F																	

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Figure 5 – Node group stipulation bit specifications

7.2.4 ECHONET byte counter (EBC)

EBC indicates the size of the ECHONET data region (EDATA region) shown in Figure 1. The size is variable in 1-byte increments. The acceptable EDATA region size ranges from 6 bytes to 256 bytes (0x06 to 0xFF; 0x00 = 256). The lower limit is 6 bytes, which indicates that a message consists of at least 6 bytes. The reason is that either the SEOJ or the DEOJ needs to be specified with the EPC to ESV options specified for a plain message. A 6-byte message can be a message requesting an ESV with the DEOJ specified or a message carrying a "response of processing impossible" for ESV with the SEOJ specified.

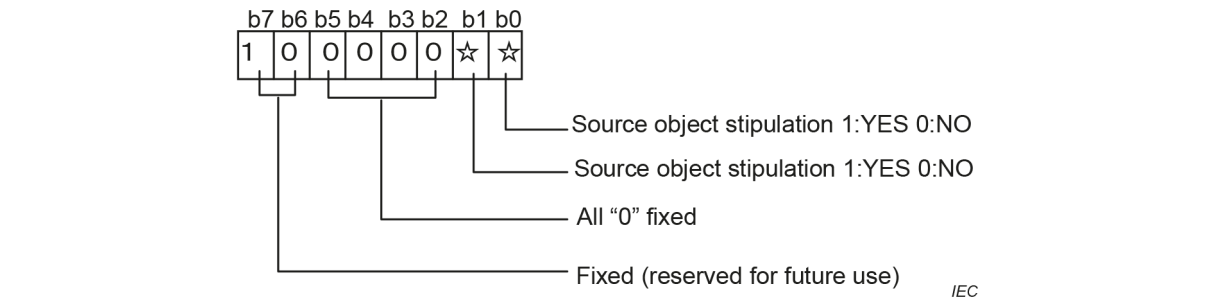
7.2.5 ECHONET data (EDATA)

The DATA region for messages exchanged by the ECHONET communication middleware.

Maximum size: 256 bytes.

7.2.6 Object message header (OHD)

This subclause provides detailed specifications for the object message header (OHD) shown in Figure 1. Detailed specifications are shown in Figure 6. The state in which b1 and b0 are both 0 will never occur.



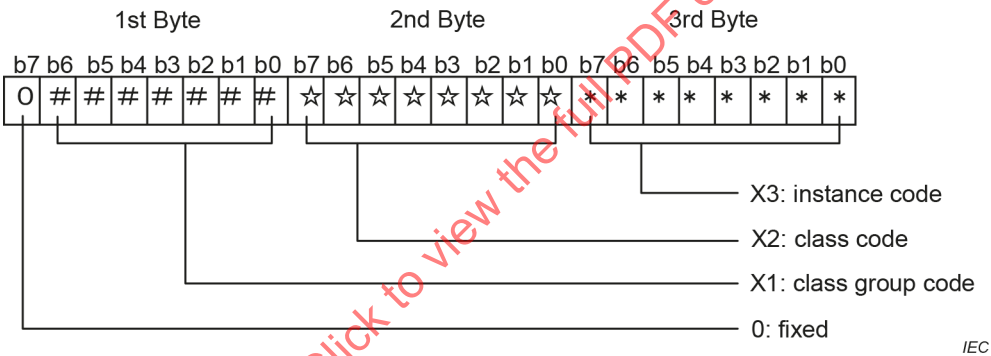
NOTE When b6 and b7 have values other than b6 = 0 and b7 = 1, b0 to b5 will have different meanings.

The meanings of bits b0 to b5 when b6 and b7 have values other than b6 = 0 and b7 = 1 will be stipulated in the future (reserved for future use).

Figure 6 – OHD detailed specifications

7.2.7 ECHONET objects (EOJ)

This subclause provides detailed specifications for the source ECHONET object (SEOJ) code and destination ECHONET object (DEOJ) code shown in Figure 1. Detailed specifications are shown in Figure 7.



NOTE The meanings of the bits when b7 of the 1st byte is 1 will be stipulated in the future (reserved for future use).

Figure 7 – EOJ detailed specifications

ECHONET objects are described using the format [X1.X2] and [X3], with these formats to be specified as shown below. (However, "." is used only for descriptive purposes and does not mean a specific code.) The object class is designated by the combination of X1 and X2, while X3 shows the class instance. A single ECHONET node may contain more than one instance of the same class, in which case X3 is used to identify each one.

The specific items in Table 3 were specified on the basis of JEM 1439 (see Clause 9.64). Detailed specifications for the objects shown here will be developed over time and, during this phase; specifications for the objects themselves (i.e., present/not present) will be further reviewed.

The instance code 0x00 is regarded as a special code (code for specifying all instances). When a DEOJ for which this code is specified is received, it is handled as a code specifying a broadcast to all instances of a specified class.

- X1 : class group code 0x00-0x7F. For details, refer to Table 3.
- X2 : class code 0x00-0xFF.
- X3 : instance code 0x00-0xFF.

The identifier code is used when more than one of the same class specified by [X1.X2] exists within the same node.

However, 0x00 is used as a general broadcast to all instances of class specified with [X1.X2].

Table 3 – List of class group codes

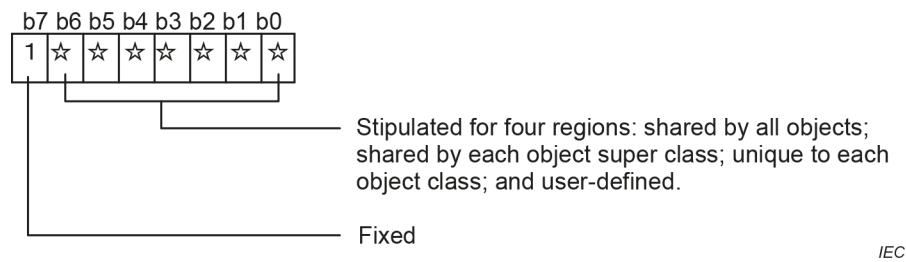
Class group code	Group name	Remarks
0x00	Sensor-related device class group	
0x01	Air conditioner-related device class group	
0x02	Housing/facility-related device class group	Includes lighting
0x03	Cooking/housework-related device class group	
0x04	Health-related device class group	
0x05	Management/control-related device class group	
0x06	AV-related device class group	
0x07~0x0C	Reserved for future use	
0x0D	Service class group	
0x0E	Profile class group	
0x0F	User definition class group	
0x10~0x1F	Communications definition class group for stipulation of status notification method	
0x20~0x2F	Communications definition class group for stipulation of setting control reception method	
0x30~0x3F	Communications definition class group for linked settings (action settings)	
0x40~0x4F	Communications definition class group for linked settings (trigger settings)	
0x50~0x5F	Secure communication access property set-up class	
0x60~0x7F	Reserved for future use	

7.2.8 ECHONET property (EPC)

This subclause provides detailed specifications for the ECHONET property (EPC) code shown in Figure 1. Detailed specifications are shown in Figure 8. The EPC specifies a service target function. Each object stipulated by X1 (class group code) and X2 (class code), described in 7.2.7, is specified here.

When a specified object changes, the target function also changes even when the code remains unchanged. However, the detailed specifications are designed to ensure that, whenever possible, the same functions will have the same code.

Specific code values for each object are stipulated in Figure 45. These codes correspond to the object property identifiers in the object definitions.



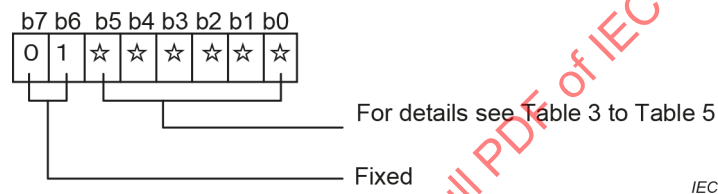
NOTE When b7 = 0, the other bits will be defined differently.

Figure 8 – EPC detailed specifications

7.2.9 ECHONET service (ESV)

7.2.9.1 General

This subclause provides detailed specifications for the ECHONET service (ESV) code shown in Figure 1. Detailed specifications are shown in Figure 9.



NOTE In cases other than when b7:b6 = 0:1, the meaning of values b0 – b5 will be specified separately.

Figure 9 – ESV detailed specifications

This code stipulates manipulation of the properties stipulated by EPC. The three main kinds of operations are shown below. There are also two kinds of responses: the "response", which is given when the stipulated properties exist; and the "response not possible", which is given when the requested properties (including array elements) do not exist or when the stipulated service cannot be processed.

"Request"/"Response" (response/response not possible)/"Notification".

A "response" is considered to be a reply to a "request" that requires a response; when the object stipulated in the DEOJ exists, as a rule it is either "response" or "response not possible" (stipulated processing cannot be accepted, or the stipulated object exists but the property does not). When the request requires no response and the stipulated object does not exist, no response is made.

There are two types of "notification": one for transmitting the own-property information autonomously and the other for sending a response to a notification request. However, these two types have the same code.

Three specific operations are provided: write (response required/no response required), read, and notification (notification/notification with response required). The 12 operations shown below are set in consideration of whether or not the content of the given property is an array.

- a) Property value write (response required/no response required)
- b) Property value read
- c) Property value notification
- d) Property value array-element-stipulated write (response required/no response required)
- e) Property value array-element-stipulated read

- f) Property value array-element-stipulated notification
- g) Property value array-element-stipulated addition (response required/no response required)
- h) Property value array-element-stipulated deletion (response required/no response required)
- i) Property value array-element-stipulated existence confirmation
- j) Property value array element addition (response required/no response required)
- k) Property value notification (response required)
- l) Property value array-element-stipulated notification (response required)

7.2.9.2 Relationship between request and response

The relationship between the message configuration (presence or absence of an SEOJ and a DEOJ) and EPC and ESV is described below.

- The EPC in an ECHONET message stipulating only the SEOJ indicates the properties of the sender object specified in the SEOJ. In this case, the ESV contains an autonomous "notification" or "notification" or "response" in response to a request for properties specified in the SEOJ and the EPC. If the ESV is a "request" in such a case, the received message is treated as an illegal message.
- The EPC in an ECHONET message stipulating only the DEOJ indicates the properties of the destination object specified in the DEOJ. In this case, the ESV contains a "request" regarding the properties specified in the DEOJ and the EPC. If the ESV is a "response" or a "notification" in such a case, the received message is treated as an illegal message.
- For ECHONET messages stipulating both the SEOJ and the DEOJ, the ESV value is used to determine whether the EPC is stipulated by the SEOJ or the DEOJ. When the ESV is a "response" or a "notification", the EPC is considered to be a component of the object specified by the SEOJ and is viewed as a "response" or "notification" directed towards the object stipulated in the DEOJ. When the ESV is a "request", the EPC is considered to be a component of the DEOJ and is viewed as a "request" from the object stipulated in the SEOJ.

Table 4, Table 5 and Table 6 show specific ESV code assignments based on the content described above. Specific descriptions of a) through l) in 7.2.9.1 are provided in (a) through (l) of the remarks column in the relevant table. In the figures given in (a) (Figure 10) through (l) (Figure 21), the DEOJ for "requests" is shown as an individually stipulated code. However, when the DEOJ indicates a broadcast to all instances of a specified class (when the DEOJ's X3 = 0x00), a response is transmitted with both "process-not-possible" response and "response" configured for each target instance. In the table, the "array elements" described above are presented as "elements".

Table 4 – List of ESV codes for requests

Service code (ESV)	ECHONET service content	Symbol	Remarks ^a
0x60	Property value write request (no response required)	SetI	(a)
0x61	Property value write request (response required)	SetC	
0x62	Property value read request	Get	(b)
0x63	Property value notify request	INF_REQ	(c)
0x64	Property value element-stipulated write request (no response required)	SetMI	(d)
0x65	Property value element-stipulated write request (response required)	SetMC	
0x66	Property value element-stipulated read request	GetM	(e)
0x67	Property value element-stipulated notify request	INFM_REQ	(f)
0x68	Property value element-stipulated add request (no response required)	AddMI	(g)
0x69	Property value element-stipulated add request (response required)	AddMC	
0x6A	Property value element-stipulated delete request (no response required)	DelMI	(h)
0x6B	Property value element-stipulated delete request (response required)	DelMC	
0x6C	Property value element existence confirm request	CheckM	(i)
0x6D	Property value element add request (no response required)	AddMSI	(j)
0x6E	Property value element add request (response required)	AddMSC	
0x6F	Reserved for future use		
^a Remarks (a) to (j) are given in the list below Table 6.			

Table 5 – List of ESV codes for response/notification

Service code (ESV)	ECHONET service content	Symbol	Remarks ^c
0x71	Property value write response	Set_Res	ESV=0x61 response (a)
0x72	Property value read response	Get_Res	ESV=0x62 response (b)
0x73	Property value notification	INF	(c) ^a
0x74	Property value notification (response required)	INFC	(k)
0x75	Property value element-stipulated write response	SetM_Res	ESV=0x65 response (d)
0x76	Property value element-stipulated read response	GetM_Res	ESV=0x66 response (e)
0x77	Property value element-stipulated notify	INFM	(f) ^b
0x78	Property value element-stipulated notify (response required)	INFMC	(l)
0x79	Property value element-stipulated add response	AddM_Res	ESV=0x69 response (g)
0x7A	Property value notify response	INFC_Res	ESV=0x74 response (k)
0x7B	Property value element-stipulated delete response	DelM_Res	ESV=0x6B response (h)
0x7C	Property value element-stipulated existence confirm response	CheckM_Res	ESV=0x6C response (i)
0x7D	Property value element-stipulated notify response	INFMC_Res	ESV=0x78 response (l)
0x7E	Property value element add response	AddMS_Res	ESV=0x6E response (j)
0x70, 0x7F	Reserved for future use		
^a Used for autonomous property value notification and for 0x63 response. ^b Used for autonomous property value notification and for 0x67 response. ^c Remarks (in brackets) are given in the list below Table 6.			

Table 6 – List of ESV codes for "response-not-possible" responses

Service code (ESV)	ECHONET service content	Symbol	Remarks ^a
0x50	Property value write "process-not-possible" response	SetI_SNA	ESV=0x60 response not possible (a)
0x51	Property value write "process-not-possible" response	SetC_SNA	ESV=0x61 response not possible (a)
0x52	Property value read "process-not-possible" response	Get_SNA	ESV=0x62 response not possible (b)
0x53	Property value notify "process-not-possible" response	INF_SNA	ESV=0x63 response not possible (c)
0x54	Property value element-stipulated write request "process-not-possible" response	SetMI_SNA	ESV=0x64 response not possible (d)
0x55	Property value element-stipulated write request "process-not-possible" response	SetMC_SNA	ESV=0x65 response not possible (d)
0x56	Property value element-stipulated read request "process-not-possible" response	GetM_SNA	ESV=0x66 response not possible (e)
0x57	Property value element-stipulated notify request "process-not-possible" response	INFM_SNA	ESV=0x67 response not possible (f)
0x58	Property value element-stipulated add request "process-not-possible" response	AddMI_SNA	ESV=0x68 response not possible (g)
0x59	Property value element-stipulated add request "process-not-possible" response	AddMC_SNA	ESV=0x69 response not possible (g)
0x5A	Property value element-stipulated delete request "process-not-possible" response	DelMI_SNA	ESV=0x6A response not possible (h)
0x5B	Property value element-stipulated delete request "process-not-possible" response	DelMC_SNA	ESV=0x6A response not possible (h)
0x5C	Property value element-stipulated existence confirm request "process-not-possible" response	CheckM_SNA	ESV=0x6C response not possible (i)
0x5D	Property value element add request "process-not-possible" response	AddMSI_SNA	ESV=0x6D response not possible (j)
0x5E	Property value element add request "process-not-possible" response	AddMSC_SNA	ESV=0x6E response not possible (j)
0x5F	Reserved for future use		

^a Remarks (in brackets) are given in the list below this table.

Relationships between request and response are described from (a) to (l).

a) Property value write service [0x60, 0x61, 0x71, 0x50, 0x51]

In the case of a "request" (0x60, 0x61), this indicates a request to write the content shown in EDT to the property stipulated in the EPC of the object stipulated in the DEOJ. In response to this "request", when a value indicating a response is stipulated (0x61) and the request shall be (or has already been) received, "response" (0x71) is returned. This "response" is not a processing implementation response. When the request is not to be received, or when the stipulated DEOJ exists but the stipulated EPC does not exist, "response not possible" (0x50, 0x51) is returned. In the response frame format, the SEOJ represents the value of the object stipulated by the request, and the relevant property is set in the EPC. When the relevant object itself does not exist, neither "response" nor "response not possible" is returned. Also, the "response" message DEA is defined as the requesting entity (i.e., the request message SEA). Relationship between request and response is shown in Figure 10.

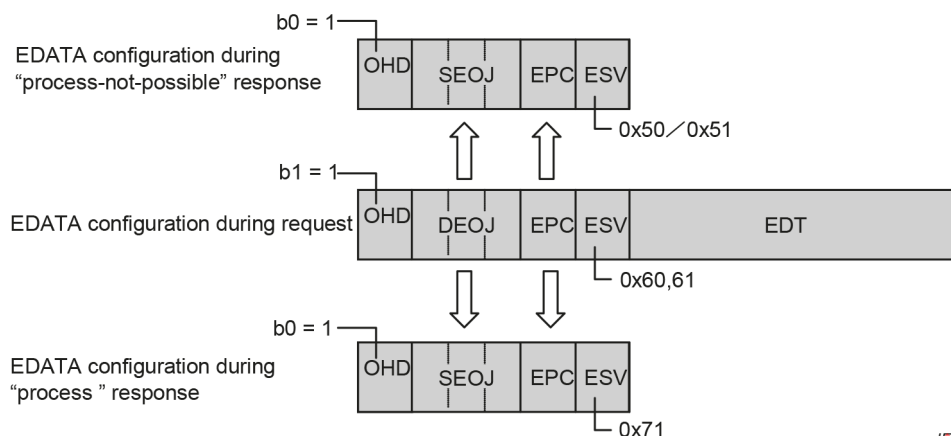


Figure 10 – EDATA configuration in property value write service

When EDATA stipulates an SEOJ during a "request", the EOJ stipulated by the SEOJ in EDATA during the "request" is allocated as a DEOJ (b1 of OHD is also set to 1), in the case of both "response not possible" and "response".

b) Property value read service [0x62, 0x72, and 0x52]

In the case of a "read" (0x62), this indicates a request to read the content of the property stipulated in the EPC of the object stipulated in the DEOJ. In response to this "read", when the request shall be (or has already been) accepted, "response" (0x72) is returned. When the request is not to be accepted, or when the stipulated DEOJ exists but the stipulated EPC does not exist, "response not possible" (0x52) is returned. In the response frame format, the value of the object stipulated by the request is set in the SEOJ, the requested property is set in the EPC, and the value of the requested property (i.e., the read content) is set in the EDT. When "response not possible" is returned, nothing is written to the EDT. When the relevant object itself does not exist, neither "response" nor "response not possible" is returned. Also, the "response" message DEA is defined as the requesting entity (i.e., the request message SEA). Relationship between request and response is shown in Figure 11.

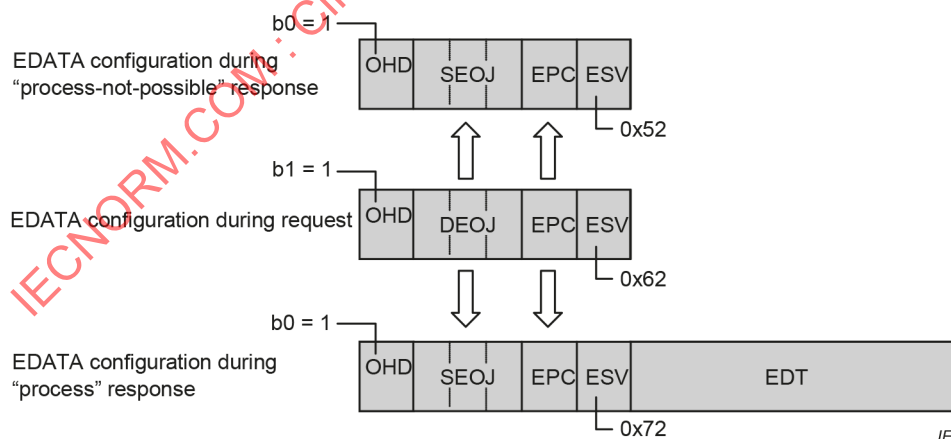


Figure 11 – EDATA configuration in property value read service

When EDATA stipulates SEOJ during a "request", the EOJ stipulated by the SEOJ in EDATA during the "request" is allocated as a DEOJ (b1 of OHD is also set to 1), in the case of both "response not possible" and "response".

c) Property value notification service [0x63, 0x73, 0x53]

There are two types of "notification": the notification sent as a response to a "notify request" (0x63) and the autonomous notification which is unrelated to notify requests. The codes for the two types are identical. (Here, notification in response to a "notify request" signifies an announcement that does not specify the property value [content], while an autonomous notification is a voluntary announcement that was not made in response to a request.) In the case of a "notify request" (0x63), this indicates a request to notify (by general broadcast; hereafter "announce" signifies a general broadcast to the entire domain) the content of the property stipulated in the EPC of the object stipulated in the DEOJ. In response to this "notify request", when the request was accepted, a "response" (0x73) value is notified; when the request is not to be accepted, a "response not possible" response (0x53) value is returned. In the response frame format, the value of the object stipulated by the request is set in SEOJ, the requested property is set in EPC, and the value of the requested property (i.e., the notification content) is set in EDT. Here, DEA is set to general broadcast, but when "response not possible" is returned, nothing is written to the EDT, and the DEA sets the EA value of the requester.

When the relevant object itself does not exist, neither "response" nor "response not possible" is returned. In the case of an autonomous "notification", the DEA is set to a general broadcast for a required status change notification. In the other cases, however, the DEA can be set as desired regardless of whether "broadcast" or "individual" is selected. Relationship between request and response is shown in Figure 12.

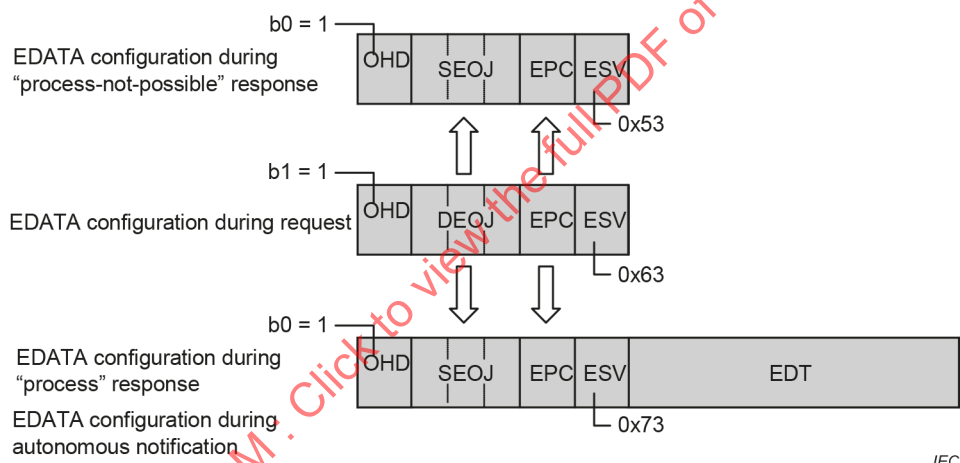


Figure 12 – EDATA configuration in property value notification service

When EDATA stipulates an SEOJ during a request, the EOJ stipulated by the SEOJ in EDATA during the "request" is allocated as a DEOJ. In the case of both "response not possible" and "process", the EOJ stipulated in the SEOJ in the EDATA during "request" is allocated as a DEOJ within the EDATA ($b1$ of OHD is also set to 1). In the case of autonomous notification, the required notification of status change does not add a DEOJ; in all other cases, the addition of a DEOJ is optional.

d) Property value element-stipulated write service [0x64, 0x65, 0x75, 0x54, 0x55]

In the case of a "request" (0x64, 0x65), this indicates a request to write the value stipulated in the EDT (includes array element number and write request value data) of the property stipulated in the EPC of the object stipulated in the DEOJ. In response to this "request", when a value to process the response is stipulated, and when the request shall be (or has already been) accepted, a "response" (0x75) is returned. However, this "response" is not a processing implementation response. When the request is not to be accepted, or when the stipulated DEOJ exists but the stipulated EPC does not exist, and when the stipulated DEOJ and EPC exist but the array element does not, "response not possible" (0x54, 0x55) is returned.

In the frame format for response, the value of the object stipulated by the request is the SEOJ, and the relevant property is set in the EPC. When the relevant object itself does not exist, neither "response" nor "response not possible" is returned. Also, the "response" message DEA is defined as the requesting entity (i.e., the request message SEA).

When the request is not to be accepted, or when the stipulated DEOJ and stipulated EPC exist, but the stipulated array element number does not exist, the EDT of "response not possible" is the array element number of a "request. The relationship between the request and the response is shown in Figure 13.

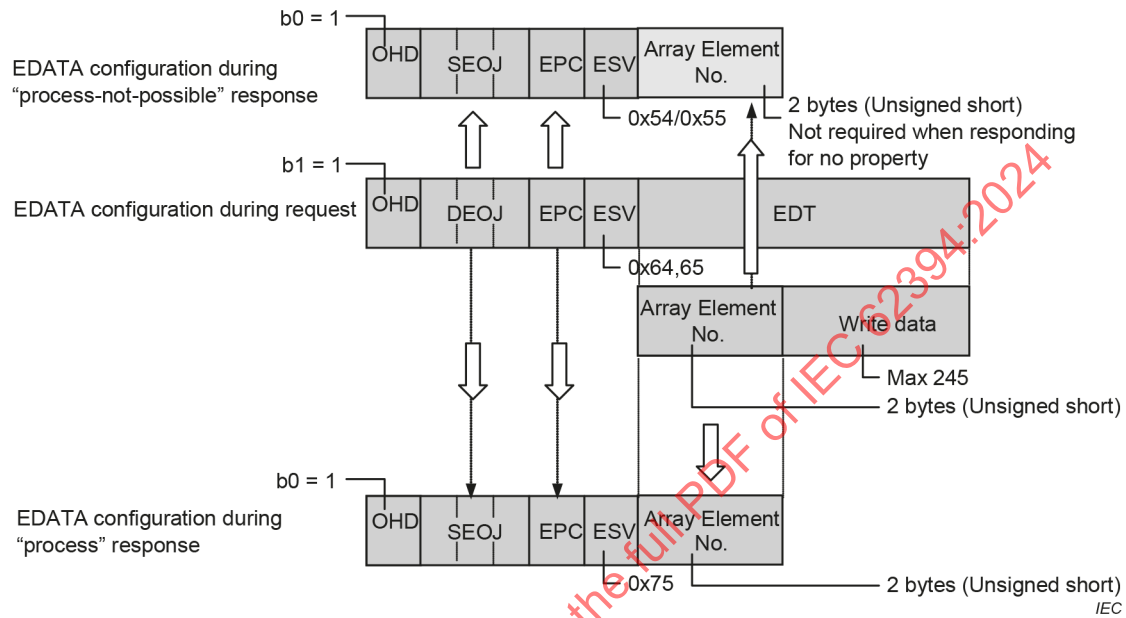


Figure 13 – EDATA configuration in property value element-stipulated write service

The content of each array element number in an array format property is defined separately for each property. When the stipulated (array) element does not exist, "response not possible" is returned. Also, when the EDATA stipulates the SEOJ during a "request", the EOJ stipulated in the SEOJ by the EDATA during the "request" is allocated as a DEOJ within EDATA (b1 of OHD is also set to 1) in the case of both "response not possible" and "response."

e) Property value element-stipulated read service [0x66, 0x76, 0x56]

In the case of a "read" (0x66), this indicates a request to read the content stipulated in the array element indicated in the EDT (includes array element number data to be read) of the property stipulated in the EPC of the object stipulated in the DEOJ. In response to this "read", when the request shall be (or has already been) accepted, "response" (0x76) is returned. When the request is not to be accepted, or when the stipulated DEOJ exists but the stipulated EPC does not, and when the stipulated DEOJ and EPC exist but the array element does not, "response not possible" (0x56) is returned. In the frame format for response, the value of the object stipulated by the request is set in the SEOJ, and the relevant property is set in the EPC and the value of the relevant property (data to be read) is set in the EDT. In the case of "response not possible", when the request is not to be accepted, or when the stipulated DEOJ exists but the stipulated EPC does not exist, the EDT of "response not possible" is the array element number of a "request" and when the stipulated DEOJ exists but the stipulated EPC does not exist, "response not possible" EDT of "response not possible" does not exist. When the relevant object itself does not exist, neither "response" nor "response not possible" is returned. Also, the "response" message DEA is defined as the requesting entity (i.e., the request message SEA). The relationship between request and response is shown in Figure 14.

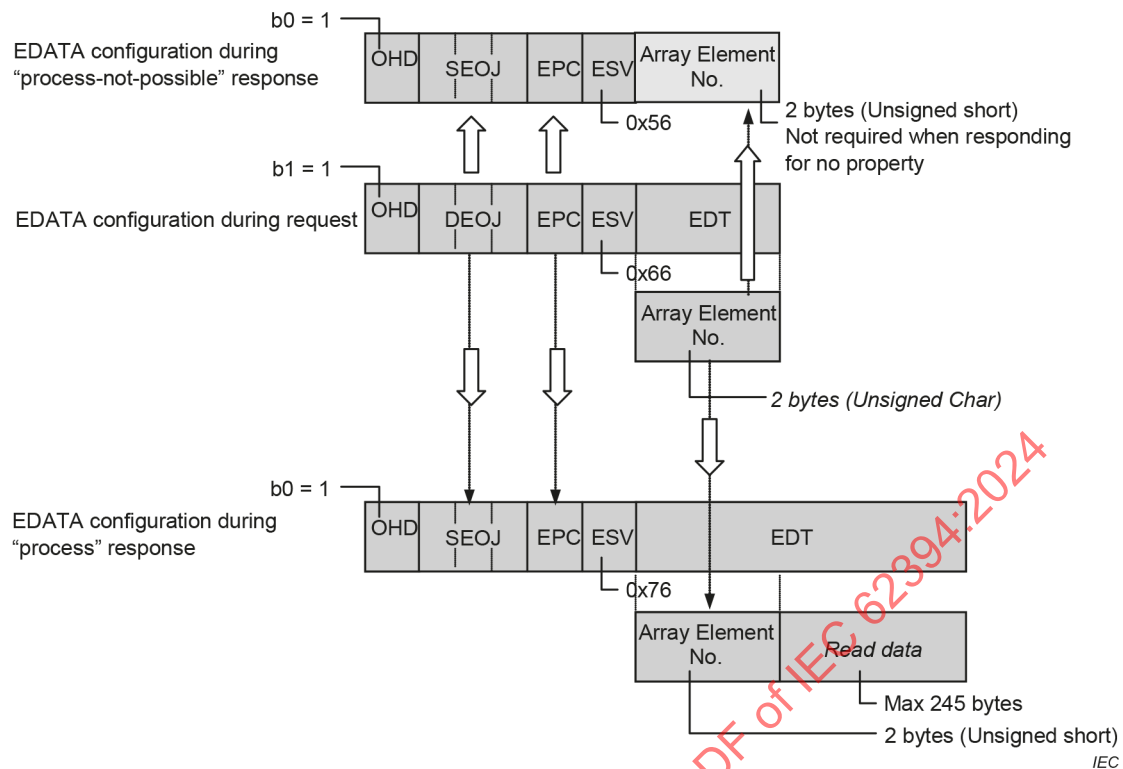


Figure 14 – EDATA configuration in property value element-stipulated read service

The content of each array element number in an array format property is defined separately for each property. When the stipulated array element (element) does not exist, "response not possible" is returned. Also, when EDATA stipulates SEOJ during a "request", the EOJ stipulated in the SEOJ by EDATA during the "request" is allocated as a DEOJ within the EDATA (b1 of OHD is also set to 1) in the case of both "response not possible" and "response".

f) Property value element-stipulated notification service [0x67, 0x77, 0x57]

There are two types of "notification": notification sent in response to a "notify request" (0x67); and autonomous notification, which is unrelated to notify requests. The two types are not distinguished from each other in the codes. (Here, notification in response to a "notify request" signifies an announcement that does not specify the property value [content], while an autonomous notification is a voluntary announcement that was not made in response to a request from someone.) In the case of a "notify request" (0x67), this indicates a request to notify (announce) the content of the array element number stipulated in the EDT of the property stipulated in the EPC of the object stipulated in the DEOJ. In response to this "notify request", when the request was accepted, an array element value (content) is announced as a "response" (0x77). When the request is not to be accepted, or when the stipulated DEOJ exists but the stipulated EPC does not, and when the stipulated DEOJ and EPC exist but the array element does not, "response not possible" (0x57) is returned. In the frame format for response, the value of the object stipulated by the request is set in the SEOJ, the requested property is set in EPC, and the value of the requested array element number and its array element value (i.e., the notification content) is set in the EDT. Here, the DEA is set to general broadcast, but when "response not possible" is returned, and the DEA sets the EA value of the requester. When the relevant object itself does not exist, neither "response" nor "response not possible" is returned.

When the request is not to be accepted, or when the stipulated DEOJ exists but the stipulated EPC does not exist, the EDT of "response not possible" is the array element number of a "request" and when the stipulated DEOJ exists but the stipulated EPC does not exist, the EDT of "response not possible" does not exist. The relationship between request and response is shown in Figure 15.

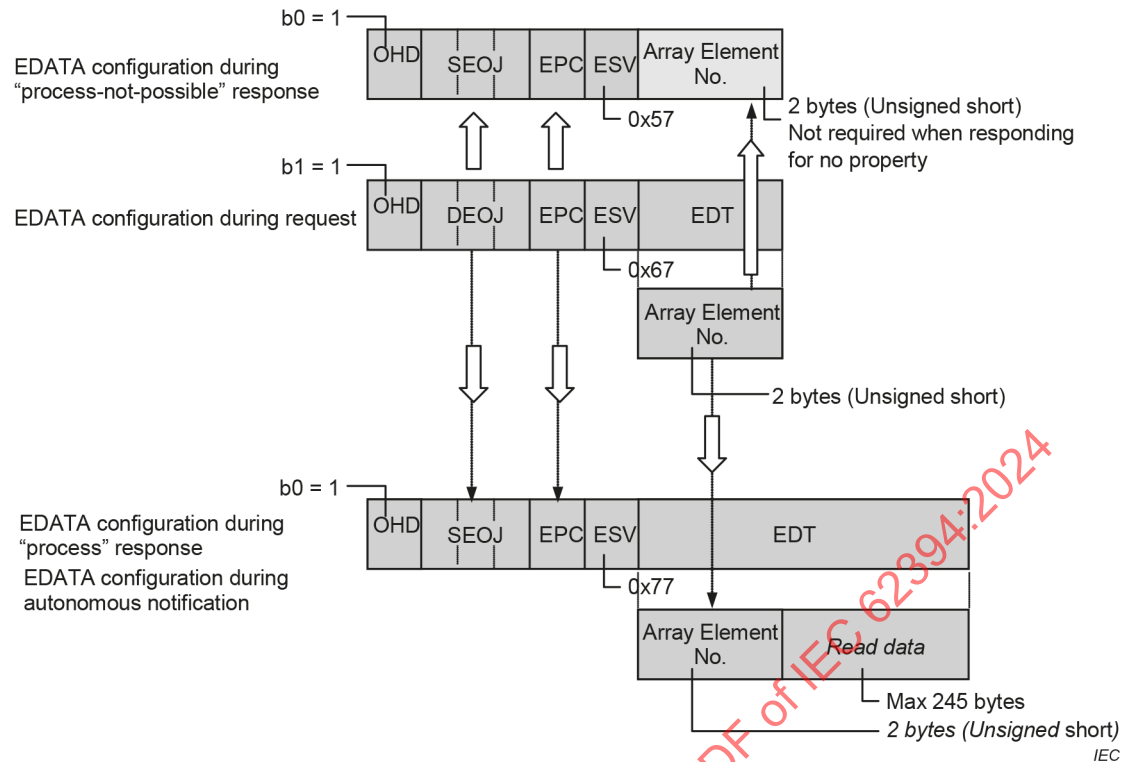


Figure 15 – EDATA configuration in property value element-stipulated notification service

The content of each array element number is defined separately for each property. When the stipulated (array) element does not exist, "response not possible" is returned. Also, when EDATA stipulates SEOJ during a "request", the EOJ stipulated in the SEOJ by EDATA during the "request" is allocated as a DEOJ within the EDATA (b1 of OHD is also set to 1) in the case of both "response not possible" and "response". In the case of autonomous notification, the required notification of status change does not add a DEOJ; in all other cases, the addition of a DEOJ is optional.

g) Property value element-stipulated addition [0x68, 0x69, 0x58, 0x59, 0x79]

In the case of a "request" (0x68, 0x69), this indicates a request to add the array element indicated in the EDT (includes array element number and write request value) of the property stipulated in the EPC of the object stipulated in the DEOJ, and to write the value stipulated therein. In response to this "request", when a value indicating implementation of the response (0x68) is stipulated, and when the request shall be (or has already been) accepted, a "response" (0x78) is returned. However, this "response" is not a processing implementation response. When the request is not to be accepted, or when the stipulated DEOJ exists but the stipulated EPC does not, and when the stipulated DEOJ and EPC exist but the array element does not, "response not possible" (0x58, 0x59) is returned. In the frame format for response, the value of the object stipulated by the request is set in SEOJ, and the requested property is set in EPC. When the relevant object itself does not exist, neither "response" nor "response not possible" is returned. Also, the "response" message DEA is defined as the requesting entity (i.e., the request message SEA).

When the request is not to be accepted, or when the stipulated DEOJ exists but the stipulated EPC does not exist, the EDT of "response not possible" is the array element number of a "request" and when the stipulated DEOJ exists but the stipulated EPC does not exist, the EDT of "response not possible" does not exist. The relationship between the request and the response is shown in Figure 16.

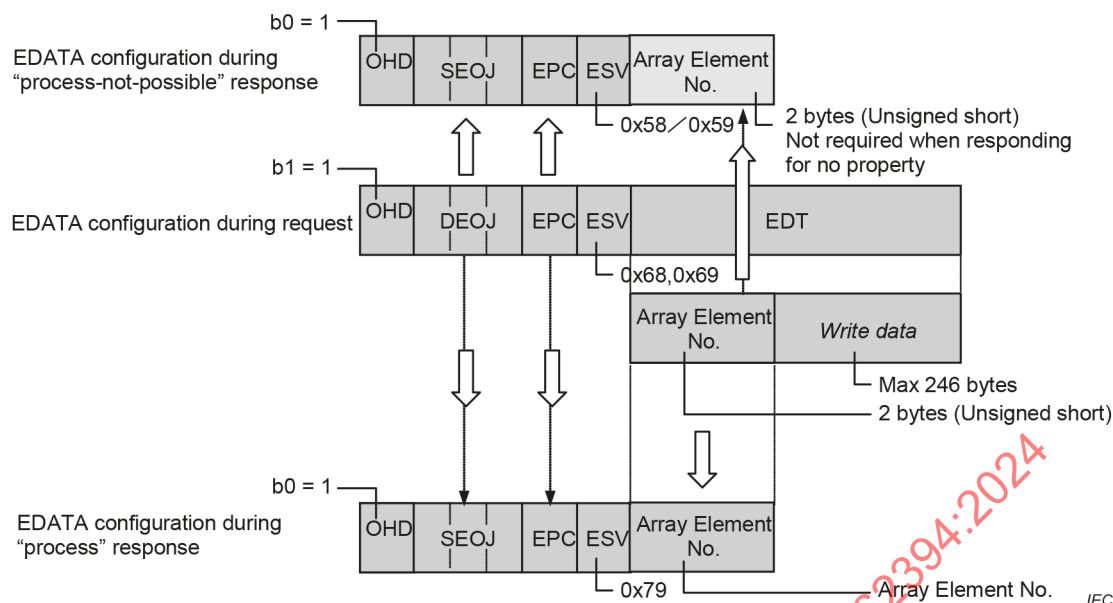


Figure 16 – EDATA configuration in property value element-stipulated addition

The content of each array element number in an array format property is defined separately for each property. When the stipulated array element (element) does not exist, "response not possible" is returned. Also, when EDATA stipulates SEOJ during a "request", the EOJ stipulated in the SEOJ by EDATA during the "request" is allocated as a DEOJ within the EDATA (b1 of OHD is also set to 1) in the case of both "response not possible" and "response".

h) Property value element-stipulated deletion [0x6A, 0x6B, 0x5A, 0x5B, 0x7B]

In the case of a "request" (0x6A, 0x6B) this indicates a request to delete the array element indicated in the EDT (array element number) from the property stipulated in the EPC of the object stipulated in the DEOJ. In response to this "request", when a value indicating implementation of the response (0x6B) is stipulated, and when the request shall be (or has already been) accepted, a "response" (0x7B) is returned. However, this "response" is not a processing implementation response. When the request is not to be accepted (including cases in which the deletion is not to be implemented), or when the stipulated DEOJ exists but the stipulated EPC does not, "response not possible" (0x5A, 0x5B) is returned. In the frame format for response, the value of the object stipulated by the request is set in SEOJ, and the relevant property is set in EPC. When the relevant object itself does not exist, neither "response" nor "response not possible" is returned. Also, the "response" message DEA is defined as the requesting entity (i.e., the request message SEA).

When the request is not to be accepted, or when the stipulated DEOJ exists but the stipulated EPC does not exist, the EDT of "response not possible" is the array element number of a "request" and when the stipulated DEOJ exists but the stipulated EPC does not exist, the EDT of "response not possible" does not exist. The relationship between the request and the response is shown in Figure 17.

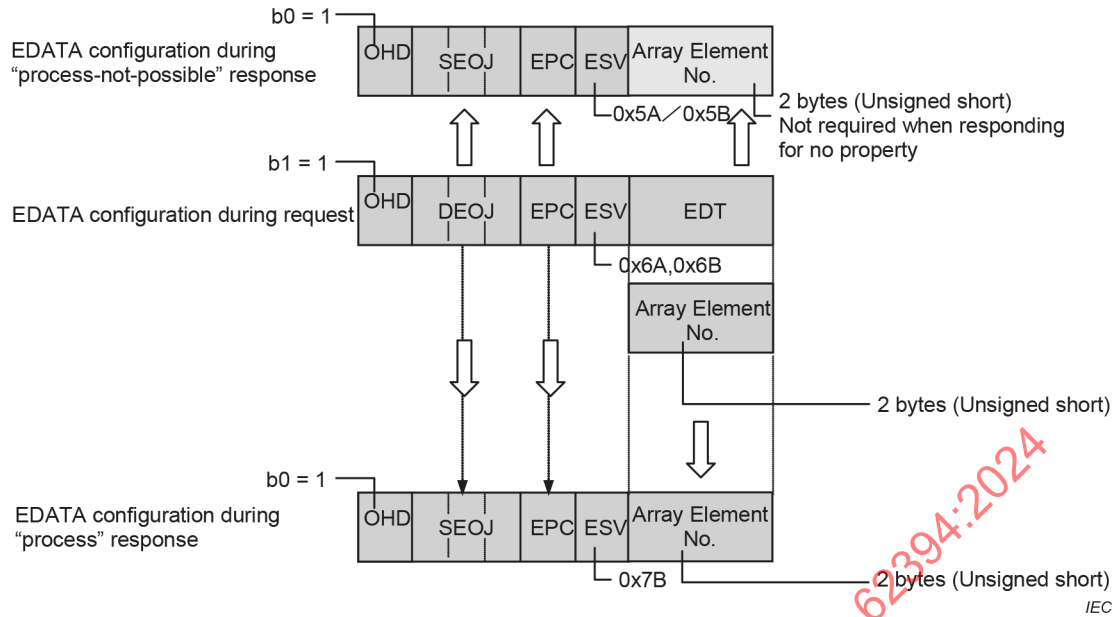


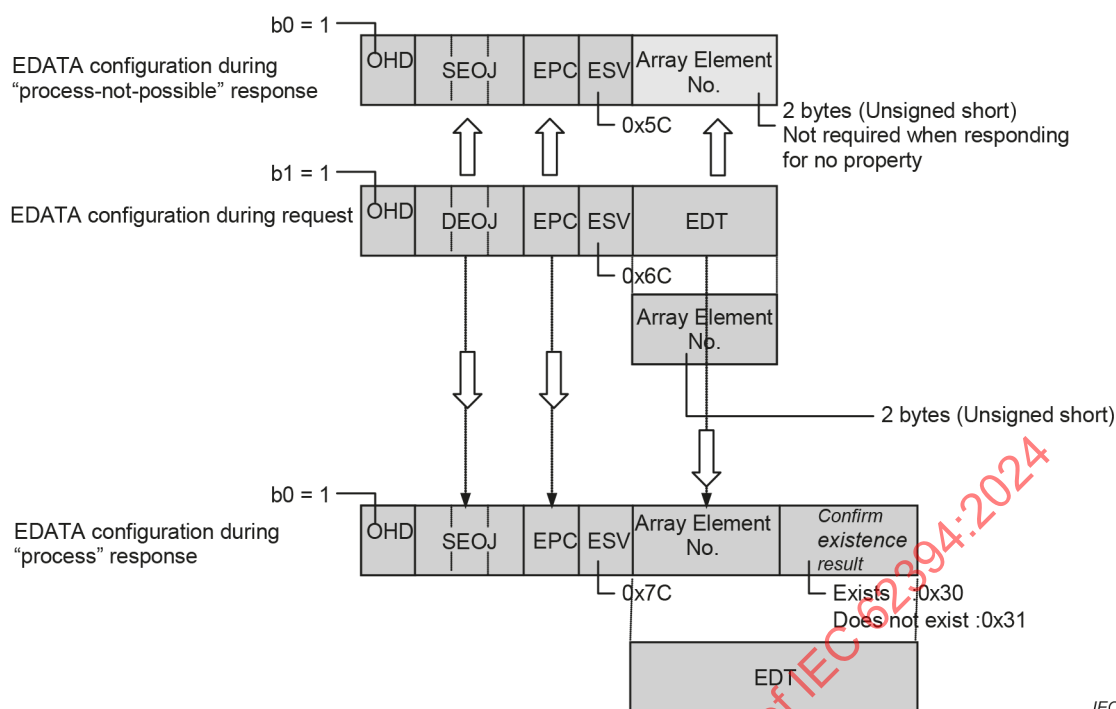
Figure 17 – EDATA configuration in property value element-stipulated deletion

The content of each array element number in an array format property is defined separately for each property. When the stipulated array element (element) does not exist, "response not possible" is returned. Also, when EDATA stipulates SEOJ during a "request", the EOJ stipulated in the SEOJ by EDATA during the "request" is allocated as a DEOJ within the EDATA (b1 of OHD is also set to 1) in the case of both "response not possible" and "response".

i) Property value element-stipulated existence confirmation [0x6C, 0x5C, 0x7C]

In the case of a "request" (0x6C), this indicates a request to confirm the existence of the array element indicated in the EDT (includes array element number value information) in the property stipulated in the EPC of the object stipulated in the DEOJ. When the request shall be (or has already been) accepted, a "response" (0x7C) is returned. When the request shall be rejected (cannot be processed by the ESV) or when the specified DEOJ exists but the specified EPC does not exist, a "process not possible" (0x5C) is returned. In the frame format for response, the value of the object stipulated by the request is set in the SEOJ, and the relevant property is set in the EPC. When the relevant object itself does not exist, neither "response" nor "response not possible" is returned. Also, the "response" message DEA is defined as the requesting entity (i.e., the request message SEA).

When the request is not to be accepted, or when the stipulated DEOJ exists but the stipulated EPC does not exist, the EDT of "response not possible" is the array element number of a "request" and when the stipulated DEOJ exists but the stipulated EPC does not exist, the EDT of "response not possible" does not exist. The relationship between request and response is shown in Figure 18.



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Figure 18 – EDATA configuration in property value element-stipulated existence confirmation

The content of each array element number in an array format property is defined separately for each property. Also, when EDATA stipulates the SEOJ during a "request", the EOJ stipulated in the SEOJ by EDATA during the "request" is allocated as a DEOJ within the EDATA (b1 of OHD is also set to 1) in the case of both "response not possible" and "response".

j) Property value element addition [0x6D, 0x6E, 0x5D, 0x5E, 0x7E]

In the case of a "request" (0x6D, 0x6E), this indicates a request to newly add an array element to the property stipulated in the EPC of the object stipulated in the DEOJ, and to write to the newly added array element the value data stipulated in the EDT. In response to this "request", when a value indicating implementation of the response (0x6E) is stipulated, and when the request shall be (or has already been) accepted, a "response" (0x7F) is returned.

However, this "response" is a processing implementation response, and the added array element number is returned as an EDT. When the request is not to be accepted, or when the stipulated DEOJ exists but the stipulated EPC does not, "response not possible" (0x5D, 0x5E) is returned. In the frame format for response, the value of the object stipulated by the request is set in the SEOJ, and the relevant property is set in the EPC. When the relevant object itself does not exist, neither "response" nor "response not possible" is returned. Also, the "response" message DEA is defined as the requesting entity (i.e., the request message SEA).

For "response not possible", the EDT does not exist. The relationship between request and response is shown in Figure 19.

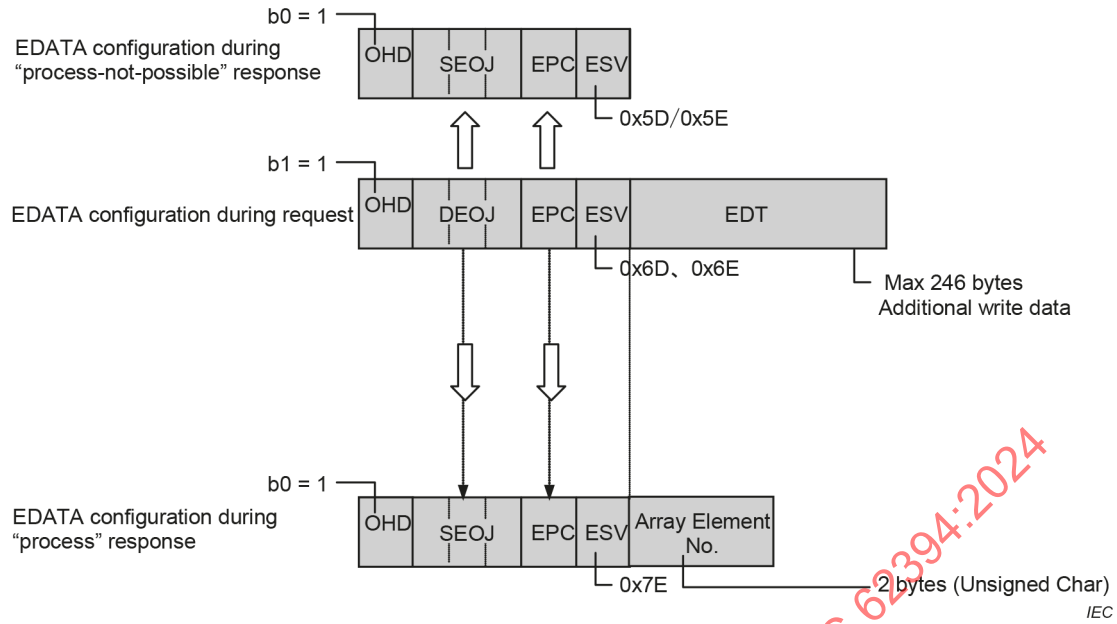


Figure 19 – EDATA configuration in property value element addition

The content of each array element number in an array format property is defined separately for each property. Also, when EDATA stipulates SEOJ during a "request", the EOJ stipulated in the SEOJ by EDATA during the "request" is allocated as a DEOJ within the EDATA (b1 of OHD is also set to 1) in the case of both "response not possible" and "response".

k) Property value notification (response required) [0x74, 0x7A]

The "notification (response required)" (0x74) autonomously notifies a specific node of the property value stipulated by the EPC of the SEOJ-stipulated object and requests a response. The response process for this "notification (response required)" varies depending on whether the DEOJ is specified.

When the DEOJ is not specified, the "response" (0x7A) for autonomous notification reception is returned at all times.

When the DEOJ is specified, on the other hand, the subsequent process varies depending on whether the specified DEOJ exists. If the specified DEOJ exists, the "response" (0x7A) for autonomous notification reception is returned. If the specified DEOJ does not exist, the message is discarded.

If a node receives a "notification (response required)" for which a broadcast is specified, the node discards the message. The relationship between the request and the response is shown in Figure 20.

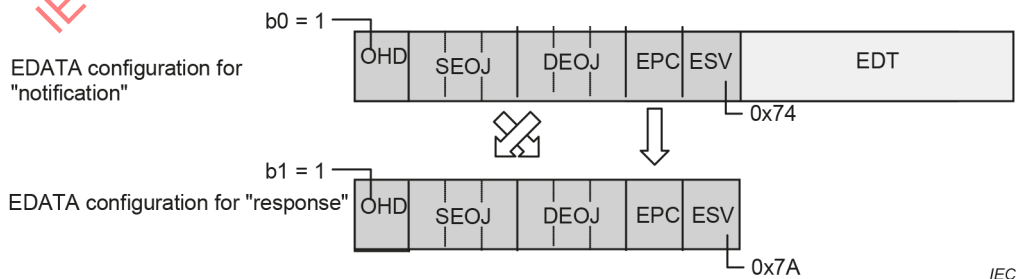


Figure 20 – EDATA configuration in property value notification (response required)

l) Property value element-stipulated notification (response required) [0x78, 0x7D]

The "notification (response required)" (0x78) autonomously notifies a specific node of the array element value stipulated by the EDT (array element number) of the property stipulated by the EPC of the SEOJ-stipulated object, and requests an acknowledgment. The response message format and response process for this "notification (response required)" varies depending on whether the DEOJ is specified.

When the DEOJ is not specified, the "response" (0x7D) for notification reception is returned at all times.

When the DEOJ is specified, on the other hand, the subsequent process varies depending on whether the specified DEOJ exists. If the specified DEOJ exists, the "response" (0x7D) for notification reception is returned. If the specified DEOJ does not exist, the message is discarded.

If a node receives a "notification (response required)" for which a broadcast is specified, the node discards the message. The relationship between request and response is shown in Figure 21.

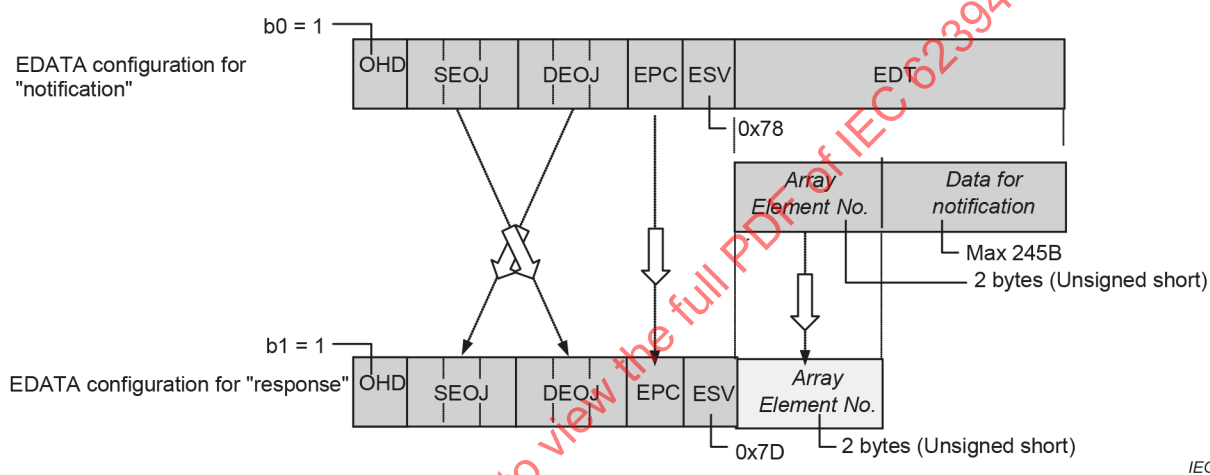


Figure 21 – EDATA configuration in property value element-stipulated notification (response required)

The services shown in Table 4, Table 5 and Table 6 are specified for each property. Regarding those stipulated as services that shall be incorporated in each property, if they have the functions of that property and disclose via communications (read/write notification, etc.), this indicates that they shall be processed. Processing of services for each property is specified in 9.3 and in the access rules column of the object class detailed specification tables. Access rules indicate all services that can be implemented. In this specification, the following ten access rules are specified:

- Set: processes services related to write requests for non-array property values (performs processing indicated in (a)).
- Get: processes services related to read requests for non-array property values (performs processing indicated in (b) (c) and (k)).
- SetM: processes services related to write requests for array property values (performs processing indicated in (d)).
- GetM: processes services related to read requests for array property values (performs processing indicated in (e) (f) and (l)).
- AddM: processes services related to element-stipulated add requests for array property values (performs processing indicated in (g)).
- DelIM: processes services related to delete requests for array property values (performs processing indicated in (h)).

- CheckM: processes services related to existence confirm requests for array property value elements (performs processing indicated in (i)).
- AddMS: processes services related to non-array-element-stipulated add requests for array property values (performs processing indicated in (j)).
- Anno: processes non-array property value notification services (performs processing indicated in (c) and (k)).
- AnnoM: processes array property value notification services (performs processing indicated in (f) and (l)).

The above processing is specified for each property; there is no mixed stipulation of Set and SetM or of Get and GetM.

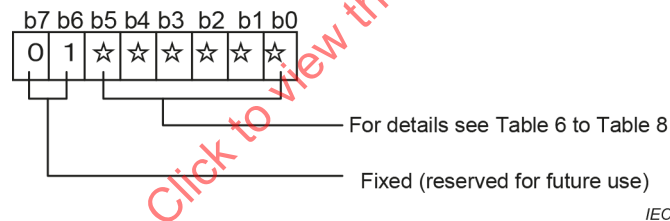
7.2.10 ECHONET property value data (EDT)

This subclause presents detailed specifications for the code for the ECHONET property value data (EDT) range shown in Figure 1. EDT consists of data for the relevant ECHONET property (EPC), such as status notification or specific setting and control by an ECHONET service (ESV). Detailed specifications are provided for the size, code value, etc., of EDT for each EPC (see Clause 9).

7.2.11 Compound ECHONET Service (CpESV)

7.2.11.1 General

This subclause provides detailed specifications for the compound ECHONET service (CpESV) code shown in Figure 1. Detailed specifications are shown in Figure 22.



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When bits b7 and b6 are 0 and 1, respectively, the meanings of bits b0 to b5 are stipulated separately.

Figure 22 – CpESV configuration

The service provided by this code is used when the compound message format is used. It specifies a simultaneous action for two or more properties stipulated by the EPC. However, it does not stipulate the order of operations. The order of property operations is an implementation issue.

Three types of operations are provided: request, response, and notification. The response is subdivided into two types: "accepted" response and "process-not-possible" request. The "accepted" response is used when the service request in relation to all the EPC-stipulated properties is accepted. The "process not possible" request is used when one or more specified properties do not exist or when the specified service cannot be processed for one or more properties.

- Request
- Response ("accepted" response/"process not possible" response)
- Notification

The "response" is a response to a "request" that requires a response. It shall be returned when a DEOJ-stipulated object exists. When the service processing request related to all the EPC-stipulated properties is accepted, the "accepted" response shall be returned. If the processing request related to one or more specified properties cannot be accepted or if the object exists but one or more properties do not exist, "process not possible" shall be returned. When the "request" does not require any response or when the specified object does not exist, no "response" will be returned.

Further, "write" (response-required write/no-response-required write), "read", and "notification" (autonomous notification/response-required notification) are regarded as specific operations. Therefore, the following five types are set. Regarding the CpESV for compound messages, array element properties are not targeted.

- a) Property value write request (no response required).
- b) Property value write request (response required).
- c) Property value read request.
- d) Property value notification.
- e) Property value notification (response required).

7.2.11.2 Relationship between request and response

The CpESV and message configurations (presence of SEOJ and DEOJ) and their relationship to EPC and ESV are described below.

- The EPC of an ECHONET message in which only the SEOJ is specified indicates the property of the SEOJ-stipulated source object. In this case, the "response", "notification", or autonomous "notification" concerning the "request" related to two or more SEOJ-/EPC-stipulated properties is positioned in the CpESV. When the CpESV is a "request" while this configuration is employed, the associated message shall be handled as an erroneous message.
- The EPC of an ECHONET message in which only the DEOJ is specified indicates the property of the DEOJ-stipulated destination object. In this case, the "request" related to two or more DEOJ-/EPC-stipulated properties are positioned in the CpESV. When the CpESV is a "response" or "notification" while this configuration is employed, the associated message shall be handled as an erroneous message.
- The EPC of an ECHONET message in which the SEOJ and DEOJ are both specified is such that the CpESV value determines whether the target object is stipulated by the SEOJ or DEOJ. When the CpESV is a "response" or "notification", it is concluded that the EPC forms a SEOJ-stipulated object and that the "response" or "notification" is addressed to a DEOJ-stipulated object. When the CpESV is a "request", on the other hand, it is concluded that the EPC forms a DEOJ and that the "request" is issued from a SEOJ-stipulated object.

Table 7, Table 8 and Table 9 show specific CpESV code assignments. The figures in (a) through (e) presume that the DEOJ for a "request" is an individually specified code. However, when the DEOJ indicates an instance general broadcast, a response is transmitted with both "process not possible" response and "response" configured for each target instance. The codes marked "reserved for future use" in the tables are to be stipulated in the future and shall not be used.

Table 7 – List of CpESV codes for request/notification

Service code (CpESV)	ECHONET service content	Symbol	Remarks ^a
0x60	Property value write request (no response required)	CpSetI	(a)
0x61	Property value write request (response required)	CpSetC	(b)
0x62	Property value read request	CpGet	(c)
0x63~0x6F	Reserved for future use		
^a Remarks (in brackets) are given in the list below Table 9.			

Table 8 – List of CpESV codes for "accepted" response

Service code (CpESV)	ECHONET service content	Symbol	Remarks ^a
0x71	Property value write "accepted" response	CpSet_Res	CpESV=61 response (b)
0x72	Property value read "accepted" response	CpGet_Res	CpESV=62 response (c)
0x73	Property value notification	CpINF_Res	(d)
0x74	Property value notification (response required)	CpINFC	(e)
0x7A	Property value notification response	CpINFC_Res	CpESV=74 response (e)
0x75~0x79, 0x7B~0x7F	Reserved for future use		
^a Remarks (in brackets) are given in the list below Table 9.			

Table 9 – List of CpESV codes for "process-not-possible" response

Service code (CpESV)	ECHONET service content	Symbol	Remarks ^a
0x50	Property value write "process not possible" response (1)	CpSetI_SNA	CpESV=60 "process not possible" response (a)
0x51	Property value write "process not possible" response (2)	CpSetC_SNA	CpESV=61 "process not possible" response (b)
0x52	Property value read "process not possible" response	CpGet_SNA	CpESV=62 "process not possible" response (c)
0x5F	Message length excessive	CpOverflow	Response to be returned when the response message is too long
0x53~0x5E	Reserved for future use		
^a Remarks (in brackets) are given below this table.			

- a) Relationships between the request and the response are described from (a) to (e). Property value writes request (requiring no response) service [0x60, 0x50].

The write request requiring no response (CpESV = 0x60) requests that the EDT-stipulated contents be written into the EPC-stipulated properties of the DEOJ-stipulated object. The order of write operations is not stipulated. The response from a request-processing node is as indicated below.

- 1) When a processing request for all properties is accepted

No response will be made.

- 2) When one or more properties relevant to the request do not exist, a processing request to one or more properties cannot be accepted, or an array property is targeted

A write "process not possible" response (1) (CpESV = 0x50) will be returned.

- 3) When the object relevant to the request does not exist, no response will be made.
- 4) When two or more identical properties exist in the request message, individual processes will be performed on the presumption that differing requests are issued. A response will be made in accordance with the processing results.

NOTE 1 The order of processes depends on the implementation. Therefore, the resulting final property status and value also depend on the implementation.

The message structure of a write "process-not-possible" response to a property value write request (requiring no response) is such that the object code of the request destination becomes the SEOJ and that the object code of the request source becomes the DEOJ. The OPC takes the same value as in the request message.

For requests (request 1 to request n) that relate to non-existent properties and process requests that are rejected, both the PDC and the EDT use the same values as those used in the write request. For requests related to properties for which processing requests are accepted, the PDC value is 0x01 and the EDT value is omitted. As for the EPC, the EPC in the request message is used as is. When the target object does not exist, neither the "response" nor the "process not possible" response is returned.

An appropriate value for the OHD shall be specified in accordance with the SEOJ/DEOJ configuration in the message. Figure 23 shows the relationship between a write request requiring no response and write addition response for situations where request m cannot be accepted. The EPC sequence in the request message shall be equal to the EPC sequence in the write "process-not-possible" response message.

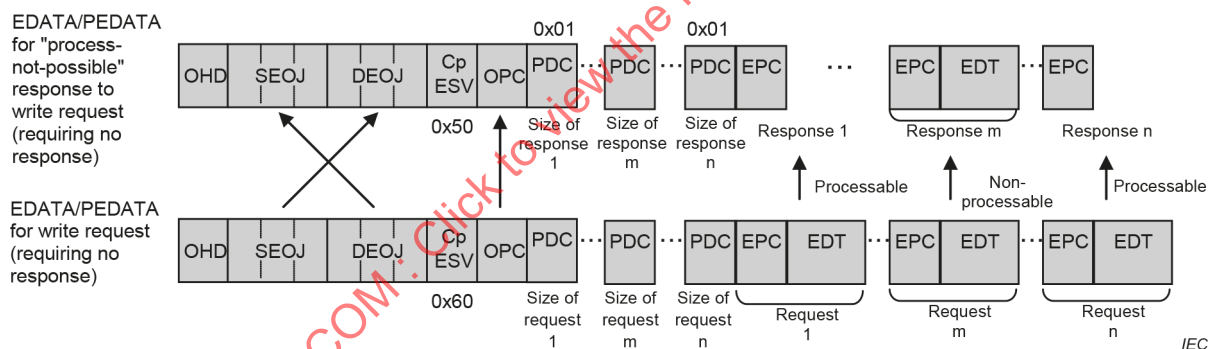


Figure 23 – Relationship between write request (requiring no response) and write "process-not-possible" response

- b) Property value write request (requiring a response) service [0x61, 0x71, and 0x51]

The write request requiring a response (CpESV = 0x61) requests that the EDT-stipulated contents be written into the EPC-stipulated properties of the DEOJ-stipulated object. The order of write operations is not stipulated. The response from a request-processing node is as indicated below.

- 1) When a processing request for all properties are accepted, a write "accepted" response (CpESV = 0x71) will be returned.
- 2) When one or more properties relevant to the request do not exist, a processing request to one or more properties cannot be accepted, or an array property is targeted, a write "process not possible" response (CpESV = 0x51) will be returned.
- 3) When the object relevant to the request does not exist, no response will be made.
- 4) When two or more identical properties exist in the request message, individual processes will be performed on the presumption that differing requests are issued. A response will be made in accordance with the processing results.

NOTE 2 The order of processes depends on the implementation. Therefore, the resulting final property status and value also depend on the implementation.

The message structure of a write "process-not-possible" response to a property value write request (requiring a response) is such that the object code of the request destination becomes the SEOJ and that the object code of the request source becomes the DEOJ. The OPC takes the same value as in the request message.

For requests (request 1 to request n) that relate to non-existent properties and process requests that are rejected, both the PDC and EDT use the same values as those used in the write request. For requests related to properties for which processing requests are accepted, the PDC value is 0x01 and the EDT value is omitted. As for the EPC, the EPC in the request message is used as is. If the target object does not exist, neither the "response" nor the "process not possible" response is returned.

The message structure of a write "accepted" response is such that the object code of the request destination becomes the SEOJ and the object code of the request source becomes the DEOJ. The OPC and subsequent values are omitted.

An appropriate value for the OHD shall be specified in accordance with the SEOJ/DEOJ configuration in the message. Figure 24 shows the relationships between a write request requiring a response, a write "accepted" response and a write "process-not-possible" response for situations where request m cannot be accepted. The EPC sequence in the request message shall be equal to the EPC sequence in the write "process-not-possible" response message.

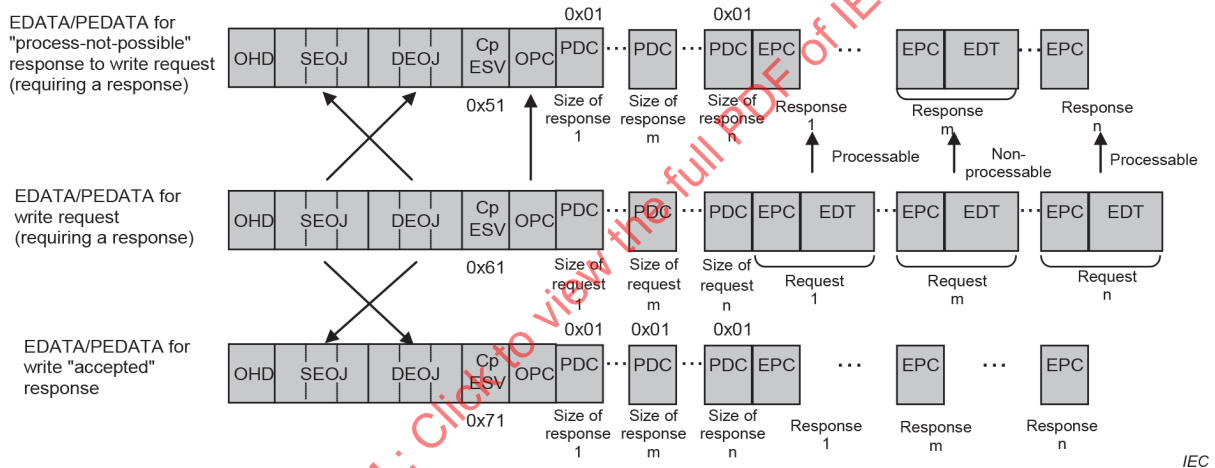


Figure 24 – Relationship between write request (requiring a response), write "accepted" response, and write "process-not-possible" response

c) Property value read request service [0x62, 0x72, 0x52, 0x5F]

The property value read request (CpESV = 0x62) requests that the contents of EPC-stipulated properties of the DEOJ-stipulated object be read. The order of read operations is not stipulated. The response from a request-processing node is as indicated below.

- 1) When a processing request for all properties is accepted, a read "accepted" response (CpESV = 0x72) will be used to return all the read values.
- 2) When one or more properties relevant to the request do not exist, a processing request to one or more properties cannot be accepted, or an array property is targeted, a write "process not possible" response (CpESV = 0x52) will be used to return the values of the read properties.
- 3) When the object relevant to the request does not exist, no response will be made.
- 4) When two or more identical properties exist in the request message, individual processes will be performed on the presumption that differing requests are issued. A response will be made in accordance with the processing results.

NOTE 3 The order of processes depends on the implementation. Therefore, if two or more property states are read, the resulting final status depends on the implementation.

The message structure of a read "process-not-possible" response is such that the object code of the request destination becomes the SEOJ and the object code of the request source becomes the DEOJ. The OPC takes the same value as in the request message.

For requests (request 1 to request n) that relate to non-existent properties and process requests that are rejected, the PDC value is 0x01 and the EDT value is omitted. For requests related to properties for which processing requests are accepted, the read value is placed in the EDT and the total number of EPC and EDT bytes is regarded as the PDC. If the target object does not exist, neither the "response" nor the "process-not-possible" response is returned.

The message structure of a read "accepted" response is such that the object code of the request destination becomes the SEOJ and the object code of the request source becomes the DEOJ. The read value is placed in the EDT, and the total number of EPC and EDT bytes is regarded as the PDC.

An appropriate value for the OHD shall be specified in accordance with the SEOJ/DEOJ configuration in the message. Figure 25 shows the relationships between a read request, a read "accepted" response and a read "process-not-possible" response for situations where request m cannot be accepted. The EPC sequence in the request message shall be equal to the EPC sequence in the read "accepted" response and read "process-not-possible" response messages.

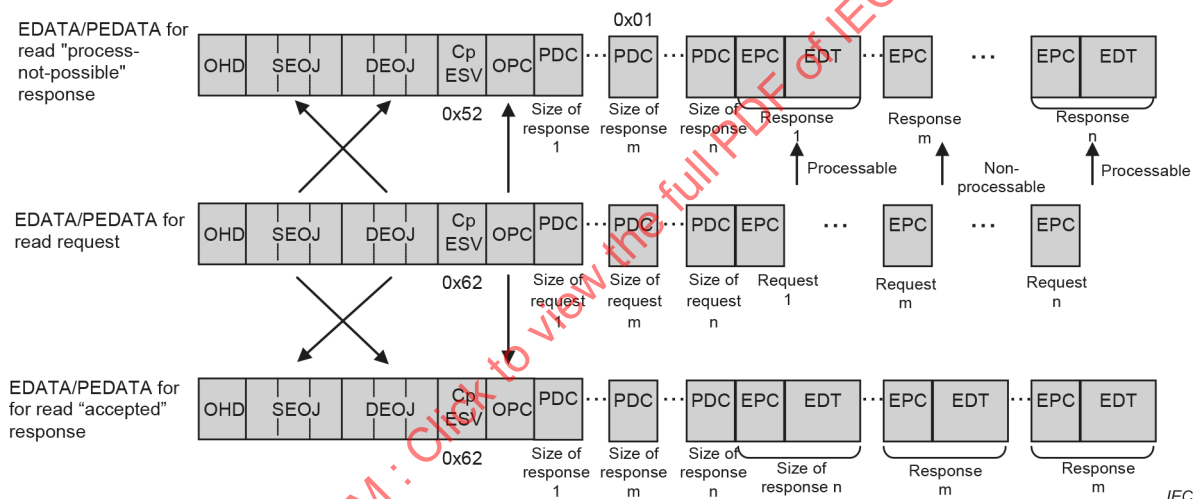


Figure 25 – Relationship between read request (requiring a response), read "accepted" response, and read "process-not-possible" response

As is obvious from Figure 25, the read "accepted" response message is longer than the read response message. In some cases, a situation occurs where the composed read "accepted" messages become longer than the maximum permissible message length when attempting to return all the requested property values. In such a situation, a response will be made using the message length overflow service code (CpESV = 0x5F). In this case, the responding side can determine the number of property values to be returned. However, the sequence of such properties shall be the same as in the request message.

d) Property value notification service [0x73]

The property value notification (CpESV = 0x73) reads the contents of EPC-stipulated properties and reports them to the DEOJ-stipulated object. When the DEOJ is not contained in the message, it is a notification to nodes. Either "individual" or "broadcast" can be selected for addressing purposes. The order of property value notifications is not stipulated. Nodes receiving this message will not return a response. The notification message format is shown in Figure 26.

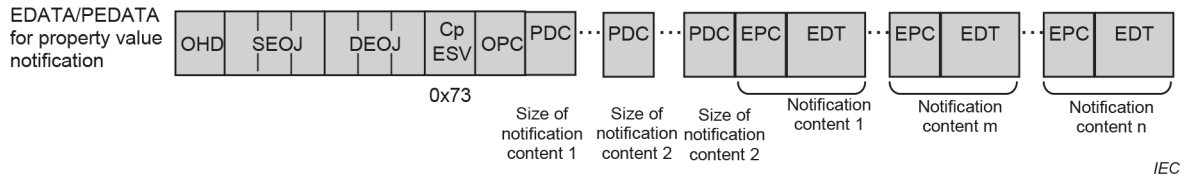


Figure 26 – Notification message format

e) Property value notification (requiring a response) service [0x74, 0x7A]

The property value notification requiring a response (CpESV = 0x74) reads the content of EPC-stipulated properties and reports it to the DEOJ-stipulated object. When the DEOJ is not contained in the message, it is a notification to a node. Only "individual" is available for addressing purposes. The order of property value notifications is not stipulated. The response from a node receiving this message is as indicated below.

- 1) When a notification is accepted, a property value notification response (CpESV = 0x7A) will be returned.
- 2) When the DEOJ-stipulated object does not exist, no response will be made.

The message structure of the notification response is such that the object code of the request destination becomes the SEOJ and the object code of the request source becomes the DEOJ. The OPC takes the same value as in the request message.

An appropriate value for the OH shall be specified in accordance with the SEOJ/DEOJ configuration in the message. Figure 27 shows the relationship between the property value notification (requiring a response) service and property value notification response service.

The EPC sequence in the property value notification request service message shall be equal to the EPC sequence in the property value notification response service message.

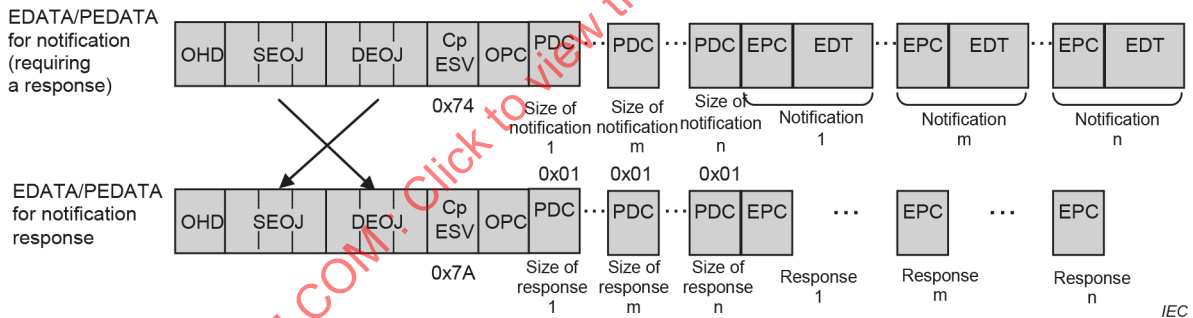


Figure 27 – Relationship between property value notification (requiring a response) and property value notification response

7.2.12 Processing target property counter (OPC)

The processing target property counter is used in the compound message format only. It consists of one byte. In a compound message, the processing target property counter retains the number of properties targeted for a write or read operation. This counter can retain the value 1 or greater. Therefore, a compound message is allowed to exist even when the number of simultaneously operable properties is only one. The maximum number of simultaneously operable properties is limited by the maximum permissible message length.

If, for instance, there are three requests as shown in Figure 28, the processing target property counter is 0x03.

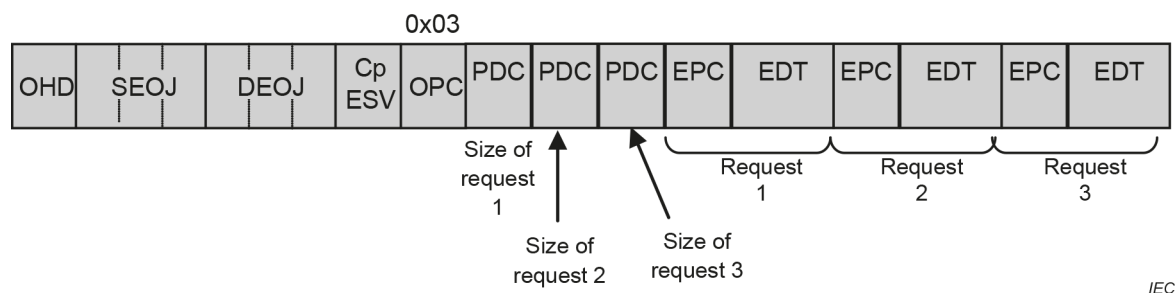


Figure 28 – Processing target property counter for three requests

7.2.13 Property data counter (PDC)

The processing data counter is used in the compound message format only. It retains the number of bytes in the ECHONET property code (EPC) and ECHONET data (EDT), which follow the proper data counter. If, for instance, the ECHONET data sizes for requests 1, 2, and 3 are 2 bytes, 1 byte, and 5 bytes, respectively, the values placed in the first, second, and third property data counters are 0x03, 0x02, and 0x06, respectively, as shown in Figure 29.

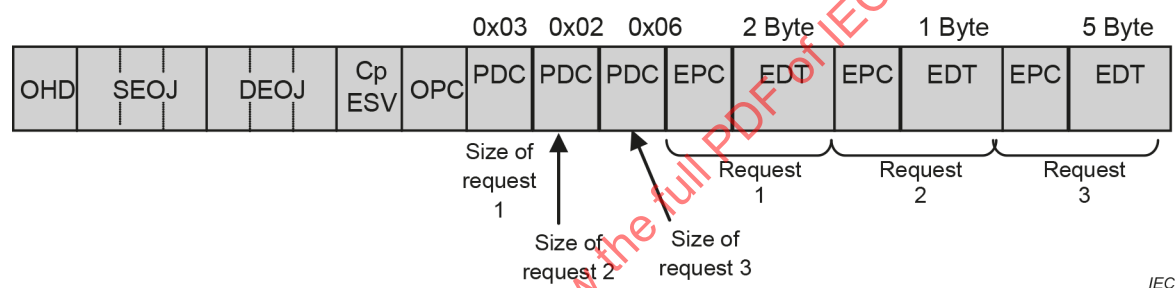


Figure 29 – Property data counter

8 Control protocol 2nd

8.1 General

Considering the situation where it is desirable to reduce the mounting load on simple devices, ECHONET Lite specifies the frame format for the ECHONET Lite Communication Middleware Block to minimize message size while fulfilling the requirements of the communications layer structure.

8.2 Frame format

8.2.1 General

Figure 30 shows the format of ECHONET Lite frames processed by the ECHONET Lite Communication Middleware. Detailed specifications for each message component are provided in 8.2.2 to 8.2.8.

In this document, messages exchanged between ECHONET Lite Communication Processing Blocks are called ECHONET Lite frames. ECHONET Lite frames are roughly divided into two types depending on the specified ELHD (see 8.2.2): message format specified by ECHONET Lite and message format unique to user. The ECHONET Lite frame length depends on the lower-layer communication media.

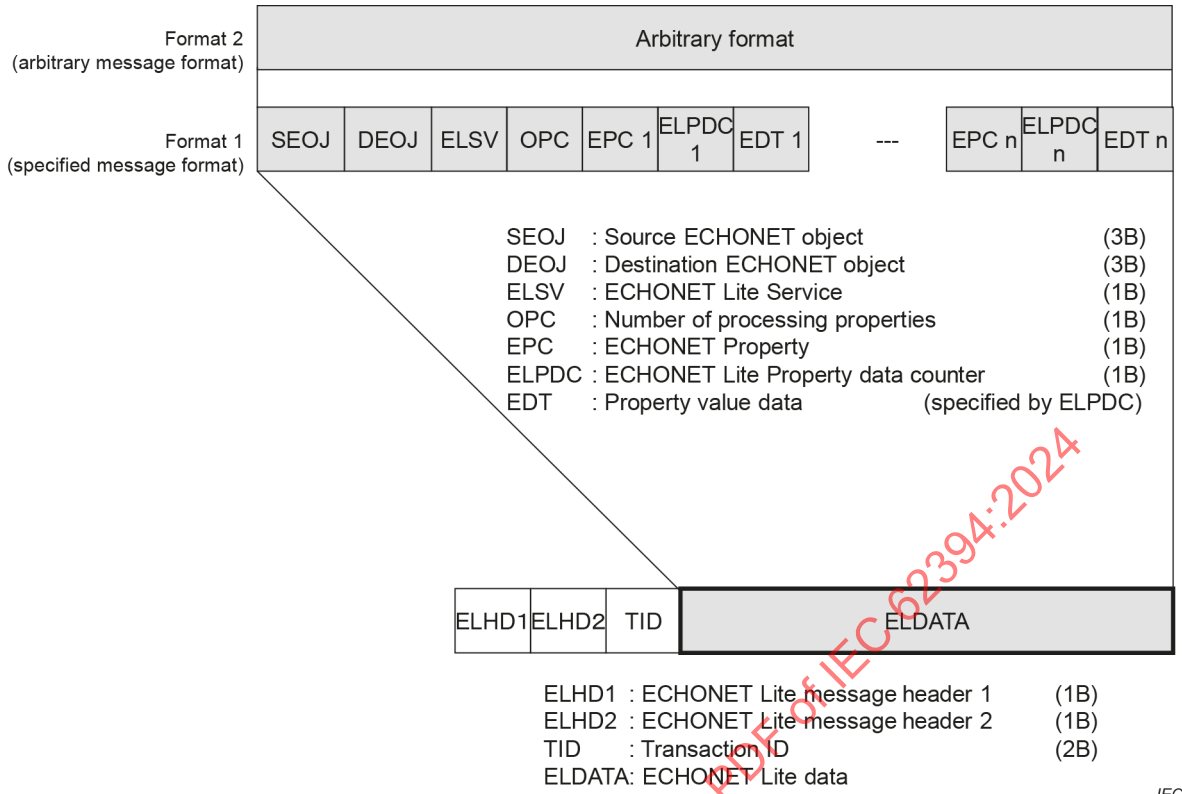


Figure 30 – ECHONET Lite frame format

8.2.2 ECHONET Lite Header (ELHD)

8.2.2.1 General

ELHD consists of ECHONET Lite Header 1 and ECHONET Lite Header 2.

8.2.2.2 ECHONET Lite Header 1 (ELHD1)

Figure 31 shows the detailed specifications of ECHONET Lite Header 1 (ELHD1).

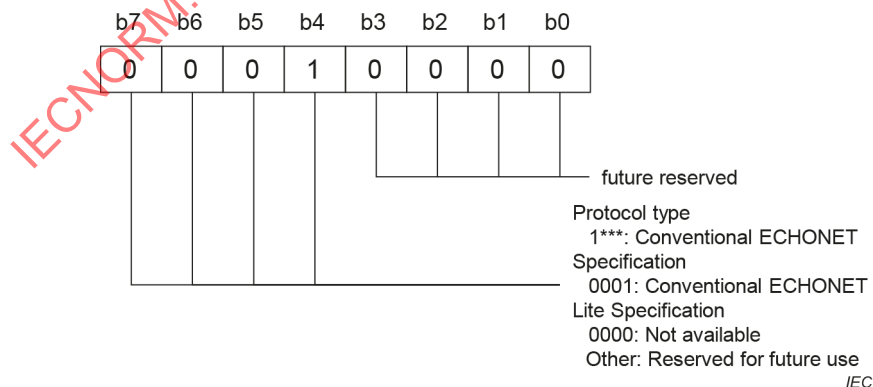


Figure 31 – Detailed specifications of ELHD1

The combination of b7 to b4 specifies an ECHONET protocol type. b7:b6:b5:b4 = 0:0:0:1 indicates the ECHONET Lite Protocol defined in these specifications. b7:b6:b5:b4 = 0:0:0:0 shall not be used because it enables coexistence with the conventional ECHONET Protocol.

8.2.2.3 ECHONET Lite Header 2 (ELHD2)

The detailed specifications of ECHONET Lite Header 2 (ELHD2) are shown in Figure 32.

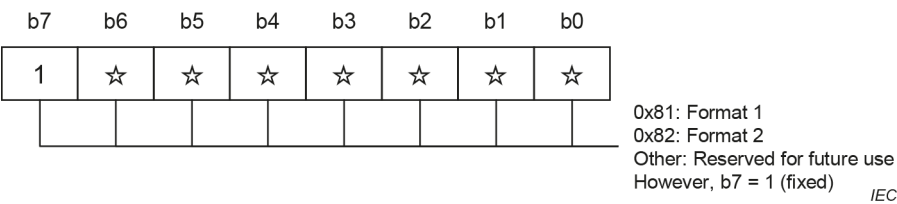


Figure 32 – Detailed specifications of ELHD2

ELHD2 defines the ELDATA frame format. When ELHD2 is 0x81, the ELDATA frame format is Format 1 (specified message format) defined in these specifications. When ELHD2 is 0x82, the ELDATA frame format is Format 2 (arbitrary message format). For coexistence with the conventional ECHONET Protocol, b7 is fixed at 1.

8.2.3 Transaction ID (TID)

TID is a parameter to string a sent request and a received response when a request sender receives a response in ECHONET Lite communications. A response sender shall store the same value as that contained in the request message.

8.2.4 ECHONET Lite Data (ELDATA)

ELDATA refers to the data area of a message exchanged by the ECHONET Lite Communication Middleware.

8.2.5 ECHONET Objects (EOJ)

Figure 33 shows the detailed specifications of ECHONET objects.

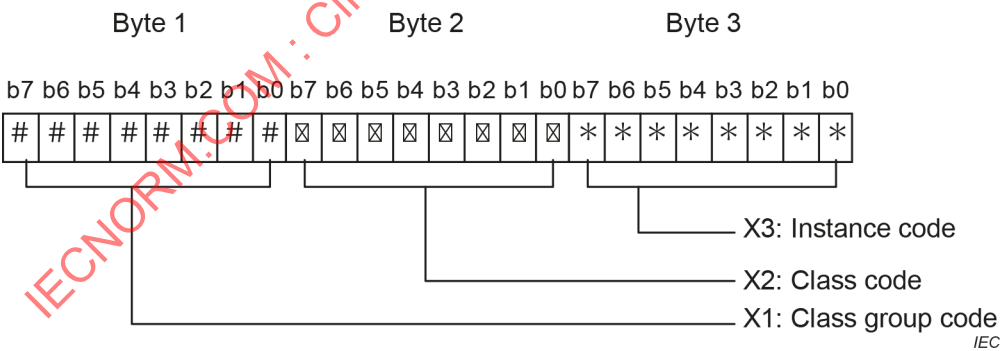


Figure 33 – Detailed specifications of EOJ code

ECHONET objects are described using the formats [X1.X2] and [X3], to be specified as shown below. (However, "." is used only for descriptive purposes and does not mean a specific code.) The object class is designated by the combination of X1 and X2, while X3 shows the class instance. A single ECHONET Lite node may contain more than one instance of the same class, in which case X3 is used to identify each one.

The specific items in Table 10 were specified based on JEM 1439. Detailed specifications for the objects shown here will be developed over time, and during this phase, specifications for the objects themselves (i.e., present/not present) will be further reviewed.

The instance code 0x00 is regarded as a special code (code for specifying all instances). When a DEOJ having this specified code is received, it is handled as a code specifying general broadcast to all instances of a specified class.

X1: Class group code

0x00–0xFF.

X2: Class code

0x00–0xFF.

X3: Instance code

0x00–0x7F. This is an identification code when more than one of the same class as that of the attributes specified by [X1.X2] exists in the same node.

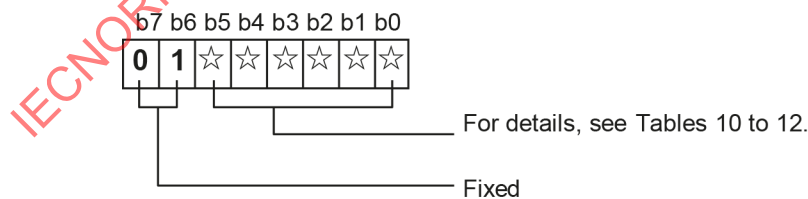
However, 0x00 is used for general broadcast to instances of the same class.

Table 10 – List of class group codes

Group code	Group name
0x00	Sensor-related device class group
0x01	Air conditioner-related device class group
0x02	Housing/facility-related device class group
0x03	Cooking/housework-related device class group
0x04	Health-related device class group
0x05	Management/control-related device class group
0x06	AV-related device class group
0x07 to 0x0D	Reserved for future use
0x0E	Profile class group
0x0F	User definition class group
0x10 to 0xFF	Reserved for future use

8.2.6 ECHONET Lite Service (ELSV)

This subclause provides detailed specifications for the ECHONET Lite service (ELSV) code. Detailed specifications are shown in Figure 34.



Note: Except when b7:b6 = 0:1, b0 to b5 have different meanings.

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Figure 34 – ELSV code detailed specifications

The service provided by this code is used when the compound message format is used. It specifies a simultaneous action for two or more properties stipulated by the EPC. However, it does not stipulate the order of operations. The order of property operations is an implementation issue.

The following three types of operations are provided. The response is subdivided into two types: "accepted" response and "process not possible" request. The "accepted" response is used when the service request in relation to all the EPC-stipulated properties is accepted. The "process not possible" request is used when one or more specified properties do not exist or when the specified service cannot be processed for one or more properties.

"Request", "response" (response possible/response not possible)", and "notification"

The "response" is a response to a "request" that requires a response. It shall be returned when an EOJ-stipulated object exists. When the service processing request related to all the EPC-stipulated properties is accepted, the "accepted" response shall be returned. When the processing request related to one or more specified properties cannot be accepted, or if the object exists but one or more properties do not exist, "process not possible" shall be returned. When the "request" does not require any response or when the specified object does not exist, no "response" is returned.

There are two types of "notification": one for transmitting own property information autonomously, and the other for sending a response to a notification request. However, these two types have the same code.

Three specific operations are provided: write (response required/no response required), read, read & write, and notification (notification/notification with response required). The six operations shown below are set.

- Property value write (response required).
- Property value write (no response required).
- Property value read.
- Property value write and read.
- Property value notification.
- Property value notification (response required).

The ELSV and message configuration and their relationship to EPC and ELSV are described here. The EPC of an ECHONET Lite message is such that the ELSV value determines whether the target object is stipulated by the SEOJ or the DEOJ. When the ELSV is a "response" or "notification", it is concluded that the EPC forms an SEOJ-stipulated object and that the "response" or "notification" is addressed to a DEOJ-stipulated object. On the other hand, when the ELSV is a "request", it is concluded that the EPC forms a DEOJ and that the "request" is issued from an SEOJ-stipulated object.

If there is no EOJ to be set as a SEOJ or a DEOJ, a node profile class shall be specified.

Table 11 shows specific ELSV code assignments based on the content described above. (The related number is indicated in the Remarks column of the table.)

In the diagrams in (a) to (f) (Figure 35 to Figure 40), the EOJ values used in relation to "requests" are individually specified codes. However, although a service request is made to two or more nonspecific object instances using a single message when the EOJ value indicates general broadcast to all instances of the specified class (i.e. X3 = 0x00), the processing in such a case shall assume that a request message was sent individually to each instance. That is, when it is necessary to send response messages, they shall be generated in such a manner that the number of instances equals the number of response messages, and messages with content that match the individual instances shall be sent after storing such types of content.

Table 11 – List of service codes for request

Service code (ELSV)	ECHONET Lite service content	Symbol	Remarks
0x60	Property value write request (no response required)	Set	Broadcast possible
0x61	Property value write request (response required)	SetC	
0x62	Property value read request	Get	Broadcast possible
0x63	Property value notification request	INF_REQ	Broadcast possible
0x64 to 0x6D	Reserved for future use		
0x6E	Property value write and read request	SetGet	Broadcast possible
0x6F	Reserved for future use		

Table 12 – List of ELSV codes for response/notification

Service code (ELSV)	ECHONET Lite service content	Symbol	Remarks
0x71	Property value write response	Set_Res	ELSV = 0x61 response; individual response
0x72	Property value read response	Get_Res	ELSV = 0x62 response; individual response
0x73	Property value notification	INF	Both individual notification and broadcast notification ^a
0x74	Property value notification (response required)	INFC	Individual notification
0x75 to 0x79	Reserved for future use		
0x7A	Property value notification response	INFC_Res	ELSV = 0x74 response; individual response
0x7B to 0x7D	Reserved for future use		
0x7E	Property value write and read response	SetGet_Res	ELSV = 0x6E response; individual response
0x7F	Reserved for future use		
^a Used for autonomous property value notification and for 0x63 response.			

Table 13 – List of ELSV codes for "response not possible"

Service code (ELSV)	ECHONET Lite service content	Symbol	Remarks
0x50	Property value write request "response not possible"	SetI_SNA	ELSV = 0x60 response not possible; individual response
0x51	Property value write request "response not possible"	SetC_SNA	ELSV = 0x61 response not possible; individual response
0x52	Property value read "response not possible"	Get_SNA	ELSV = 0x62 response not possible; individual response
0x53	Property value notification "response not possible"	INF_SNA	ELSV = 0x63 response not possible; individual response
0x54 to 0x5D	Reserved for future use		
0x5E	Property value write and read "response not possible"	SetGetI_SNA	ELSV = 0x6E response not possible; individual response
0x5F	Reserved for future use		

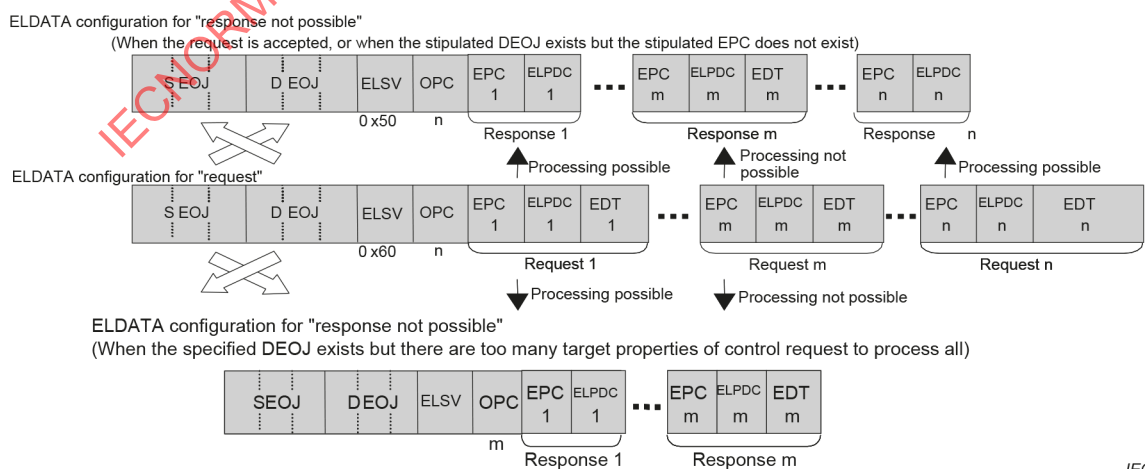
Relationships between request and response are described in a) to f).

a) Property value write service (no response required) [0x60, 0x50]

In the case of a "request" (0x60), this indicates a request to write the content shown in the EDT to the property stipulated in the EPC of the DEOJ-stipulated object.

When the request is not accepted, or when the stipulated DEOJ exists but the stipulated EPC does not exist, "response not possible" (0x50) is returned. When the specified DEOJ exists but there are too many target properties of control request to process all, the number of properties processed from the beginning is stored in the OPC and "response not possible" (0x50) is returned as a response. Then, the destination address of the lower communication layer shall be the source of "request" (the source address of the "request" message in the lower communication layer).

When the relevant object itself does not exist, neither "response" nor "response not possible" is returned. The relationship between request and response is shown in Figure 35.



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Figure 35 – ELDATA configuration for property value write service (no response required)

b) Property value write service (response required) [0x61, 0x71, 0x51]

In the case of "request" (0x61), this indicates a request to write the content shown in the EDT to the property stipulated in the EPC of the DEOJ-stipulated object.

In response to this "request", when the request shall be (or has already been) accepted, a "response" (0x71) is returned. However, this "response" is not a processing implementation response. In the frame format for response, the value of the object stipulated by the request is set in the SEOJ and the same value as for the request is set in the OPC. In the EPC, the same property code for the request is set. To indicate that the request was accepted, the ELPDC is set to 0 and no EDT is attached.

When the request is not accepted, or when the stipulated DEOJ exists but the stipulated EPC does not exist, "response not possible" (0x51) is returned. In the same way as for a message of "response", the request-stipulated object value is set in the SEOJ, the request-source object value is set in the DEOJ, the same value as for the request is set in the OPC, and the same property code for the request in the EPC for a message of "response not possible". For the EPC that accepted the request, 0 is set in the succeeding ELPDC and no EDT is attached. For the EPC that did not accept the request, the same value as for the request is set in the succeeding ELPDC and the requested EDT is attached to indicate that the request could not be accepted.

When the specified DEOJ exists, but there are too many target properties of control request to process all, the number of properties processed from the beginning is stored in the OPC, the same property code for the request is set in the EPC, and 0 is set in the ELPDC. Then "response not possible" (0x51) is returned as a response. In this case, the responding side can determine the number of property values to be returned. However, the sequence of such properties shall be the same as in the request message.

When the relevant object itself does not exist, neither "response" nor "response not possible" is returned. Whether a response is possible or not, the destination address of the lower communication layer shall be the source of "request" (the source address of the "request" message in the lower communication layer). The relationship between request and response is shown in Figure 36.

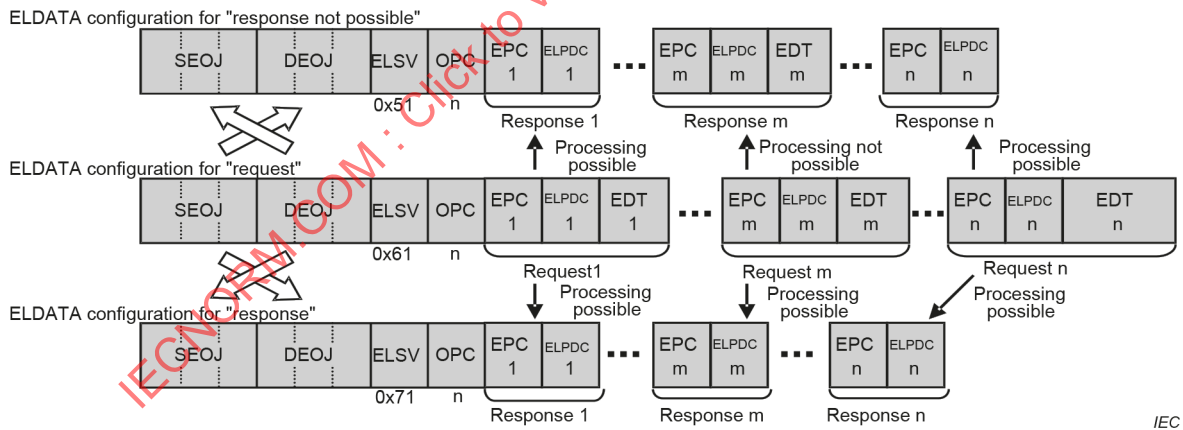


Figure 36 – ELDATA configuration for property value write service (response required)

c) Property value read service [0x62, 0x72, 0x52]

In the case of "read" (0x62), this indicates a request to read EPC-stipulated properties from the DEOJ-stipulated object.

When the request shall be (or has already been) accepted for all properties, a "response" (0x72) is returned. In the frame format for response, the value of the object stipulated by the request is set in the SEOJ, and the value of the request-source object is set in the DEOJ. In the OPC, the same value as for the request is set. To indicate that the request was accepted, the length of the read property is set in the ELPDC and the read property value in the EDT.

When the request is not accepted, or when the stipulated DEOJ exists but the stipulated EPC does not exist, "response not possible" (0x52) is returned. In the same way as for a message of "response", the request-stipulated object value is set in the SEOJ, the request-source object value is set in the DEOJ, the same value as for the request is set in the OPC, and the same property code for the request is set in the EPC for a message of "response not possible". For the EPC that accepted the request, the length of the read property is set in the succeeding ELPDC and the read property value in the EDT. For the EPC that did not accept the request, 0 is set in the succeeding ELPDC and no EDT is attached to indicate that the request was not accepted.

When the specified DEOJ exists, but there are too many target properties of control request to process, or all the property values requested for read cannot be returned because the allowable message length is not enough, the number of properties processed from the beginning is stored in the OPC, the same property code for the request is set in the EPC, the length of the read property is set in the ELPDC, and the read property value is set in the EDT. Then, "response not possible" (0x52) is returned as a response. In this case, the responding side can determine the number of property values to be returned. However, the sequence of such properties shall be the same as in the request message.

When the relevant object itself does not exist, neither "response" nor "response not possible" is returned. Whether a response is possible or not, the destination address of the lower communication layer shall be the source of "request" (the source address of the "request" message in the lower communication layer). The relationship between request and response is shown in Figure 37.

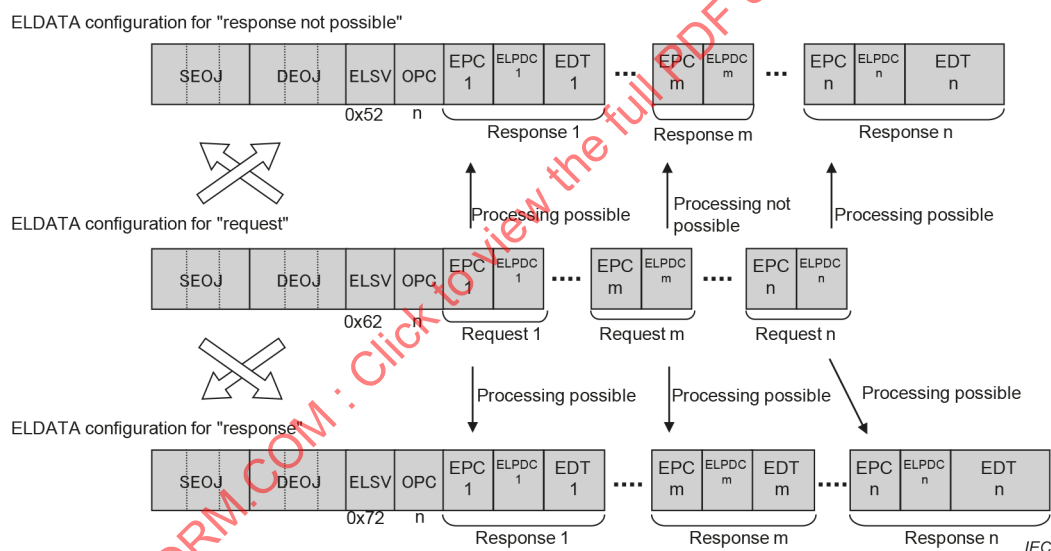


Figure 37 – ELDATA configuration for property value read service

d) Property value write and read service [0x6E, 0x7E, 0x5E]

"Write & read" (0x6E) indicates a service to process two requests by a single message: a request for writing EDT-stipulated contents into EPC-stipulated properties of a DEOJ-stipulated object and a request for the contents of EPC-stipulated properties from a DEOJ-stipulated object. The number of write-requested properties is stored in the OPCSet and that of read-requested properties is set in the OPCGet.

When the request shall be (or has already been) accepted, a "response" (0x71) is returned. In the frame format for response, the value of the object stipulated by the request is set in the SEOJ and the request-source object value in the DEOJ. The same value as for the request is set in the OPCSet, the same property code for the request is set in the EPC, 0 is set in the ELPDC, and no EDT is attached. The same value as for the request is set in the OPCGet, the same property code for the request is set in the EPC, the length of the read property is set in the ELPDC, and the read property value is set in the EDT.

When the request is not accepted, or when the stipulated DEOJ exists but the stipulated EPC does not exist, "response not possible" (0x5E) is returned. When the specified DEOJ exists, but there are too many target properties of control request to process, or all the property values requested for write or read cannot be returned because the allowable message length is not enough, the number of properties processed from the beginning is stored in the OPCSet and OPCGet. Then "response not possible" (0x5E) is returned as a response. In this case, the responding side can determine the number of property values to be returned. However, the sequence of such properties shall be the same as in the request message.

When the relevant object itself does not exist, neither "response" nor "response not possible" is returned. Whether a response is possible or not, the destination address of the lower communication layer shall be the source of "request" (the source address of the "request" message in the lower communication layer). The relationship between request and response is shown in Figure 38.

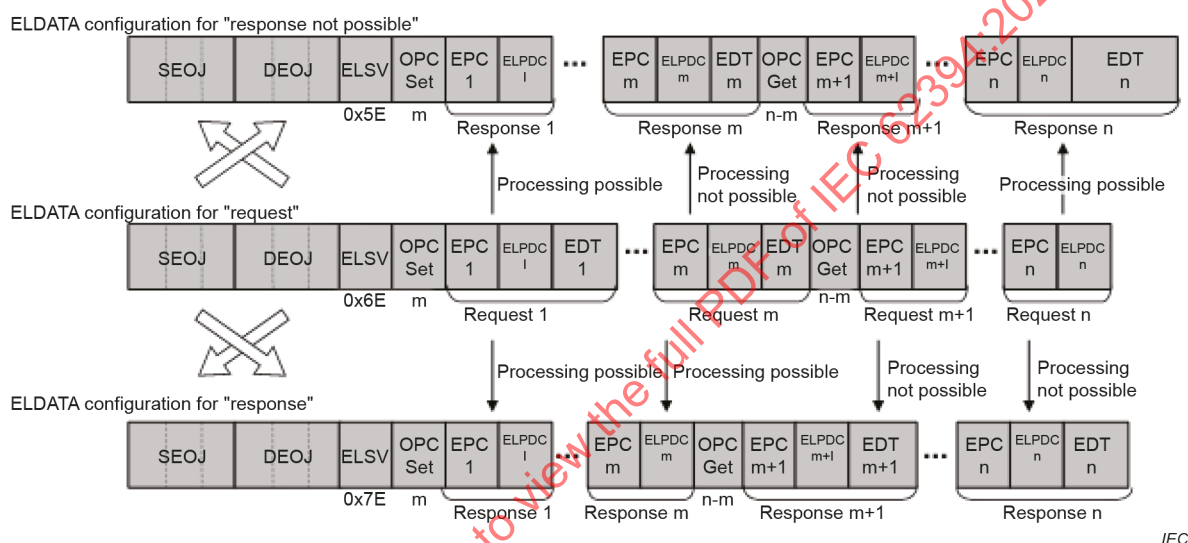


Figure 38 – ELDATA configuration for property value write and read service

This service is an option. If a node not supporting this service receives a request for the service, 0 shall be set in the OPCSet and OPCGet, and a "response not possible" (0x52) shall be returned as a response.

e) Property value notification service [0x63, 0x73, 0x53]

There are two types of "notification": the notification sent as a response to a "notify request" (0x63) and the autonomous notification, which is unrelated to notify requests. The codes for the two types are identical. (Here, notification in response to a "notify request" signifies an announcement that does not specify the property value [content], while an autonomous notification is a voluntary announcement that was not made in response to a request.) In the case of a "notify request" (0x63), this indicates a request to notify (by general broadcast; hereafter "announce" signifies a general broadcast) the content of the property stipulated in the EPC of the DEOJ-stipulated object.

In response to this "notify request", when the request shall be accepted, a "response" (0x73) value is notified. The request-stipulated object value is set in the SEOJ, the request-source object value is set in the DEOJ, and the same value as for the request is set in the OPC. The same property code as for the request is set in the EPC and the property length of notification is set in the ELPDC. In the EDT, the requested property value (contents of notification) is stored. For broadcast, destination addresses in lower communication layers are set.

When the request is not accepted, or when the stipulated DEOJ exists but the stipulated EPC does not exist, "response not possible" (0x53) is returned. In the same way as for a message of "response", the request-stipulated object value is set in the SEOJ, the request-source object value is set in the DEOJ, the same value as for the request is set in the OPC, and the same property code for the request in the EPC for a message of "response not possible". For the EPC that accepted the request, the length of the read property is set in the succeeding ELPDC and the read property value in the EDT. For the EPC that did not accept the request, 0 is set in the succeeding ELPDC and no EDT is attached to indicate that the request was not accepted. When the specified DEOJ exists but there are too many target properties of control request to process, or the property value (contents of notification) requested for read cannot be returned because the allowable message length is not enough, the number of properties processed from the beginning is stored in the OPC, the same property code for the request is set in the EPC, the length of the read property is set in the ELPDC, and the read property value is set in the EDT. Then "response not possible" (0x53) is returned as a response. In this case, the responding side can determine the number of property values to be returned. Also, for a response not possible, the address of the lower communication layer of the request source shall be set as the destination address of the lower communication layer. When the relevant object itself does not exist, neither "response" nor "response not possible" is returned. (See Figure 39 for the sequence.) In the case of an autonomous "notification", the DEA is set to a general broadcast for a required status change notification. In the other cases, however, the destination of the lower communication layer can be set arbitrarily for broadcast or individual transmission.

For an autonomous "notification", a node profile class is stored because there is no EOJ to be set in the DEOJ in particular.

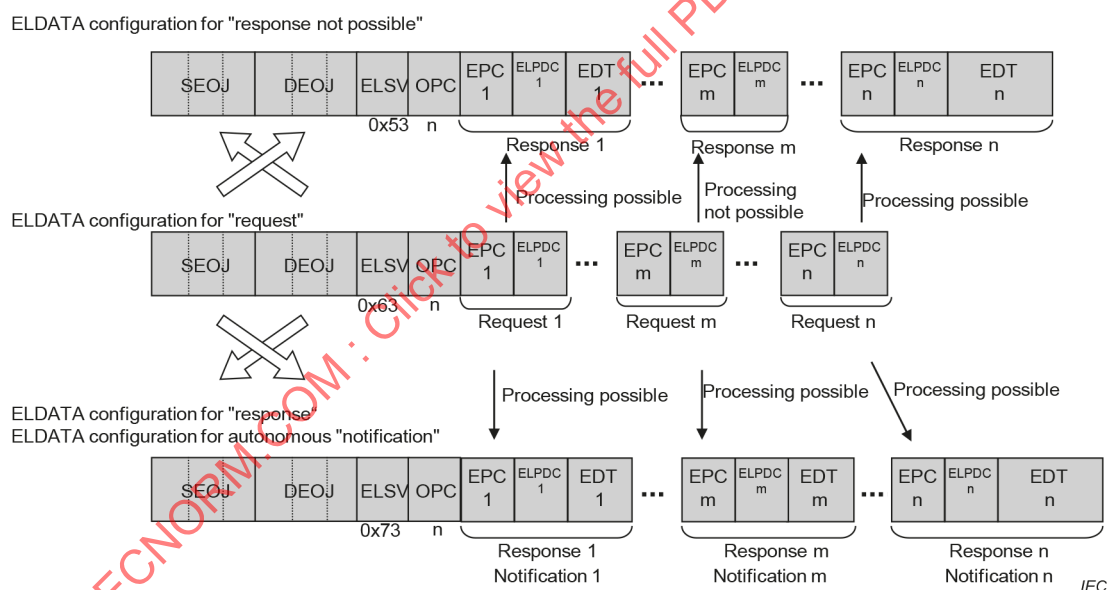


Figure 39 – ELDATA configuration for property value notification service

f) Property value notification (response required) [0x74, 0x7A]

The "notification (response required)" (0x74) autonomously notifies a specific node of the property value stipulated by the EPC of the SEOJ-stipulated object and requests a response. The response process for this "notification (response required)" varies depending on whether or not the DEOJ is specified.

Processing varies depending on whether the specified DEOJ exists. When the specified DEOJ exists, a "response" (0x7A) for autonomous notification reception is returned. (See Figure 40 for the sequence.) In a response message, the requested object value is set in the SEOJ and the request-source object value in the DEOJ. The same value as for notification is set in the OPC and the same property code as for notification is set in the EPC. To indicate that the notification was received, the ELPDC is set to 0 and no EDT is attached.

When the specified DEOJ does not exist, the message shall be discarded. The nodes that received the notification (response required) by broadcast shall discard this message.

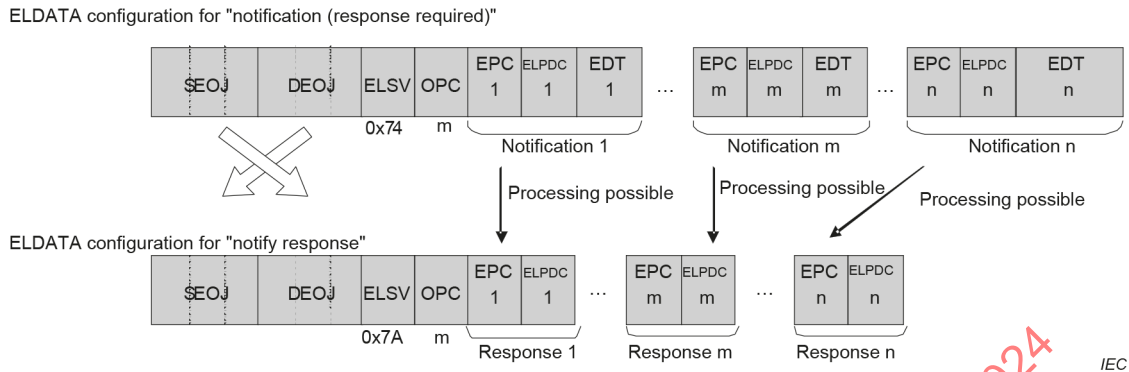


Figure 40 – ELDATA configuration for property value notification (response required) service

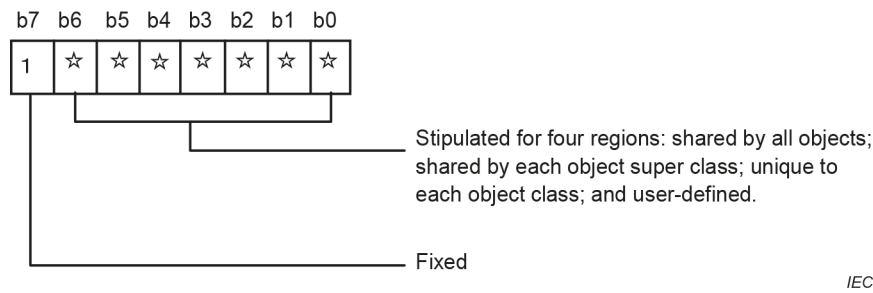
The services shown in Table 11, Table 12 and Table 13 above are specified for each property. Regarding those stipulated as services that shall be incorporated in each property, if they have the functions of that property and disclose via communications (read/write/notification, etc.), this indicates that they shall be processed. Processing of services for each property is specified in the access rules column of the object class detailed in Table 16, Table 19 to Table 29, Table 31 to Table 58, Table 68 to Table 86, Table 92, and Table 98 to Table 110. Access rules indicate all services that can be implemented. In these tables, the following four access rules are specified:

- Set: processes services related to write requests for property values (performs processing indicated in a) and b)).
- Get: processes services related to read requests for property values (performs processing indicated in c) and e)).
- SetGet: processes services related to write and read requests for property values (performs processing indicated in d)).
- Anno: processes non-array property value notification services (performs processing indicated in e) and f)).

The above processing is specified for each property.

8.2.7 ECHONET property (EPC)

This subclause provides detailed specifications for the ECHONET property (EPC) code shown in Figure 30, Figure 41 and Table 14. The EPC specifies a service target function. Each object stipulated by X1 (class group code) and X2 (class code), described in 8.2.6, is specified here. (When a specified object changes, the target function also changes even when the code remains unchanged. However, the detailed specifications are designed to ensure that, whenever possible, the same functions will have the same code.)



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When b7 = 0, the other bits will be defined differently.

Figure 41 – EPC detailed specifications

Table 14 – EPC code allocation table

		b7–b4 values							
		8	9	A	B	C	D	E	F
b3–b0 values (hex)	0	Region shared by all object classes	Region shared in each class group ^b	Region unique to each class ^b	User-defined ^a				
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	A								
	B								
	C								
	D								
	E								
	F								

EPC code space is divided to four regions (shaded areas) separated by the commonality.

^a Stipulated for each user. In the case of a user-defined object class, 0xA to 0xF in the four high-order bits (b7 to b4) are user-defined.

^b As a rule these two regions are used, but in practice the boundary line will change for each class group.

8.2.8 ECHONET Lite Property data counter (ELPDC)

The property data counter retains the number of bytes in ECHONET Property Value Data (EDT). If, for instance, the ECHONET property value data sizes for requests 1, 2, and 3 are 2 bytes, 1 byte, and 5 bytes, respectively, the values placed in the first, second, and third property data counters are 0x02, 0x01, and 0x05, respectively, as shown in Figure 42.

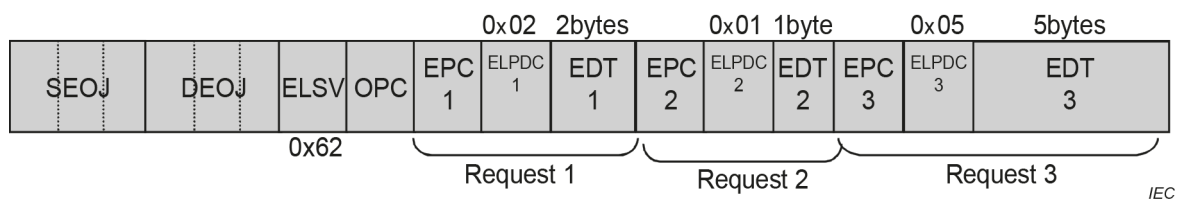


Figure 42 – ECHONET Lite Property data counter

9 ECHONET objects: detailed specifications

9.1 Basic concept

Clause 9 specifies specific values for the class codes of ECHONET objects processed in the ECHONET communication middleware, whose types and overview are given in Clause 7 and Clause 8, along with property configurations and detailed specifications for property configurations. In the case of class codes, rather than providing entirely new specifications, standards already being studied by the industry were applied whenever possible to capitalize on past work. Regarding object properties, the operands (control content) of JEM 1439 were analyzed and referred to. ECHONET objects described in this subclause are divided into three main classes: device objects, profile objects, and communications definition objects. In terms of the code structure, they will be divided into the class groups shown below. This clause presents the shared ECHONET property specifications and object super classes that form ECHONET objects.

a) Device objects

- Sensor-related device class group
- Air-conditioning-related device class group
- Housing-related device class group
- Cooking/housework-related device class group
- Health-related device class group
- Management and control-related device class group
- AV-related device class group

b) Profile objects

- Profile class group

c) Communications definition objects

- Sensor-related device communications definition class group
- Air-conditioning-related device communications definition class group
- Housing-related device communications definition class group
- Cooking/housework-related device communications definition class group
- Health-related device communications definition class group
- Management and control-related device communications definition class group
- Profile communications definition class group
- AV-related device communications definition class group

Each ECHONET node shall implement a device object for at least one representative device.

9.2 ECHONET properties: basic specifications

9.2.1 General

This subclause presents the specifications shared by all ECHONET object classes, of which details are provided in this Subclause 9.2 and in 9.3.

9.2.2 ECHONET property value data types

The ECHONET property value is expressed as an unsigned integer when the value is a non-negative integer value; it is expressed as a signed integer when the value is an integer value containing negatives.

When the value is a small value, it is handled as a fixed-point type. When it is a non-negative small value, it is treated as an unsigned integer, and when it is a small value containing negatives, it is treated as a signed integer. Data types and sizes are specified individually for each property.

Although the property data size is specified individually for each property, property value data of 2 bytes or larger comprises ECHONET communication middleware messages as ECHONET property value data (EDT) beginning from the most significant byte.

9.2.3 Property value range

The treatment of property values when the actual device value operating range differs from them, is specified below.

- a) When the actual device property value operating range is smaller than the ECHONET property definition range and the actual device property value assumes the upper and lower limit values, the upper and lower limit values of the operating range are considered to be the property values. Assuming that the ECHONET property definition range is 0x00 to 0xFD (0 °C to 253 °C) and the corresponding actual device operating range is 0x0A to 0x32 (10 °C to 50 °C), when the actual device value is the upper limit value (50 °C) of the operating range, the upper limit value 0x32 (50 °C) of the actual device operating range is considered to be the ECHONET property value, and when the actual device property value is the lower limit value (10 °C), the lower limit value 0x0A (10 °C) is considered to be the ECHONET property value.
- b) When the actual device property value operating range as ECHONET property is larger than the ECHONET property definition range and the actual device property value assumes a value outside the ECHONET property definition range, a code showing an underflow or overflow becomes the property value.
- c) Assuming that the ECHONET property definition range is 0x00 to 0xFD (0 °C to 253 °C) and the corresponding actual device operating range is –10 °C to 300 °C, when the actual device value assumes a value below the ECHONET property definition range, the underflow code 0xFE becomes the property value. When the actual device property value assumes a value above the ECHONET property definition range, the overflow code 0xFF becomes the property value.

Table 15 shows the underflow and overflow codes for each data type.

Table 15 – Data types, data sizes, and overflow/underflow codes

Data type	Data size	Underflow	Overflow
Signed char	1 byte	0x80	0x7F
Signed short	2 byte	0x8000	0x7FFF
Signed long	4 byte	0x80000000	0x7FFFFFFF
Unsigned char	1 byte	0xFE	0xFF
Unsigned short	2 byte	0xFFFE	0xFFFF
Unsigned long	4 byte	0xFFFFFFFF	0xFFFFFFFF

9.2.4 Required class properties

In the class property specifications described in Clause 9, the properties indicated as "mandatory" shall be implemented when implementing the given class.

In addition, actual devices need not implement functions corresponding to all codes listed in the property content value range for a required property. They shall implement only those codes corresponding to the functions they possess.

In the "announcement at status change" column in the property list, the "o" mark denotes mandatory processing when the property is implemented. When a property marked in this manner is implemented and its status changes, an announcement (property value notification service data transmission with an intra-domain general broadcast specified) shall be made.

9.2.5 Array

ECHONET properties can be in the form of an array. Array elements are stipulated by an array element number, which ranges from 0x0000 to 0xFFFF. Array elements may be non-contiguous. The example of array elements is shown in Figure 43. The data type of each array element shall be unique within a property.

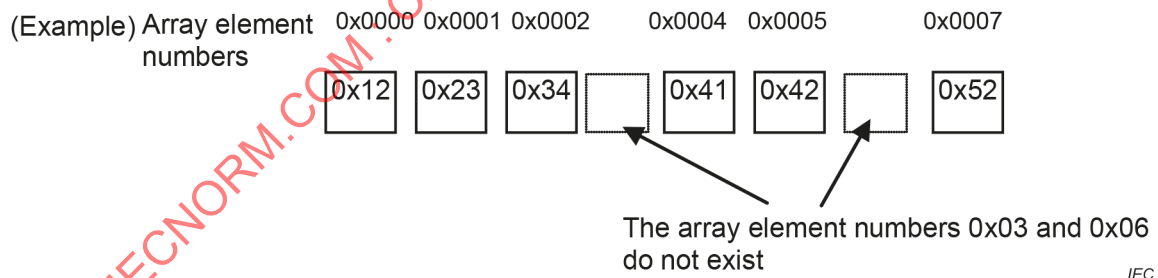


Figure 43 – Example of array elements

For the property value element-stipulated write service (ESV = 0x64, 0x65), property value element-stipulated read service (ESV = 0x66), property value element-stipulated notification service (ESV = 0x67), and property value element-stipulated deletion service (ESV = 0x6A, 0x6B), the "process not possible" response is returned if the associated array element does not exist. For the property value element-stipulated addition service (ESV=0x68, 0x69), the "process-not-possible" response is returned if the associated array element exists.

The property value element-stipulated deletion service deletes a specified array element but does not shift the subsequent elements forward. The example of property value element deletion is shown in Figure 44.

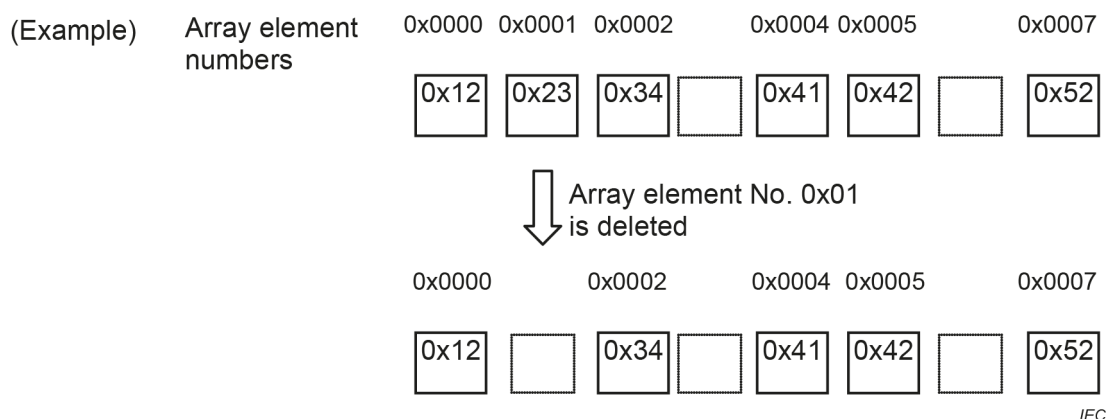


Figure 44 – Example of property value element deletion

The property value element addition service (ESV = 0x6D, 0x6E) does not specify the array element number to which an element addition shall be applied. Such a target array element number depends on the implementation. An example of property value element addition is shown in Figure 45.

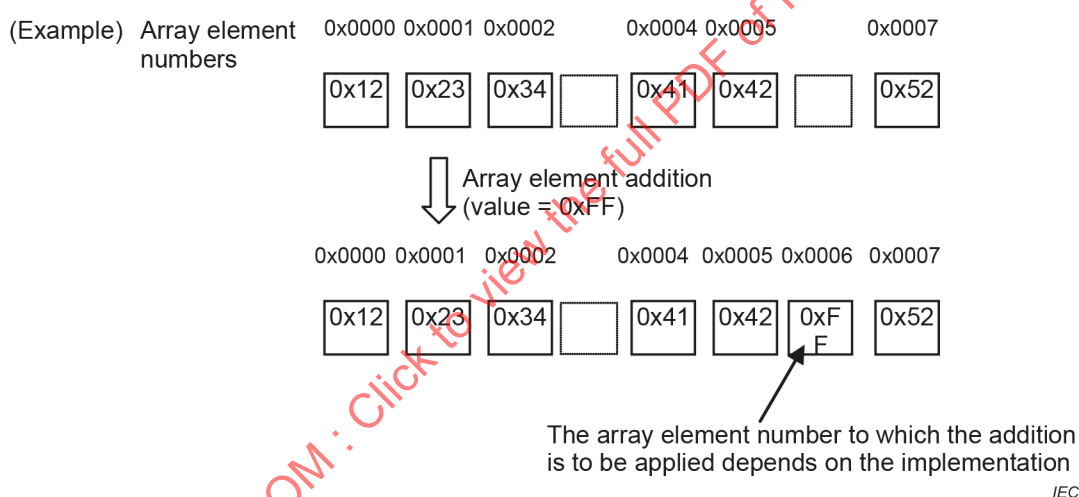


Figure 45 – Example of property value element addition

9.3 Device object super class specifications

9.3.1 General

Subclause 9.3 provides detailed specifications for the property configurations shared by all device object classes in the class groups corresponding to device objects (class group codes 0x00 to 0x06). These specifications will be presented as the device object super class.

9.3.2 Overview of device object super class specifications

The device object super class property is implemented by each device object class. Specifications for the device object super class are shown below.

The "operating status" (EPC = 0x80) property implements the "get" access rule for all device object classes, signifying that it can be referenced from other nodes. Similarly, the "status change announcement property map" (EPC = 0x9D), "fault status" (EPC = 0x88), "set properties map" (EPC = 0x9E), and "get properties map" (EPC = 0x9F) properties also implement the "get" access rule, signifying that they can be referenced. Table 16 shows the list of device object super class configuration properties.

Table 16 – List of device object super class configuration properties

[illegible]

Property name	EPC	Contents of property	Data size	Data size byte	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)						
Measured cumulative energy consumption	0x85	Indicates the cumulative energy consumption of the device in increments of 0,001 kWh.	unsigned long	4	Get			
		0x0 to 0x3B9AC9FF (0 kWh to 999 999,999 kWh)						
Manufacturer's fault code	0x86	Indicates the manufacturer-defined fault code.	unsigned char × (max) 225	Max 225	Get			
		First byte: Indicates the data size of the fault code field.						
		Second to fourth bytes: Manufacturer code.						
		Fifth and succeeding bytes: Field for manufacturer-defined fault code						
Current limit setting	0x87	Indicates the current limit setting (0 % to 100 %).	unsigned char	1	Set/Get			
		0x00 to 0x64 (= 0 % to 100 %)						
Fault status	0x88	Indicates whether a fault (e.g. a sensor trouble) has occurred or not.	unsigned char	1	Get	○	○	
		Fault occurred = 0x41, No fault has occurred = 0x42.						
Fault description	0x89	Describes the fault.	unsigned short	2	Get			
		See 9.3.12.						
Manufacturer code	0x8A	3-byte manufacturer code	unsigned char × 3	3	Get	○		
		(Defined by the ECHONET Consortium.)						
Business facility code	0x8B	3-byte business facility code	unsigned char × 3	3	Get			
		(Defined by each manufacturer.)						
Product code	0x8C	Identifies the product using ASCII code.	unsigned char × 12	12	Get			
		(Defined by each manufacturer.)						
Production number	0x8D	Indicates the production number using ASCII code.	unsigned char × 12	12	Get			
		(Defined by each manufacturer.)						
Production date	0x8E	4-byte production date code	unsigned char × 4	4	Get			
		Indicates the production date in the YYMD format (1 character = 1 byte).						
		YY: Year (e.g. 1999 = 0x07CF)						
		M: Month (e.g. December = 0x0C)						
		D: Day (e.g. 20th = 0x14)						

Property name	EPC	Contents of property	Data size	Data size byte	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)						
Cumulative operating time	0x9A	Indicates the cumulative number of days, hours, minutes or seconds for which the device has operated, using 1 byte for the unit and 4 bytes for the time.	unsigned char + unsigned long	1+4 bytes	Get			
		First byte: Indicates the unit. Second: 0x41; Minute: 0x42; Hour: 0x43; Day: 0x44 Second to fifth bytes: Indicates the elapsed time in the unit specified by the first byte. 0x00000000 to 0xFFFFFFFFD (0 to 4 294 967 295)						
SetM property map	0x9B	See Clause 10.	unsigned char × (MAX17)	Max. 17	Get	○ ^a		
GetM property map	0x9C	See Clause 10.	unsigned char × (MAX17)	Max. 17	Get	○ ^a		
Status change announcement property map	0x9D	See Clause 10.	unsigned char × (MAX17)	Max. 17	Get	○		
Set property map	0x9E	See Clause 10.	unsigned char × (MAX17)	Max. 17	Get	○		
Get property map	0x9F	See Clause 10.	unsigned char × (MAX17)	Max. 17	Get	○		
The ○ marks in the "Announcement at status change" column indicate that the processing is mandatory when the property is implemented.								
^a GetM and SetM property map may not be implemented in control protocol 2 nd shown in Clause 8.								

9.3.3 Operation status property

The "operation status" property of the device object super class indicates whether the functions specific to each class are operating in the actual device (ON) or not (OFF). In the case of a node in which a device object class is implemented and the functions specific to that class start operating upon start-up of the node, this property may be implemented with the value fixed at 0x30. However, the operation status of the communications function of the node shall be indicated in the "operation status" property of the node profile object.

9.3.4 Installation location property

The "installation location" property indicates the location at which the device has been installed in the form of 1-byte bitmap information. This property is a rewritable mandatory property. When the value is changed, the new value shall be broadcast throughout the domain.

The 8 bits of the "installation location" property are assigned a free definition designation bit, an installation location code and a location number. In the case where all the bits are 0, a special code that indicates that the installation location has not been specified is used. In the case where all the bits are 1, a special code that indicates that the installation location is indefinite is used.

The information contained in each of the bits is as described below. Table 17 shows the relationships between the installation location types, free definition designation bit, installation location code and location number.

- Free definition designation bit (b7)

This is comprised of a single bit, b7. When b7 is 1, the installation location code and location number can be freely defined.

When b7 is 0, the installation location code and location number indicate the installation location of the device according to the rules specified in Table 17.

- Installation location code (b3 to b6)

This code is comprised of the 4 bits from b3 to b6. When b7 is 1, this code can be freely defined.

When b7 is 0, this code indicates the type of the installation location of the device according to the rules specified in Table 17.

- Location number (b0 to b2)

This number is comprised of the 3 bits from b0 to b2. When b7 is 1, this number can be freely defined. When b7 is 0, this number is used to distinguish a space of a given type from another space of the same type. For example, when there are 2 lavatories, the lavatory on the first floor can be distinguished from the lavatory on the second floor by assigning 001b as the location number for the former and 010b as the location number for the latter.

When b7 is 0, the location number field value 000b indicates that the "installation location" property has been initialized on the assumption that the device will be installed at the installation location specified by the installation location code. This situation is herein expressed as the "location number not specified" situation.

In the case where the "installation location" property has been initialized without making an assumption about the type of the installation location for the device, the setting shall be set to 0x00 (the "installation location not specified" code). When it is inappropriate to specify a specific location type as the installation location type for the device, the "installation location" property setting shall be set to 0xFF (the "installation location indefinite" code).

The values 0x01 to 0x07 are reserved for future use.

Table 17 – Installation location (space) types and the bit values assigned to them

MSB						LSB		
Installation location type	Free definition designation bit	Installation location code				Location number		
	b7	b6	b5	b4	b3	b2	b1	b0
Living room	0	0	0	0	1	"000b" to "111b" ("000b" indicates that the location number has not been specified.)		
Dining room	0	0	0	1	0			
Kitchen	0	0	0	1	1			
Bathroom	0	0	1	0	0			
Lavatory	0	0	1	0	1			
Washroom/ changing room	0	0	1	1	0			
Passageway	0	0	1	1	1			
Room	0	1	0	0	0			
Stairway	0	1	0	0	1			
Front door	0	1	0	1	0			
Storeroom	0	1	0	1	1			
Garden/perimeter	0	1	1	0	0			
Garage	0	1	1	0	1			
Veranda/balcony	0	1	1	1	0			
Others	0	1	1	1	1			
Free definition ^a	1	"0000000b" to "1111110b"						
Installation location not specified	0	0	0	0	0	0	0	0
Installation location indefinite	1	1	1	1	1	1	1	1
Reserved for future use	"00000001b" to "00000111b"							

^a "Free definition" signifies that the installation location code and location number can be freely defined for the use of the device in a store or medium- or small-sized building.

9.3.5 Standard version information property

The "Standard version information" property indicates the release order and the revision number of the APPENDIX as a one-byte ASCII code and a one-byte binary value.

The first and second bytes are fixed at 0x00 in this version, reserved for future expansion. The third byte indicates the order of release. If only adding or changing properties when revising specifications, or correcting errata and clerical errors, a revision number shall be assigned rather than updating the order of release of this specification, and the revision number shall be indicated by a binary value in the fourth byte. When updating the order of release indicated in the third byte, the revision number of the fourth byte shall be 0x00. For example, if APPENDIX Release is P and the revision number is 2, the first and second bytes shall be 0x00(0), the third byte 0x50 (P), and the fourth byte 0x02 (2).

9.3.6 Identification number property

The "identification number" property is a number that allows each device object to be uniquely identified. The first byte indicates the format of the unique number.

In the case where the unique number type is 0xFE ("defined by the manufacturer"), the unique number is comprised of a 3-byte manufacturer code field, which contains the unique manufacturer code assigned by the ECHONET Consortium to the manufacture in question, and a 13-byte unique ID field, which contains the unique identification number defined by the manufacturer. This property's data structure is shown in Figure 46. Each vendor shall ensure that there will be no code value overlap.

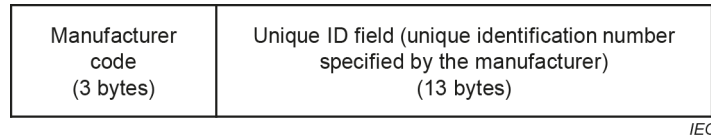


Figure 46 – Data structure of "identification number" property

9.3.7 Measured instantaneous power consumption property

This property indicates the instantaneous power consumption of the device in watts. The value range for this property shall be from 0x0000 to 0xFFFD. When the property value of the actual device is higher than the upper bound of the value range, 0xFFFF (overflow code) shall be used. When the property value of the actual device is lower than the lower bound of the value range, 0xFFFE (underflow code) shall be used.

9.3.8 Measured cumulative energy consumption property

This property indicates the cumulative energy consumption of device in increments of 0,001 kWh. The value range for this property shall be from 0x00000000 to 0x3B9AC9FF (from 0 kWh to 999 999,999 kWh). When a measured cumulative energy consumption overflow occurs, the counting shall restart from 0x00000000.

9.3.9 Manufacturer's fault code property

This property identifies the faults that have occurred in the device using unique fault codes defined by the manufacturer.

The first byte indicates the data size of the fault code field.

The second to fourth bytes indicates the 3-byte manufacturer code assigned to the manufacturer in question by the ECHONET Consortium.

The fifth and succeeding bytes (i.e. the fault code field) contain the unique fault code defined by the manufacturer in question.

In the case where this property is implemented, the implementation of the "Fault description" property is mandatory. This property's data structure is shown in Figure 47.

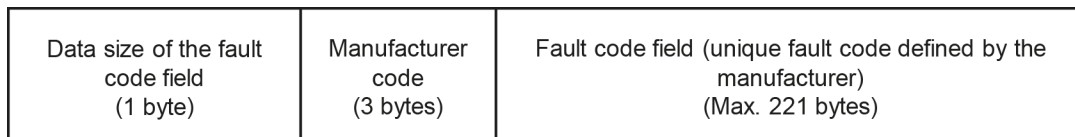


Figure 47 – Data structure of "manufacturer's fault code" property

9.3.10 Current limit setting property

The "current limit setting" property contains the setting for the maximum consumable current (i.e. current limit setting). The value range for this property shall be from 0 to 100 (from 0x00 to 0x64), and the unit is %. The maximum consumable current at any given moment for the device associated with the object in question is the maximum current specified for that device times the rate specified by the value contained in this property at that moment. When the value of this property is 100, no current limit is imposed. In the case where it is not possible to limit the current consumption using the value specified by this property, the current consumption shall be limited using a value that is closest to and lower than the value specified by this property. A read value shall be one set in the equipment.

9.3.11 Fault status property

The "fault status" property of the device object super class indicates whether a fault has occurred in the actual device. This property shall be set to 0x41 when there is a fault and 0x42 when there is no fault.

9.3.12 Fault description property

The "fault description" property shall be assigned fault description code values as specified in Table 18. A "recoverable fault" as defined in the table is a fault which is currently inhibiting the proper operation of the device or a function of the device but whose cause can be removed by a user action. A "fault that requires repair" as defined in the table is a fault which is currently inhibiting the proper operation of the device or a function of the device, and whose cause cannot be removed without repair work by a specialist.

The lower-order byte of the fault description code shall indicate the general fault classification and the higher-order byte of the fault description code shall indicate the detailed fault classification. The detailed fault classification for recoverable faults will be determined in the future for each class. In the case where recoverable faults or faults that require repair are to be identified only with the general fault classification without using the detailed fault classification, the higher-order byte of the fault description code shall be set to 0x00.

a) Lower-order byte of the fault description code

The lower-order byte of the fault description code provides an overview of the fault in the form of general fault classification.

The value of the lower-order byte of the fault description code shall be 0x00 when no fault has occurred in the device.

The lower-order byte of the fault description code shall be set to a value between 0x01 and 0x09 when a recoverable fault (i.e. a fault that can be repaired by a user action) occurs in the device, according to the value assignment rules described below. The general fault classification for recoverable faults is based on the type of user action required to recover from the fault. 0x01 indicates that a fault has occurred which can be repaired by restarting the device by turning the power off and on again. 0x02 indicates that a fault has occurred which can be repaired by restarting the device and resetting it. 0x03 indicates that a fault has occurred which can be repaired by changing the way the device is mounted or by opening/closing a lid or door. 0x04 indicates that a fault has occurred which can be repaired by supplying fuel, water, air, etc. 0x05 indicates that a fault has occurred which can be repaired by cleaning the device. 0x06 indicates that a fault has occurred which can be repaired by changing the battery or cell. 0x09 can be freely defined by the user. 0x07 and 0x08 are reserved for future revisions to add other types of recoverable faults.

The lower-order byte of the fault description code shall be set to a value between 0x0A and 0x6E, when a fault that requires repair occurs in the device, according to the value assignment rules described below. The general fault classification for faults that require repair is based on the location of the fault. 0x0A to 0x13 indicate that a safety device has tripped. Values between 0x14 to 0x1D indicate that a fault has occurred in the user interface. 0x1E to 0x3B indicate that a fault has occurred in the sensor system. 0x3C to 0x59 indicate that a fault has occurred in an actuator, etc. 0x5A to 0x6E indicate that a fault has occurred in a control circuit board.

b) Higher-order byte of the fault description code

The higher-order byte of the fault description code provides detailed information on the fault in the form of detailed fault classification for each general fault classification category.

When the value of the lower-order byte of the fault description code is 0x00 (no fault), the value of the higher-order byte of the fault description code shall be 0x00. 0x04 to 0xFF are reserved for future use.

When the value of the lower-order byte of the fault description code is a value between 0x01 and 0x06, the higher-order byte of the fault description code can take the value 0x00 or a value between 0x04 and 0xFF. The higher-order byte of the fault description code shall be set to 0x00 in the case where faults are to be identified only with the general fault classification without using the detailed fault classification. 0x04 to 0xFF are reserved for a future class-specific detailed fault classification.

When the value of the lower-order byte of the fault description code is 0x07 or 0x08, the higher-order byte of the fault description code can take the value 0x00 or a value between 0x04 and 0xFF. All of these values are reserved for future use.

When the value of the lower-order byte of the fault description code is 0x09, the higher-order byte of the fault description code can take the value 0x00 or a value between 0x04 and 0xFF. All of these values can be freely defined by the user.

When the value of the lower-order byte of the fault description code is a value between 0x0A and 0x6E, the higher-order byte of the fault description code can take the value 0x00 or a value between 0x04 and 0xFF. The higher-order byte of the fault description code shall be set at 0x00 in the case where faults are to be identified only with the general fault classification without using the detailed fault classification. The values 0x04 to 0xFF can be freely defined by the user.

The values between 0x006F and 0x03E8, which are values for combinations of higher- and lower-order bytes of the fault description code, are values that can be freely defined by the user for faults that require repair.

The value 0x03FF, which is a value for combinations of higher- and lower-order bytes of the fault description code, indicates that a fault has occurred but the recovery method or fault location cannot be determined.

The values between 0x03E9 and 0x03FE, which are values for combinations of higher- and lower-order bytes of the fault description code, are reserved for future use.

Table 18 – Fault-content property value assignments

		Fault description code	
General fault classification		Fault description code Lower-order byte	Fault description code Higher-order byte
No fault		0x00	0x00: No fault. 0x04 to 0xFF: reserved for future use.
Recoverable faults	Faults that can be repaired by turning off the power switch and turning it on again or withdrawing and re-inserting the power plug.	0x01	0x00: Faults are to be identified only by the general fault classification without using the detailed fault classification. 0x04 to 0xFF: reserved for future use
	Faults that can be repaired by pressing the reset button.	0x02	
	Faults that can be repaired by changing the way the device is mounted or by opening/closing a lid or door.	0x03	
	Faults that can be repaired by supplying fuel, water, air, etc.	0x04	
	Faults that can be repaired by cleaning the device (filter etc.)	0x05	
	Faults that can be repaired by changing the battery or cell.	0x06	
	Reserved for future use	0x07 to 0x08	
	User-definable domain	0x09	
Faults that require repair	Abnormal event or the tripping of a safety device	0x0a to 0x13	0x00: Faults are to be identified only with the general fault classification without using the detailed fault classification. 0x04 to 0xFF: user-definable
	Fault in a switch	0x14 to 0x1D	
	Fault in the sensor system	0x1E to 0x3B	
	Fault in a component such as an actuator	0x3C to 0x59	
	Fault in a control circuit board	0x5A to 0x6E	
	User-definable domain	0x006F to 0x03E8	
A fault has occurred but the recovery method or fault location cannot be determined.		0x03FF	
Reserved for future use.		0x03E9 to 0x03FE, 0x**6F to 0x**FF (**: 04 to FF)	

9.3.13 Manufacturer code property

The "manufacturer code" property identifies the manufacturer using a 3-byte code. Each ECHONET Consortium member is assigned a unique "manufacturer code" property value by the Consortium.

Also, 0xFFFFFFFF shall be defined as for experimental use, while 0xFFFFFE is to be undefined.

9.3.14 Business facility code property

The "business facility code" property identifies the relevant business facility of the manufacturer using a 3-byte code. "Business facility code" property values are defined by each manufacturer.

9.3.15 Product code property

The "product code" property identifies the relevant product of the manufacturer using a 12-byte ASCII code. "Product code" property values are defined by each manufacturer. When the "product code" property value is less than 12 bytes, the product code shall be left-justified in the data area and the remainder of the data area shall be padded with NULLs or spaces.

9.3.16 Production number property

The "production number" property indicates the production number of the relevant product of the manufacturer using a 12-byte ASCII code. "Production number" property values are defined by each manufacturer. When the "production number" property value is less than 12 bytes, the production number shall be left-justified in the data area and the remainder of the data area shall be padded with NULLs or spaces.

9.3.17 Production date property

The "production date" property indicates the production date of the relevant product of the manufacturer using a 4-byte code. Two of the 4 bytes are used to indicate the year of production. The remaining 2 bytes are used to indicate the month of production and the day of production, with one byte used for each.

9.3.18 Power-saving operation setting property

The "power-saving operation setting" property contains the status as to whether the device associated with the object in question is operating in power-saving mode. When the value contained is 0x41, the device operates in power-saving mode. When the value contained is 0x42, the device operates in normal operation mode (non-power-saving mode).

9.3.19 Remote control setting property

This property indicates with one byte whether the control is through a public network or not or whether the controls through a public network are possible or not in the situation that the communication line under observation is normal. The value shall be 0x41 for control not through a public network and 0x42 for control through a public network. The value shall be 0x61 for a status where the communication line is normal (operation through a public network is not possible) and 0x62 for a status where the communication line is normal (operation through a public network is possible).

For control through a public network, several properties including this property are stored in one message and the message is sent as a control request. When the message is sent, this property shall always be attached to the first property (EDT = 0x42: control through a public network).

A control request message refers to a property value write request (no response required), property value write request (response required), or a property value write and read request.

For example, when an air conditioner is set to cooling mode by operation control through a public network, this property shall be set to the first property and sent by a single control request message in order of the "Remote control setting" property and the "Operation mode setting" property.

When a control request message is sent where the property value of this property is 0x42, the minimum value of the processing target property counter (OPC) shall be 2.

For control not through a public network, this property is not given but a control request message shall be sent. For example, when an air conditioner is set to cooling mode not through a public network, only the "Operation mode setting" property shall be sent as a control request message without this property.

When the property status is control through a public network (EDT = 0x42) but there is control from a dedicated controller, direct control from the main unit, or control not through a public network, change the status to control not through a public network (EDT = 0x41) on devices equipped with this property.

This property also may be used for comprehending on the device side whether the status of the communication line between the control server or the controller that controls the device and the device itself is normal or not. Controllers that do not have a device operation function through a public network need to comprehend the status of the home communication line between the controller and the device (see Figure 48).

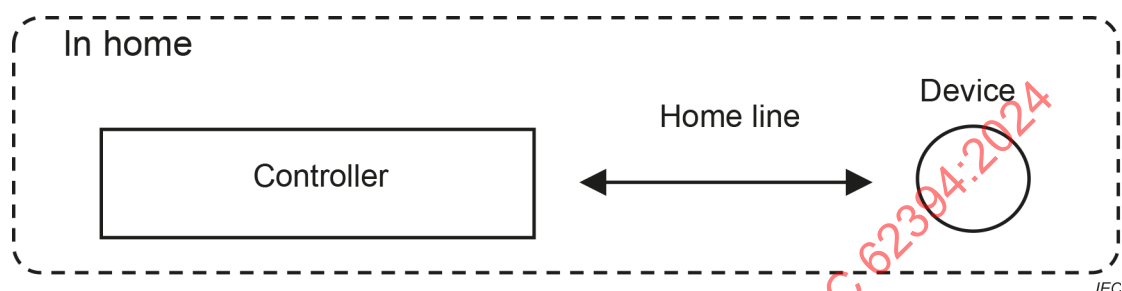


Figure 48 – Configuration without "control server"

Controllers that do not have a device operation function through a public network need to comprehend the status of the home communication line between the controller and the device and the status of the public network between the controller and control server (see Figure 49).

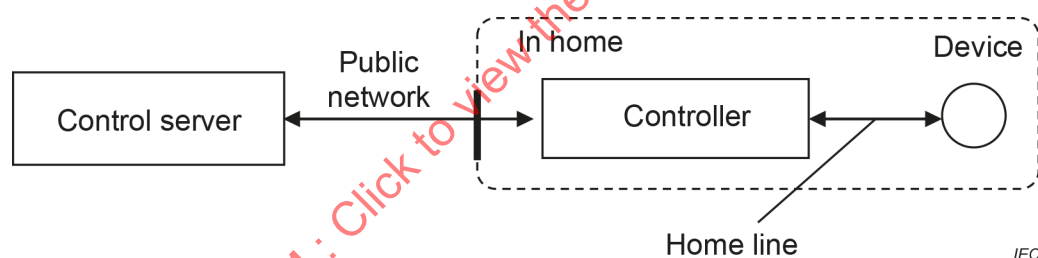


Figure 49 – Configuration with "control server"

If making the device comprehend the status of communication line, the controller that controls the device always should send a control request message for only this property (in other words, OPC = 1) at fixed periods to the device that is being controlled. And the control request message including this property should be received by the device, so that it can comprehend that the line is normal. For the transmission cycle, approximately 2 h is recommended. When an extremely short transmission cycle is set, there can be cases where other transmissions are blocked or where the burden on the device becomes large. If it is too long, on the other hand, there can be cases where the device is unable to accurately confirm interruption. In view of such conditions, it is necessary to set an appropriate value for the transmission cycle. For transmission, the property value 0x61 is used for configuration without the control server, and 0x62 is used for configuration with the control server. The controller in configuration with the control server should suspend transmission of the control request message while it is recognized that the public network is interrupted.

Based on the above, a device that receives a control request for this property is able to recognize whether the control is through a public network or not (0x41/42), or the status of the communication line (0x61/62).

In addition, the device can also recognize that the communication line is interrupted if receiving of a control request for this property where the property value is 0x61 or 0x62 has been interrupted for more than a certain period. Devices that receive a control request for this property shall not update their own property values with the received values if the property value is 0x61 or 0x62.

If it is guaranteed that the device will not become unstable even in cases where the communication line has been interrupted, the device does not have to process the control request in cases where the property value of this property is 0x61 or 0x62 (cases of comprehension of the status of the communication line), but rather by simply sending a response to the transmission source.

Judgments as to whether the status of the communication line is normal or abnormal are dependent on implementation on the device side.

9.3.20 Current time setting property

This property indicates the current local time using a value between 0x00 and 0x17 (0 and 23) for the hours and a value between 0x00 and 0x3B (0 and 59) for the minutes.

The first byte of the property value indicates hours, and the second byte indicates minutes.

9.3.21 Current date setting property

This property indicates the current date using a value between 0x0001 and 0x270F (1 and 9999) for the year, a value between 0x01 and 0x0C (1 and 12) for the month and a value between 0x01 and 0x1F (1 and 31) for the day.

The first and second bytes are treated as one piece of unsigned short data which indicates the year (2 bytes). The third byte indicates the month (1 byte) and the fourth byte indicates the day (1 byte).

9.3.22 Power limit setting property

This property contains the setting for the maximum consumable power (i.e. power limit setting). The value range for this property shall be from 0 to 65 535 (from 0x0000 to 0xFFFF), and the unit is the watt. In the case where it is not possible to limit the power consumption using the value specified by this property, the power consumption shall be limited using a value that is closest to and lower than the value specified by this property. A read value shall be one set in the equipment.

9.3.23 Cumulative operating time property

The "cumulative operating time" property indicates the cumulative operating time.

The first byte indicates the unit for the cumulative operating time. The values that can be used for the first byte are 0x41 (seconds), 0x42 (minutes), 0x43 (hours) and 0x44 (days).

The second to fifth bytes are treated as one piece of unsigned long data which indicates the cumulative operating time in the unit specified by the first byte. The value range for the cumulative operating time (second to fifth bytes) shall be from 0x00000000 to 0xFFFFFFFF (from 0 to 4 294 967 294). 0xFFFFFFFF shall be used as the overflow code.

The operating states that are to be counted in when counting up the operating periods and the conditions for starting and stopping the counting shall be device-dependent and no requirement is specified for these.

9.3.24 Property map property

The device object super class defines 3 "property maps", which provide information on the services that can be provided by the individual properties published by objects.

Of these, "Set property map" and "Get property map" provide information as to what access rules the individual properties published by the implemented objects support in terms of individual product specifications.

"Status change announcement property map" lists the properties that have been so set that a broadcast is performed upon a property value change.

The formats of these maps are as shown in Clause 10. When there is no property to list in a map, the number of properties shall be set to "0" and the second and succeeding bytes shall be left blank.

The definitions of the individual property maps are as follows:

a) Set property map

This is the property map that lists the properties which support the "Set" access rule. For array properties for which batch writing shall be permitted, the EPC values shall be registered on the Set property map.

b) Get property map

This is the property map that lists the properties which support the "Get" access rule. For array properties for which batch reading shall be permitted, the EPC values shall be registered on the Get property map.

c) SetM property map

This is the property map that lists the properties which support the "SetM" access rule. For array properties for which batch writing shall be permitted, the EPC values shall be registered on the SetM property map. Devices which install only "control protocol 2nd" shown in Clause 8 cannot implement the SetM property map because it is not possible to define array properties.

d) GetM property map

This is the property map that lists the properties which support the "GetM" access rule. For array properties for which batch reading shall be permitted, the EPC values shall be registered on the GetM property map. Devices which install only "Control protocol 2nd" shown in Clause 8 cannot implement the SetM property map, because it is not possible to define array properties.

e) Status change announcement property map

This is the property map that lists the properties that have been so set that an intra-domain broadcast is performed upon a property value change. These properties include properties supported in individual product specifications which are specified as properties requiring broadcasting in the "announcement at status change" column of the requirements for properties of individual objects, as well as properties that support "announcement at status change" as part of the product specifications.

A property that is published in a property map as a property capable of supporting the access rule associated with the map shall support that access rule. For properties that are not published in a property map as properties capable of supporting the access rule associated with the map, whether to support that access rule shall be device implementation-dependent.

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	—	Set		○	
		ON = 0x30, OFF = 0x31				Get	○		
Measured value of relative humidity	0xE0	Indicates measured value of relative humidity in %.	unsigned char	1 byte	%	Get	○		
		0x00 to 0x64 (0 % to 100 %)							

9.5.2 Operation status property

This property indicates whether the function native to this class is operating or not (ON/OFF). In the node mounting this class, if the function of this class is started concurrently with the start of node operation, this property may be implemented at a fixed value of 0x30 (operation status ON).

9.5.3 Measured value of relative humidity property

This property indicates the measured value of relative humidity in %. The property value range shall be 0x00 to 0x64 (0 % to 100 %). When the property value of the actual device exceeds this property value range, the overflow code 0xFF shall be used. When said value falls below the property value range, the underflow code 0xFE shall be used.

9.6 Illuminance sensor class specifications

9.6.1 General

The control commands of "illuminance sensor" are shown in Table 21.

Class group code : 0x00

Class code : 0x0D

Table 21 – List of illuminance sensor properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned short	1 byte	–	Set		○	
		ON = 0x30, OFF = 0x31				Get	○		
Measured illuminance value 1	0xE0	Indicates measured illuminance value in lux.	unsigned short	2 bytes	lx	Get	○ ^a		
		0x0000 to 0xFFFD (0 lx to 65 533 lx)							
Measured illuminance value 2	0xE1	Indicates measured illuminance value in kilolux.	unsigned short	2 bytes	klx	Get	○ ^a		
		0x0000 to 0xFFFD (0 klx to 65 533 klx)							

^a Implementation of "measured illuminance value 1 of EPC 0xE0" or "measured illuminance value 2 of EPC 0xE1" shall be mandatory.

9.6.2 Operation status property

This property indicates whether the function native to this class is operating or not (ON/OFF). In the node mounting this class, if the function of this class is started concurrently with the start of node operation, this property may be implemented at a fixed value of 0x30 (operation status ON).

9.6.3 Measured illuminance value 1 property

This property indicates the measured illuminance value in lux. The property value range shall be 0x0000 to FFFD (0 lx to 65 533 lx). When the property value of the actual device exceeds this property value range, the overflow code 0xFFFF shall be used. When said value falls below the property value range, the underflow code 0xFFFE shall be used.

9.6.4 Measured illuminance value 2 property

This property indicates the measured illuminance value in kilolux. The property value range shall be 0x0000 to FFFD (0 klx to 65 533 klx). When the property value of the actual device exceeds this property value range, the overflow code 0xFFFF shall be used. When said value falls below the property value range, the underflow code 0xFFFE shall be used.

9.7 Human detection sensor class specifications

9.7.1 General

The control commands of "human detection sensor" are shown in Table 22.

Class group code : 0x00

Class code : 0x07

Table 22 – List of human detection sensor properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status	unsigned char	1 byte	–	Set		○	
		ON = 0x30, OFF = 0x31				Get	○		
Detection threshold level	0xB0	Specifies detection threshold level (8-step).	unsigned char	1 byte	–	Set/Get			
		0x31 to 0x38							
Human detection status	0xB1	Indicates human detection status.	unsigned char	1 byte	–	Get	○	○	
		Human detection status found = 0x41 Human detection status not found = 0x42							

9.7.2 Operation status property

This property indicates whether the function native to this class is operating or not (ON/OFF). In the node mounting this class, if the function of this class is started concurrently with the start of node operation, this property may be implemented at a fixed value of 0x30 (operation status ON).

9.7.3 Detection threshold level property

Sets the threshold value that causes EPC = 0xB1 "human detection status" to be set to "found" (8-step). The minimum value is 0x31 and the maximum value is 0x38. No concrete value is specified for each level. If the detection threshold of the actual device is higher or lower than the 8-step range, the property of the actual device shall be assigned to the property value of the 8 steps specified in this property.

9.7.4 Human detection status property

This property indicates whether a human detection status is found or not. When EPC = 0xB0 "detection threshold level" is implemented, this property is set to "human detection status found" if the threshold set by the detection threshold level is exceeded, and is set to "human detection status not found" if the detection threshold value is not reached.

9.8 Electric energy sensor class specifications

9.8.1 General

The Control commands of "electric energy sensor" are shown in Table 23.

Class group code : 0x00

Class code : 0x22

Table 23 – List of electric energy sensor properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	–	Set	☐		
		ON = 0x30, OFF = 0x31				Get			
Cumulative amounts of electric energy	0xE0	Indicates cumulative amounts of electric energy in 0,001 kWh.	unsigned long	4 bytes	0,001 kWh	Get	☐		
		0x00000000 to 0x3B9AC9FF (0 kWh to 999 999,999 kWh)							
Medium-capacity sensor instantaneous electric power	0xE1	Indicates measured instantaneous electric power in watts.	signed long	4 bytes	W	Get			
		0xC4653601 to 0x3B9AC9FF (-999 999,999 to 999 999,999)							
Small-capacity sensor instantaneous electric power	0xE2	Indicates instantaneous electric power in increments of 0,1 W.	signed short	2 bytes	0,1 W	Get			
		0x8001 to 0x7FFE (-3 276,7 to 3 276,6)							
Large-capacity sensor instantaneous electric power	0xE3	Indicates instantaneous electric power in increments of 0,1 kW.	signed short	2 bytes	0,1 kW	Get			
		0x8001 to 0x7FFE (-3 276,7 to 3 276,6)							
Cumulative amounts of electric energy measurement log	0xE4	Indicates measurement result log of cumulative amounts of electric energy (0,001 kWh) for the past 24 h in 30-min sections.	unsigned long x 48	192 bytes	0,001 kWh	Get			
		0 to 0x3B9AC9F (0 kWh to 999 999,999 kWh)							
Effective voltage value	0xE5	Indicates effective voltage value in V.	unsigned short	2 bytes	V	Get			
		0x0000 to 0xFFFFD (0 V to 65 533 V)							

9.8.2 Operation status property

This property indicates whether the function native to this class is operating or not (ON/OFF). In the node mounting this class, if the function of this class is started concurrently with the start of node operation, this property may be implemented at a fixed value of 0x30 (operation status ON).

9.8.3 Cumulative amounts of electric energy property

This property indicates the cumulative amounts of electric energy in 0,001 kWh. The property value range shall be from 0x00000000 to 0x3B9AC9FF (0 kWh to 999 999,999 kWh). When the cumulative amounts of electric energy overflows, this value shall be incremented from 0x00000000.

9.8.4 Small-capacity sensor instantaneous electric power property

This property indicates the measured value of small-capacity sensor instantaneous electric power in increments of 0,1 W. The property value range shall be from 0x8001 to 0x7FFD (–3 276,7 W to 3 276,6 W). When the property value of the actual device exceeds this property value range, the overflow code 0x7FFF shall be used. When said value falls below the property value range, the underflow code 0x8000 shall be used.

9.8.5 Medium-capacity sensor instantaneous electric power property

This property indicates the measured instantaneous electric power of the medium-capacity sensor in W. The value range of the property shall be from 0xC4653601 to 0x3B9AC9FF (–999 999,999 W to 999 999,999 W). If the property value of the actual device is above or below the value range, 0x7FFFFFFF (overflow code) or 0x80000000 (underflow code) shall be used, respectively.

9.8.6 Large-capacity sensor instantaneous electric power property

This property indicates the measured value of large-capacity sensor instantaneous electric power in increments of 0,1 kW. The property value range shall be from 0x8001 to 0x7FFD (–3 276,7 kW to 3 276,6 kW). When the property value of the actual device exceeds this property value range, the overflow code 0x7FFF shall be used. When said value falls below the property value range, the underflow code 0x8000 shall be used.

9.8.7 Cumulative amounts of electric energy measurement log property

This property indicates the cumulative amounts of electric energy (0,001 kWh) measurement result log for the past 24 h in 30-min sections. The measured value in 0,001 kWh at each 0 min and 30 min based on the time set in the property name "Current time setting" (EPC = 0x97) shall be indicated in the range from 0x00000000 to 0x3B9AC9FF (0 kWh to 999 999,999 kWh). The property value shall begin with the high-order byte in time series. However, for the hours and half hours at which the amount of electric energy was not measured, 0xFFFFFFFF shall be used as the historical data value.

9.8.8 Effective voltage value property

This property indicates the measured value of effective voltage of the electric energy sensor in V. This property may be implemented as a fixed value of the rated voltage of measurement.

9.9 Open/close sensor class specifications

9.9.1 General

The control commands of "open/close sensor" are shown in Table 24.

Class group code : 0x00

Class code : 0x29

Table 24 – List of open/close sensor properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	—	Set		○	
		ON = 0x30, OFF = 0x31				Get	○		
Degree-of-opening detection status 1	0xE0	Specifies open/close detection status and one of 8 different degrees of opening.	unsigned char	1 byte	—	Get	○ ^a		
		Close detected: 0x30; Degree-of-opening level: 0x31 to 0x38; Open detected but degree-of-opening unknown: 0x39							
Detection threshold level	0xB0	Specifies detection threshold level (8-step).	unsigned char	1 byte	—	Set/Get			
		Detection threshold level 0x31 to 0x38							
Degree-of-opening detection status 2	0xB1	Specifies whether degree-of-opening detected or not	unsigned char	1 byte	—	Get	○	○ ^a	
		Open detected = 0x41, Close detected = 0x42							

^a Either the "degree-of-opening detection status 1" (EPC = 0xE0) or "degree-of-opening detection status 2" (EPC = 0xB1) property shall be implemented.

9.9.2 Operation status property

This property indicates whether the function native to this class is operating or not (ON/OFF). In the node mounting this class, if the function of this class is started concurrently with the start of node operation, this property may be implemented at a fixed value of 0x30 (operation status ON).

9.9.3 Degree-of-opening detection status 1 property

This property indicates whether a door or window is open or closed and uses 8 different steps to indicate the degree of opening.

The property value 0x30 indicates that a door or window is closed. If the property value is between 0x31 and 0x38, it indicates that the detection target is open. The property value 0x31 indicates the minimum degree of opening, whereas the property value 0x38 indicates the maximum degree of opening. Here, the terms "closed", "open", and "degree of opening" represent various states detected by an open/close sensor mounted on a door or window. Degrees of opening represented by the values 0x31 to 0x38 should be defined by dividing the difference between the closed state (0x30) and fully open state (0x38) into equal portions.

9.9.4 Detection threshold level property

Sets 8 steps of threshold values at which "open/close detection status 2" (EPC = 0xB1) changes to "open/close detected". The minimum value is 0x31 and the maximum value is 0x38. No concrete value is specified for each level. If the detection threshold of the actual device is higher or lower than the 8-step range, the property of the actual device shall be assigned to the property value of the 8 steps specified in this property.

9.9.5 Degree-of-opening detection status 2 property

This property specifies detecting of open/close status. In implementing EPC = 0xB0 "detection threshold level", when the detection level becomes higher than or equal to a threshold value set by the detection threshold level, the degree-of opening detection changes into "degree-of-opening detection detected" = 0x41. When the detection level becomes lower than the threshold value set by the detection threshold level, the degree-of opening detection changes into "degree-of-opening detection not detected" = 0x42.

9.10 Current sensor class specifications

9.10.1 General

The control commands of "current sensor" are shown in Table 25.

Class group code : 0x00

Class code : 0x23

Table 25 – List of current sensor properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	–	Set		○	
		ON = 0x30, OFF = 0x31				Get	○		
Measured current value 1	0xE0	Indicates measured current value in mA.	unsigned long	4 bytes	mA	Get	○ ^a		
		0x00000000 to 0xFFFFFFF (0 mA to 4 294 967 293 mA)							
Rated voltage to be measured	0xE1	Rated voltage value to be measured by current sensor	unsigned short	2 bytes	V	Get			
		0x0000 to 0xFFFF (0 V to 65 533 V)							
Measured current value 2	0xE2	Indicates measured current value in mA.	signed long	4 bytes	mA	Get	○ ^a		
		0x80000001 to 0x7FFFFFFE (–2 147 483 646 mA to 2 147 483 646 mA)							

^a Either "Measured current value 1 of EPC 0xE0" or "Measured current value 2 of 0xE2" shall be mandatory.

9.10.2 Operation status property

This property indicates whether the function native to this class is operating or not (ON/OFF). In the node mounting this class, if the function of this class is started concurrently with the start of node operation, this property may be implemented at a fixed value of 0x30 (operation status ON).

9.10.3 Measured current value 1 property

This property indicates the measured current value in milliamperes. When an alternating current is measured, its effective value shall be indicated. The property value range shall be from 0x00000000 to 0xFFFFFFFF (0 mA to 4 294 967 293 mA). When the property value of the actual device exceeds this property value range, the overflow code 0xFFFFFFFF shall be used. When said value is below the property value range, the underflow code 0xFFFFFFFEE shall be used.

9.10.4 Rated voltage property to be measured property

This property indicates the rated voltage value to be measured by the current sensor in volts. This property may be implemented as a fixed value.

9.10.5 Measured current value 2 property

This property indicates the measured current value in milliamperes. When an alternating current is measured, its effective value shall be indicated. The property value range shall be from 0x80000001 to 0x7FFFFFFE (–2 147 483 647 mA to 2 147 483 646 mA). When the property value of the actual device exceeds this property value range, the overflow code 0x7FFFFFFF shall be used. When said value is below the property value range, the underflow code 0x80000000 shall be used. The current direction shall be the positive direction from power supply to device.

9.11 Air speed sensor class specifications

9.11.1 General

The control commands of "air speed sensor" are shown in Table 26.

Class group code : 0x00

Class code : 0x1F

Table 26 – List of air speed sensor properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	–	Set		○	
		ON = 0x30, OFF = 0x31				Get	○		
Measured value of air speed	0xE0	Indicates the measured value of air speed in increments of 0,01 m/s.	unsigned short	2 bytes	0,01 m/s	Get	○		
		0x0000 to 0xFFFFD (0 m/s to 655,33 m/s)							
Air flow direction	0xE1	Indicates the air flow direction in degrees (angles).	unsigned short	2 bytes	degree	Get			
		0x0000 to 0x0168 (0° to 360°)							

9.11.2 Operation status property

This property indicates whether the function native to this class is operating or not (ON/OFF). In the node mounting this class, if the function of this class is started concurrently with the start of node operation, this property may be implemented at a fixed value of 0x30 (operation status ON).

9.11.3 Measured value of air speed property

This property indicates the measured value of air speed in increments of 0,01 m/s. The property value range shall be from 0x0000 to 0xFFFFD (0 m/s to 655,33 m/s). When the property value of the actual device exceeds this property value range, the overflow code 0xFFFF shall be used. When said value falls below the property value range, the underflow code 0xFFFE shall be used.

9.11.4 Air flow direction property

This property indicates the air flow direction in increments of degrees. The property value range shall be from 0x0000 to 0x0168 (0° to 360°). The north direction should be 0° (360°) as a rule.

9.12 Water flow rate sensor class specifications

9.12.1 General

The control commands of "water flow rate sensor" are shown in Table 27. This class is provided for a water tap or the like and is stipulated for the purpose of measuring the amount of water used.

Class group code : 0x00

Class code : 0x25

Table 27 – List of water flow rate sensor properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	–	Set		○	
		ON = 0x30, OFF = 0x31				Get	○		
Cumulative flow rate	0xE0	Indicates measured cumulative flow in cubic-centimetres.	unsigned long	4 bytes	cm ³	Get			
		0x00000000 to 0x3B9AC9FF (0 to 999 999 999)							
Flow rate	0xE2	Indicates measured instantaneous flow rate in cm ³ /min.	unsigned long	4 bytes	cm ³ /min	Get	○		
		0x0000 to 0x3B9AC9FF (0 to 999 999 999)							

9.12.2 Operation status property

This property indicates whether the function native to this class is operating or not (ON/OFF). In the node mounting this class, if the function of this class is started concurrently with the start of node operation, this property may be implemented at a fixed value of 0x30 (operation status ON).

9.12.3 Cumulative flow rate property

This property indicates the integral value of the flow rate in cubic centimetres (cm³). The property value range shall be from 0x00000000 to 0x3B9AC9FF (from 0 cm³ to 999 999 999 cm³). If the measured integral flow of the actual device exceeds this property value range, the overflow code 0xFFFFFFFF shall be set.

9.12.4 Flow rate property

This property indicates the flow rate in cubic centimetres per minute (cm³/min). The property value range shall be from 0x00000000 to 0x3B9AC9FF (from 0 cm³/min to 999 999 999 cm³/min). If the measured value of flow rate of the actual device exceeds this property value range, the overflow code 0xFFFFFFFF shall be set.

9.13 Rain sensor class specifications

9.13.1 General

The control commands of "rain sensor" are shown in Table 28.

Class group code : 0x00

Class code : 0x13

Table 28 – List of rain sensor properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	–	Set		○	
		ON = 0x30, OFF = 0x31				Get	○		
Detection threshold level	0xB0	Specifies detection threshold level (8-step).	unsigned char	1 byte	–	Set/Get			
		0x31 to 0x38							
Rain detection status	0xB1	Indicates rain detection status.	unsigned char	1 byte	–	Get	○	○	
		Rain detection status found = 0x41 Rain detection status not found = 0x42							

9.13.2 Operation status property

This property indicates whether the function native to this class is operating or not (ON/OFF). In the node mounting this class, if the function of this class is started concurrently with the start of node operation, this property may be implemented at a fixed value of 0x30 (operation status ON).

9.13.3 Detection threshold level property

This property sets the threshold value that causes EPC = 0xB1 "rain detection status" to be set to "Found" (8-step). The minimum value is 0x31 and the maximum value is 0x38. No concrete value is specified for each level. If the detection threshold of the actual device is higher or lower than the 8-step range, the property of the actual device shall be assigned to the property value of the 8 steps specified in this property.

9.13.4 Rain detection status property

This property indicates whether a rain detection status is found or not. When EPC = 0xB0 "detection threshold level" is implemented, this property is set to "rain detection status found" if the threshold set by the detection threshold level is exceeded and is set to "rain detection status not found" if the detection threshold value is not reached.

9.14.1 General

Class code : 0x30

Table 29 – List of home air conditioner properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	–	Set	○	○	
		ON = 0x30, OFF = 0x31				Get	○		
Power-saving operation setting	0x8F	Indicates whether the device is operating in power-saving mode.	unsigned char	1 byte	–	Set/Get	○	○	
		Operating in power-saving mode = 0x41 Operating in normal operation mode = 0x42							
Operation mode setting	0xB0	Used to specify the operation mode ("automatic", "cooling", "heating", "dehumidification", "air circulation" or "other"), and to acquire the current setting.	unsigned char	1 byte	–	Set/Get	○	○	
		The following values shall be used: Automatic: 0x41 Cooling: 0x42 Heating: 0x43 Dehumidification: 0x44 Air circulation: 0x45 Other: 0x40							
Automatic temperature control setting	0xB1	Used to specify whether or not to use the automatic temperature control function, and to acquire the current setting.	unsigned char	1 byte	–	Set/Get			
		Automatic = 0x41 Non-automatic = 0x42							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Normal/high-speed/silent operation setting	0xB2	Used to specify the type of operation ("normal", "high-speed" or "silent"), and to acquire the current setting.	unsigned char	1 byte	–	Set/Get			
		Normal operation: 0x41 High-speed operation: 0x42 Silent operation: 0x43							
Set temperature value	0xB3	Used to set the temperature and to acquire the current setting.	unsigned char	1 byte	°C	Set/Get	○		
		0x00 to 0x32 (0 °C to 50 °C)							
Set value of relative humidity in dehumidifying mode	0xB4	Used to set the relative humidity for the dehumidification mode and to acquire the current setting.	unsigned char	1 byte	%	Set/Get			
		0x00 to 0x64 (0 % to 100 %)							
Set temperature value in cooling mode	0xB5	Used to set the temperature for the cooling mode and to acquire the current setting.	unsigned char	1 byte	°C	Set/Get			
		0x00 to 0x32 (0 °C to 50 °C)							
Set temperature value in heating mode	0xB6	Used to set the temperature for the heating mode and to acquire the current setting.	unsigned char	1 byte	°C	Set/Get			
		0x00 to 0x32 (0 °C to 50 °C)							
Set temperature value in dehumidifying mode	0xB7	Used to set the temperature for the dehumidification mode and to acquire the current setting.	unsigned char	1 byte	°C	Set/Get			
		0x00 to 0x32 (0 °C to 50 °C)							
Rated power consumption	0xB8	Rated power consumption in each operation mode of cooling/heating/dehumidifying/circulation	unsigned short × 4	8 bytes	W	Get			
		0x0000 to 0xFFFFD (0 W to 65 533 W) Cooling: heating: dehumidifying: circulation							
Measured value of current consumption	0xB9	Measured value of current consumption	unsigned short	2 bytes	0,1 A	Get			
		0x0000 to 0xFFFFD (0 A to 6 553,3 A)							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Automatic control of air flow direction setting	0xA1	Used to specify whether or not to use the automatic air flow direction control function, to specify the plane(s) (vertical and/or horizontal) in which the automatic air flow direction control function shall be used, and to acquire the current setting.	unsigned char	1 byte	–	Set/Get			
		Automatic = 0x41, non-automatic = 0x42, automatic (vertical) = 0x43, automatic (horizontal) = 0x44							
Automatic swing of air flow setting	0xA3	Used to specify whether or not to use the automatic air flow swing function, to specify the plane(s) (vertical and/or horizontal) in which the automatic air flow swing function shall be used, and to acquire the current setting.	unsigned char	1 byte	–	Set/Get			
		Automatic air flow swing function not used = 0x31, used (vertical) = 0x41, used (horizontal) = 0x42, used (vertical and horizontal) = 0x43							
Air flow direction (vertical) setting	0xA4	Used to specify the air flow direction in the vertical plane by selecting a pattern from the 5 predefined patterns, and to acquire the current setting.	unsigned char	1 byte	–	Set/Get			
		Uppermost = 0x41, lowermost = 0x42, central = 0x43, midpoint between uppermost and central = 0x44, midpoint between lowermost and central = 0x45							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Humidifier function setting	0xC1	Used to specify whether or not to use the humidifier function, and to acquire the current setting.	unsigned char	1 byte	–	Set/Get			
		Humidifier function ON = 0x41, humidifier function OFF = 0x42							
Ventilation air flow rate setting	0xC2	Used to specify the ventilation air flow rate by selecting a level from the predefined levels, and to acquire the current setting.	unsigned char	1 byte	–	Set/Get			
		Automatic control of ventilation air flow rate = 0x41, ventilation air flow rate = 0x31 to 0x38							
Degree of humidification setting	0xC4	Used to specify the degree of humidification to achieve by selecting a level from the predefined levels, and to acquire the current setting.	unsigned char	1 byte	–	Set/Get			
		Automatic control of the degree of humidification = 0x41 degree of humidification = 0x31 to 0x38							
Mounted air cleaning method	0xC6	A bitmap indicates mounted method of exercising air cleaning function. Bit 0: Information about electrical dust collection method mounting 0 – Not mounted 1 – Mounted Bit 1: Information about cluster ion method mounting 0 – Not mounted 1 – Mounted	unsigned char	1 byte	–	Get			

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Mounted self-cleaning method	0xCA	A bitmap indicates mounted method for exercising self-cleaning function.	unsigned char	1 byte	–	Get			
		Bit 0: Information about ozone cleaning method mounting 0 – Not mounted 1 – Mounted Bit 1: Information about drying method mounting 0 – Not mounted 1 – Mounted							
Self-cleaning function setting	0xCB	An 8-byte array used to specify, for each type of self-cleaning function, whether or not to use the self-cleaning function and the degree of self-cleaning to achieve with the self-cleaning function, and to acquire the current settings.	unsigned char × 8	1 byte × 8	–	SetM /GetM Set/Get			
		Element 0: Indicates whether or not to use the ozone-based self-cleaning function. Element 1: Indicates whether or not to use the drying-based self-cleaning function. Elements 2 to 7: Reserved for future use.							
Special function setting	0xCC	Used to specify the "special function" to use, and to acquire the current setting.	unsigned char	1 byte	–	Set/Get			
		No setting: 0x40, clothes dryer function: 0x41, condensation suppressor function: 0x42, mite and mould control function: 0x43, active defrosting function: 0x44 0x45 –: Reserved for future use.							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
ON timer setting (time)	0x91	Used to specify the time for the time-based reservation function in the HH:MM format and to acquire the current setting.	unsigned char × 2	2 bytes	–	Set/Get			
		0 to 0x17: 0 to 0x3B (= 0 to 23): (= 0 to 59)							
ON timer setting (relative time)	0x92	Used to specify the relative time for the relative time-based reservation function in the HH:MM format and to acquire the current setting.	unsigned char × 2	2 bytes	–	Set/Get			
		0 to 0xFF: 0 to 0x3B (= 0 to 255): (= 0 to 59)							
OFF timer-based reservation setting	0x94	Used to specify whether or not to use the OFF timer (time-based reservation function, relative time-based reservation function or both), and to acquire the current setting.	unsigned char	1 byte	–	Set/Get			
		Both the time- and relative time-based reservation functions are ON = 0x41, both reservation functions are OFF = 0x42, time-based reservation function is ON = 0x43, relative time-based reservation function is ON = 0x44							
OFF timer setting (time)	0x95	Used to specify the time for the time-based reservation function in the HH:MM format and to acquire the current setting.	unsigned char × 2	2 bytes	–	Set/Get			
		0 to 0x17: 0 to 0x3B (= 0 to 23): (= 0 to 59)							
OFF timer setting (relative time)	0x96	Used to specify the relative time for the relative time-based reservation function in the HH:MM format and to acquire the current setting.	unsigned char × 2	2 bytes	–	Set/Get			
		0 to 0xFF: 0 to 0x3B (= 0 to 255): (= 0 to 59)							

9.14.2 Operation status property

This property is used to specify whether to turn on or off the household air conditioner, and to acquire the current operation status. 0x30 and 0x31 shall be used for the ON and OFF states, respectively. When the property value is 0x31 (OFF), values specified or acquired with other properties are not guaranteed.

9.14.3 Power-saving operation setting property

This property indicates the operation mode of the household air conditioner ("normal mode" (not saving power) or "power-saving mode") and to acquire the current status. 0x41 and 0x42 shall be used for power-saving mode and normal mode (not saving power), respectively. For "Life watching service," "Announcement at status change" is mandatory.

9.14.4 Operation mode setting property

This property is used to specify the operation mode of the household air conditioner ("automatic", "cooling", "heating", "dehumidification", "air circulator" or "other") and to acquire the current setting. "Other" represents an operation mode other than the 5 modes. 0x41, 0x42, 0x43, 0x44, 0x45 and 0x40 shall be used for "automatic", "cooling", "heating", "dehumidification", "air circulation" and "other", respectively. It is only required to implement the property values that correspond to the modes supported by the actual piece of equipment in which this class is implemented. For example, if the piece of equipment in which this class is implemented does not have an air circulator function, it is not necessary to implement the value for the air circulation mode (0x45).

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.5 Automatic temperature control setting property

This property is used to specify whether or not to use an automatic temperature control function of a household air conditioner that allows the air conditioner to operate based on an automatic temperature setting calculation algorithm, etc. implemented in the main body of the air conditioner and without using as the target any "temperature setting" property (EPC = 0xB3, 0xB5, 0xB6 or 0xB7) to acquire the current setting.

0x41 and 0x42 shall be used for the ON and OFF states, respectively.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.6 Normal/high-speed/silent operation setting property

This property is used to specify the type of operation ("normal", "high-speed" or "silent") and to acquire the current setting. 0x41, 0x42 and 0x43 shall be used for "normal", "high-speed" and "silent", respectively. This property can be used in combination with the "operation mode setting" property (EPC = 0xB0) to achieve "high-speed (rapid) cooling", "high-speed (rapid) heating", "high-speed (strong) dehumidification", etc. The 3 types of operation ("normal", "high-speed" and "silent") are mutually exclusive.

9.14.7 Set temperature value property

This property is used to set the temperature (°C) for the current operation mode of the air conditioner that is specified by the "operation mode setting" property, and to acquire the current setting. The value of this property shall be used as the target temperature when the air conditioner does not have an automatic temperature control function or when it has an automatic temperature control function that is disabled (by the "automatic temperature control setting" property). The value to be used when the specified target temperature is indeterminable as a result of enabling the automatic temperature control function shall be 0xFD (temperature indeterminable).

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.8 Set value of relative humidity in dehumidifying mode property

This property is used to set the relative humidity (in %) for the "dehumidification" mode (as specified by the "operation mode setting" property (EPC = 0xB0)), and to acquire the current setting. Implementation of this property allows values to be specified and acquired even when a mode other than the "dehumidification" mode is specified by the "operation mode setting" property (EPC = 0xB0).

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.9 Set temperature value in cooling mode property

This property is used to set the temperature (°C) for the "cooling" mode (as specified by the "operation mode setting" property (EPC = 0xB0)), and to acquire the current setting. Implementation of this property allows values to be specified and referenced even when a mode other than the "cooling" mode is specified by the "operation mode setting" property (EPC = 0xB0).

The value of this property shall be used as the target temperature when the air conditioner does not have an automatic temperature control function or when it has an automatic temperature control function that is disabled (by the "automatic temperature control setting" property).

The content of this property shall match the content of the "temperature setting" property (EPC = 0xB3).

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.10 Set temperature value in heating mode property

This property is used to set the temperature (°C) for the "heating" mode (as specified by the "operation mode setting" property (EPC = 0xB0)), and to acquire the current setting. Implementation of this property allows values to be specified and referenced even when a mode other than the "heating" mode is specified by the "operation mode setting" property (EPC = 0xB0).

The value of this property shall be used as the target temperature when the air conditioner does not have an automatic temperature control function, or when it has an automatic temperature control function that is disabled (by the "automatic temperature control setting" property).

The content of this property shall match the content of the "temperature setting" property (EPC = 0xB3).

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.11 Set temperature value in dehumidifying mode property

This property is used to set the temperature (°C) for the "dehumidification" mode (as specified by the "operation mode setting" property (EPC = 0xB0)), and to acquire the current setting. Implementation of this property allows values to be specified and referenced even when a mode other than the "dehumidification" mode is specified by the "operation mode setting" property (EPC = 0xB0).

The value of this property shall be used as the target temperature when the air conditioner does not have an automatic temperature control function or when it has an automatic temperature control function that is disabled (by the "automatic temperature control setting" property).

The content of this property shall match the content of the "temperature setting" property (EPC = 0xB3).

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.12 Rated power consumption property

This property indicates, in watts, the rated power consumption values (brochure values) for the "cooling", "heating", "dehumidification" and "air circulation" modes. The range of rated power consumption value for each of the 4 modes shall be 0x0000 to 0xFFFFD (0 W to 65 533 W) and the bytes shall be used in such a manner that the four values are indicated in the order stated in the previous sentence. When the actual piece of equipment does not support one or more of the four modes, the underflow code 0xFFFFE shall be used for the unsupported mode(s).

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.13 Measured value of current consumption property

This property indicates the present measured electric current consumption of the air conditioner in 0,1 A increments. When the measured electric current is alternating current, the effective value shall be indicated. The property value range shall be 0x0000 to 0xFFFFD (0 A to 6 553,3 A). When the property value of the actual piece of equipment is higher than the upper limit of the property value range, the overflow code 0xFFFF shall be used. When the property value is lower than the lower limit of the property value range, the underflow code 0xFFFFE shall be used.

9.14.14 Measured value of room relative humidity property

This property indicates the measured indoor relative humidity in percent (%). The property value range shall be 0x00 to 0x64 (0 % to 100 %). When the property value of the actual piece of equipment is higher than the upper limit of the property value range, the overflow code 0xFF shall be used. When the property value is lower than the lower limit of the property value range, the underflow code 0xFE shall be used. When the measurement value cannot be returned, 0xFD shall be used.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.15 Measured value of room temperature property

This property indicates the measured room temperature (°C). The property value range shall be 0x81 to 0x7D (–127 °C to 125 °C). When the property value of the actual piece of equipment is higher than the upper limit of the property value range, the overflow code 0x7F shall be used. When the property value is lower than the lower limit of the property value range, the underflow code 0x80 shall be used. When the measurement value cannot be returned, 0x7E shall be used.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.16 Set temperature value of user remote control property

This property indicates the last temperature (°C) set by the user using a remote controller unit for the household air conditioner. This property is mainly used for reference purposes after changing the temperature setting for the household air conditioner by means of a controller, etc.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.17 Measured cooled air temperature property

This property indicates the measured cooled air temperature (°C) at the outlet. The property value range shall be 0x81 to 0x7D (–127 °C to 125 °C). When the property value of the actual piece of equipment is higher than the upper limit of the property value range, the overflow code 0x7F shall be used. When the property value is lower than the lower limit of the property value range, the underflow code 0x80 shall be used. When the measurement value cannot be returned, 0x7E shall be used.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.18 Measured outdoor air temperature property

This property indicates the measured air temperature (°C) (outdoor atmospheric temperature) where the outdoor unit is installed. The property value range shall be 0x81 to 0x7D (–127 °C to 125 °C). When the property value of the actual piece of equipment is higher than the upper limit of the property value range, the overflow code 0x7F shall be used. When the property value is lower than the lower limit of the property value range, the underflow code 0x80 shall be used. When the measurement value cannot be returned, 0x7E shall be used.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.19 Relative temperature setting property

This property is used to specify, in 0,1 °C increments, the relative temperature relative to the target temperature (i.e. the temperature differential above or below the target temperature the user wishes to achieve) for an operation mode of the household air conditioner and to acquire the current setting. It is also possible to use this property to specify a relative temperature for an operation mode that does not use an absolute value of temperature as the target such as the "automatic" mode. The property value range shall be 0x81 to 0x7D (–12,7 °C to 12,5 °C). 0xF6 shall be used for a differential of 1,0 °C below the target temperature and 0x0A shall be used for a differential of 1,0 °C above the target temperature.

When the property value of the actual piece of equipment is higher than the upper limit of the property value range, the overflow code 0x7F shall be used. When the property value is lower than the lower limit of the property value range, the underflow code 0x80 shall be used. When the setting cannot be returned, 0x7E shall be used.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.20 Air flow rate setting property

This property is used to specify the air flow rate or to specify using the function to automatically control the air flow rate, and to acquire the current setting. The air flow rate shall be selected from the 8 levels predefined in the 0x31 to 0x38 range. When the automatic air flow rate control function is used, the property value shall be 0x41. The air flow rate values for the 8 levels may be defined freely, as long as 0x31 and 0x38 are used for the minimum and maximum air flow rates, respectively.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.21 Automatic control of air flow direction setting property

This property is used to specify whether or not to use the automatic air flow direction control function, to specify the plane(s) (vertical and/or horizontal) in which the automatic air flow direction control function shall be used, and to acquire the current setting.

Automatic (vertical and horizontal) = 0x41, non-automatic = 0x42, automatic (vertical) = 0x43, automatic (horizontal) = 0x44.

It is only required to implement the property values that correspond to the functions provided by the actual piece of equipment in which this class is implemented.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.22 Automatic swing of air flow setting property

This property is used to specify whether or not to use the automatic air flow swing function, to specify the plane(s) (vertical and/or horizontal) in which the automatic air flow swing function shall be used, and to acquire the current setting.

Automatic air flow swing function not used = 0x31, used (vertical) = 0x41, used (horizontal) = 0x42, used (vertical and horizontal) = 0x43.

It is only required to implement the property values that correspond to the functions provided by the actual piece of equipment in which this class is implemented.

9.14.23 Air flow direction (vertical) setting property

This property is used to specify the air flow direction in the vertical plane by selecting a pattern from the 5 predefined patterns and to acquire the current setting. The air flow direction (vertical) is shown in Figure 50.

Uppermost = 0x41, lowermost = 0x42, central = 0x43, midpoint between uppermost and central = 0x44, midpoint between lowermost and central = 0x45.

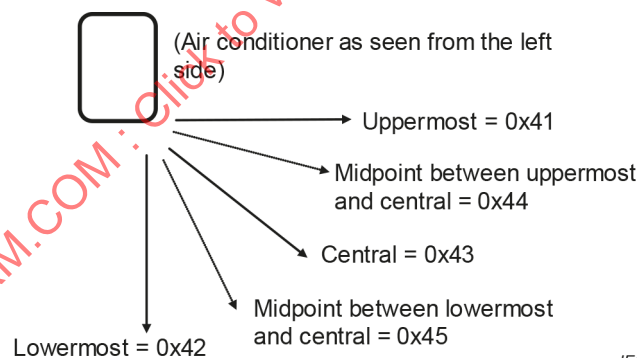


Figure 50 – Air flow direction (vertical) setting

It is only required to implement the property values that correspond to the directions supported by the actual piece of equipment in which this class is implemented. Applicability of this property to the automatic air flow swing function shall be equipment-dependent.

9.14.24 Air flow direction (horizontal) setting property

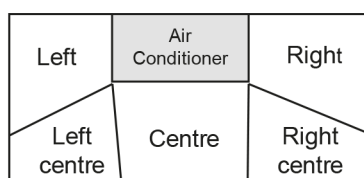
This property is used to specify the air flow direction(s) in the horizontal plane by selecting a pattern (i.e. "left", "midpoint between left and central", "central", "midpoint between right and central" or "right" or a combination of two or more of the 5 directions, see Table 30, and to acquire the current setting. It is only required to implement the property values that correspond to the directions supported by the actual piece of equipment in which this class is implemented. Applicability of this property to the automatic air flow swing function shall be equipment-dependent. The air flow direction (horizontal) is shown in Figure 51.

Table 30 – Air flow direction (horizontal) setting

Code	Left	Left centre	Centre	Right centre	Right	Remarks	Code	Left	Left centre	Centre	Right centre	Right	Remarks
0x41	x	x	x	o	o	Earlier version "right"							
42	o	o	x	x	x	Earlier version "left"							
43	x	o	o	o	x	Earlier version "centre"							
44	o	o	x	o	o	Earlier version "left-right"	0x60	o	x	x	x	x	
51	x	x	x	x	o		61	o	x	x	x	o	
52	x	x	x	o	x		62	o	x	x	o	x	
0x53: Not used (because of 0x41 = earlier version "right")							63	o	x	x	o	o	
54	x	x	o	x	x		64	o	x	o	x	x	
55	x	x	o	x	o		65	o	x	o	x	o	
56	x	x	o	o	x		66	o	x	o	o	x	
57	x	x	o	o	o		67	o	x	o	o	o	
58	x	o	x	x	x		0x68: Not used (because of 0x42 = earlier version "left")						
59	x	o	x	x	o		69	o	o	x	x	o	
5A	x	o	x	o	x		6A	o	o	x	o	x	
5B	x	o	x	o	o		0x6B: Not used (because of 0x44 = earlier version "left-right")						
5C	x	o	o	x	x		6C	o	o	o	x	x	
5D	x	o	o	x	o		6D	o	o	o	x	o	
0x5E: Not used (because of 0x43 = earlier version "centre")							6E	o	o	o	o	x	
5F	x	o	o	o	o		6F	o	o	o	o	o	

(Top view)

The five directions are as indicated on the right.



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Figure 51 – Air flow direction (horizontal) setting**9.14.25 Special state property**

This property indicates when the household air conditioner is in a "special" state, namely, the "defrosting", "preheating", or "heat removal" state.

0x41, 0x42 and 0x43 shall be used for the "defrosting", "preheating", and "heat removal" states, respectively. When the air conditioner is in a state other than the "defrosting", "preheating" and "heat removal" states, 0x40 shall be used.

The "preheating" state shall mean a state in which the compressor is being preheated with the indoor unit fan rotating at a low speed or not rotating, after the heating function is activated or after completion of a defrosting cycle, to allow the air conditioner to supply warm air.

The "heat removal" state shall mean a state in which a fan (the indoor unit fan in most cases) is rotating and the refrigerating cycle is operating to release the residual heat from the air conditioner after the air conditioner is turned off (especially after being used in the heating mode).

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.26 Non-priority state property

This property indicates when the household air conditioner is in a "non-priority" state. An example of a household air conditioner (indoor unit) in a "non-priority" state would be one that shares an outdoor unit with another air conditioner (indoor unit) and cannot operate in some of its operating modes because of limitations imposed by the operating mode of the other air conditioner (indoor unit).

0x40 and 0x41 shall be used for the "normal operation" and "non-priority" states, respectively.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.27 Ventilation function setting property

This property is used to specify whether or not to use the ventilation function of the household air conditioner, to specify the ventilation direction, and to acquire the current setting.

Ventilation function ON (outlet direction) = 0x41, ventilation function OFF = 0x42, ventilation function ON (intake direction) = 0x43, ventilation function ON (intake and outlet directions) = 0x44.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.28 Humidifier function setting property

This property is used to specify whether or not to use the humidifier function of the household air conditioner, and to acquire the current setting. Humidifier function ON = 0x41, humidifier function OFF = 0x42.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.29 Ventilation air flow rate setting property

This property is used to specify the ventilation air flow rate by selecting a level from the 8 predefined levels (0x31 to 0x38) or to specify using the function to automatically control the ventilation air flow rate (0x41 = automatic ventilation air flow rate control used), and to acquire the current setting.

The ventilation air flow rate values for the 8 levels may be defined freely, as long as 0x31 and 0x38 are used for the minimum and maximum ventilation air flow rates, respectively.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

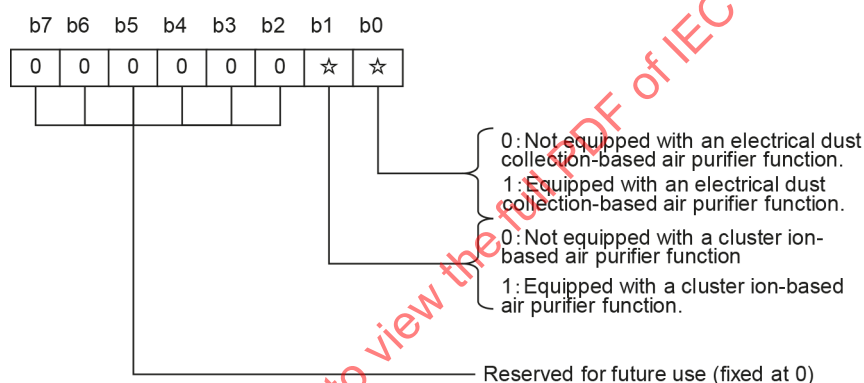
9.14.30 Degree of humidification setting property

This property is used to specify the amount of moisture to add for humidification by selecting a level from the 8 predefined levels (0x31 to 0x38) or to specify using the function to automatically control the amount of moisture to add (0x41 = automatic control used), and to acquire the current setting. The moisture values for the 8 levels may be defined freely, as long as 0x31 and 0x38 are used for the minimum and maximum amounts, respectively.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.31 Mounted air cleaning method property

This property indicates, in bitmap format, the air purifier function(s) supported by the air conditioner. A value of "0" for bit 0 or bit 1 shall mean that the air conditioner is not equipped with an electrical dust collection-based or cluster ion-based air purifier function, respectively, and a value of "1" for bit 0 or bit 1 shall mean that the air conditioner is equipped with an electrical dust collection-based or cluster ion-based air purifier function, respectively. The meanings of each bit are shown in Figure 52.



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Figure 52 – Mounted air cleaning method

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

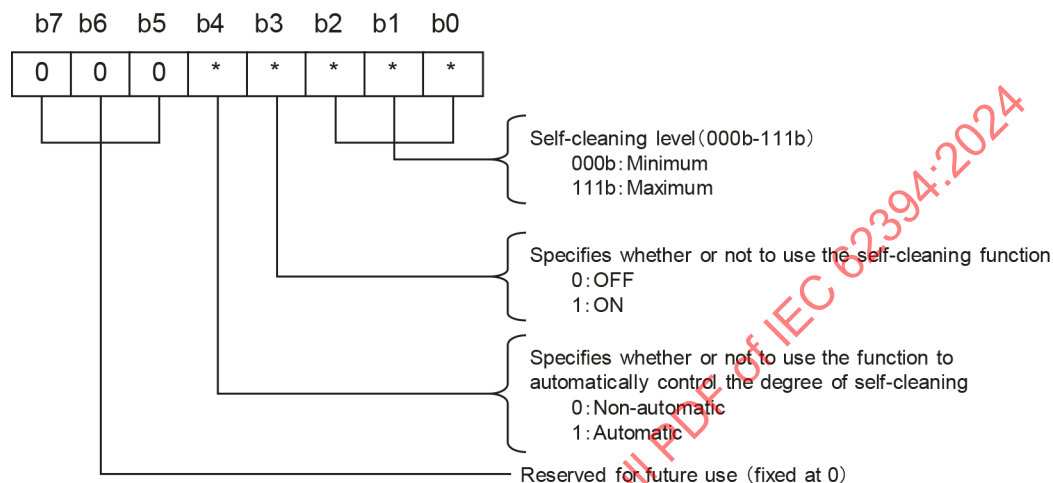
9.14.32 Air purifier function setting property

An 8-element array is used to specify, for each type of air purifier function, whether or not to use the air purifier function, whether or not to use the function to automatically control the degree of air purification, the degree of air purification to achieve with the air purifier function when the function to automatically control the degree of air purification is not used, and to acquire the current settings.

Each element of the array is used for a different type of air purifier function.

- Element 0: Electrical dust collection type
- Element 1: Cluster ion type
- Elements 2 to 7: Reserved for future use.

The size of each element is 1 byte. Bits 0 to 2 are used to specify the degree of air purification to achieve with the air purifier function, by selecting a level from the 8 predefined levels (000b to 111b). The degree of air purification for the 8 levels may be defined freely, as long as 000b and 111b are used for the lowest and highest levels, respectively. Bit 3 specifies whether or not to use the air purifier function ("OFF" when the value of bit 3 is "0" and "ON" when the value of bit 3 is "1"). Bit 4 specifies whether or not to use the function to automatically control the degree of air purification for the air purifier function ("non-automatic" when the value of bit 4 is "0" and "automatic" when the value of bit 4 is "1"). When the value of bit 4 is "1" (automatic), the degree of air purification specified by bits 0 to 2 becomes ineffective. Figure 53 illustrates the composition of an element.



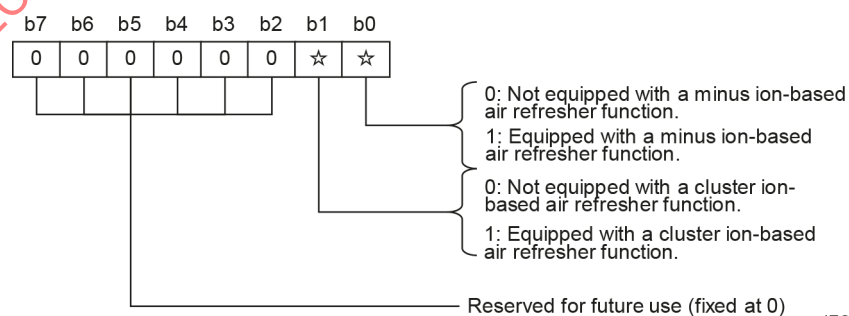
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Figure 53 – Air purifier function setting

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.33 Mounted air refresh method property

This property indicates, in bitmap format, the air refresher function(s) supported by the air conditioner. A value of "0" for bit 0 or bit 1 shall mean that the air conditioner is not equipped with a minus ion-based or cluster ion-based air refresher function, respectively, and a value of "1" for bit 0 or bit 1 shall mean that the air conditioner is equipped with a minus ion-based or cluster ion-based air refresher function, respectively. The meanings of each bit are shown in Figure 54.



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Figure 54 – Air refresh method

9.14.34 Air refresher function setting property

An 8-element array is used to specify, for each type of air refresher function, whether or not to use the air refresher function, whether or not to use the function to automatically control the degree of air refreshing, the degree of air refreshing to achieve with the air refresher function, when the function to automatically control the degree of air refreshing is not used, and to acquire the current settings.

Each element of the array is used for a different type of air refresher function.

- Element 0: Negative ion type
- Element 1: Cluster ion type
- Elements 2 to 7: Reserved for future use.

The size of each element is 1 byte. Bits 0 through 2 are used to specify the degree of air refreshing to achieve with the air refresher function by selecting a level from the 8 predefined levels (000b to 111b). The degree of air refreshing for the 8 levels may be defined freely, as long as 000b and 111b are used for the lowest and highest levels, respectively. Bit 3 specifies whether or not to use the air refresher function ("OFF" when the value of bit 3 is "0" and "ON" when the value of bit 3 is "1"). Bit 4 specifies whether or not to use the function to automatically control the degree of air refreshing for the air refresher function ("non-automatic" when the value of bit 4 is "0" and "automatic" when the value of bit 4 is "1"). When the value of bit 4 is "1" (automatic), the degree of air refreshing specified by bits 0 to 2 becomes ineffective. Figure 55 illustrates the composition of an element.

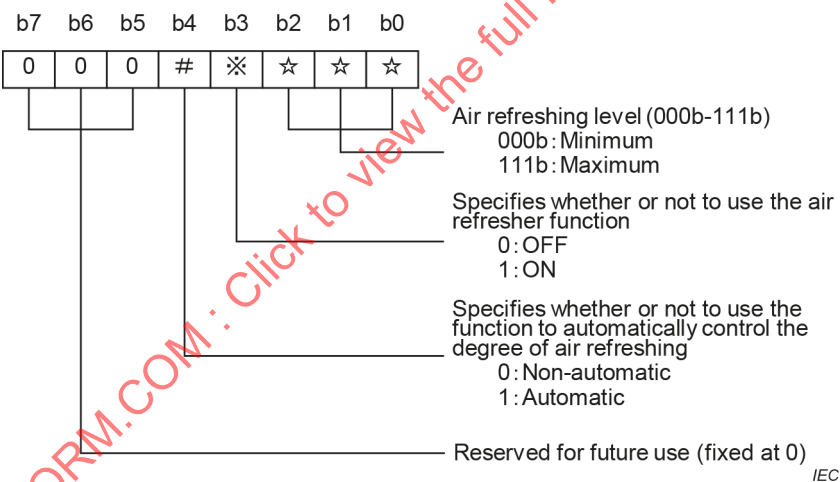


Figure 55 – Air refresher function setting

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.35 Mounted self-cleaning method property

This property indicates, in bitmap format, the self-cleaning function(s) supported by the air conditioner. A value of "0" for bit 0 or bit 1 shall mean that the air conditioner is not equipped with an ozone-based or drying-based self-cleaning function, respectively, and a value of "1" for bit 0 or bit 1 shall mean that the air conditioner is equipped with an ozone-based or drying-based self-cleaning function, respectively. The meanings of each bit are shown in Figure 56.

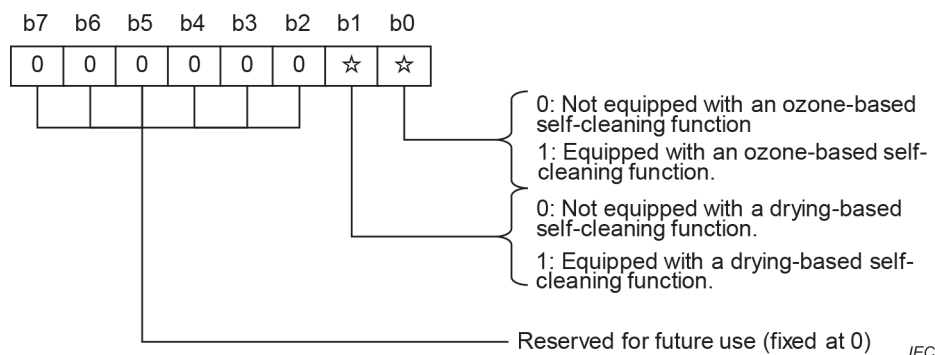


Figure 56 – Self-cleaning method

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.36 Self-cleaning function setting property

An 8-element array is used to specify, for each type of self-cleaning function, whether or not to use the self-cleaning function, whether or not to use the function to automatically control the degree of self-cleaning, the degree of self-cleaning to achieve with the self-cleaning function when the function to automatically control the degree of self-cleaning is not used, and to acquire the current settings.

Each element of the array is used for a different type of self-cleaning function.

- Element 0: Ozone-type
- Element 1: Drying-type
- Elements 2 to 7: Reserved for future use.

The size of each element is 1 byte. Bits 0 to 2 are used to specify the degree of self-cleaning to achieve with the self-cleaning function by selecting a level from the 8 predefined levels (000b to 111b). The degree of self-cleaning for the 8 levels may be defined freely, as long as 000b and 111b are used for the lowest and highest levels, respectively. Bit 3 specifies whether or not to use the self-cleaning function ("OFF" when the value of bit 3 is "0" and "ON" when the value of bit 3 is "1"). Bit 4 specifies whether or not to use the function to automatically control the degree of self-cleaning for the self-cleaning function ("non-automatic" when the value of bit 4 is "0" and "automatic" when the value of bit 4 is "1"). When the value of bit 4 is "1" (automatic), the degree of self-cleaning specified by bits 0 to 2 becomes ineffective. Figure 57 illustrates the composition of an element.

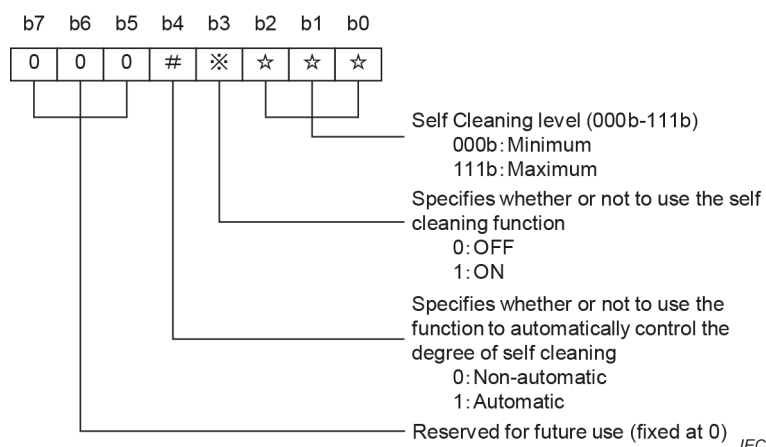


Figure 57 – Self-cleaning function setting

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.37 Special function setting property

This property is used to specify the "special function" to use in the mode specified by the "operation mode setting" property (0xB0), and to acquire the current setting. 0x41, 0x42, 0x43, and 0x44 shall be used for the clothes dryer function, condensation suppressor function, mite and mould control function, and active defrosting function, respectively. When none of the 4 special functions is specified, 0x40 shall be used. 0x45 and succeeding values shall be reserved for future use.

In cases where any one of the special functions is designed in such a way that setting the value for that function in the "'special function' setting" property necessitates an "operation mode setting" property (0xB0) value change to ensure consistency between the content of the "operation mode setting" property and the content of the "'special function' setting" property, a means shall be provided to automatically make any required change to the content of the "operation mode setting" property. For instance, if the clothes dryer function is designed to only operate in the "heating" mode, the "operation mode setting" property value shall be changed to the value for the "heating" mode whenever the clothes dryer function is specified and the "operation mode setting" property value is that for a function other than the "heating" mode. However, the relationship between the two properties shall be implementation-dependent and is not specified in this document.

It is only required to implement the property values that correspond to the functions provided by the actual piece of equipment in which this class is implemented.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.38 Operation status of components property

This property indicates the operation status of the air conditioner components in bitmap format.

Bit 0: Operation status of the compressor:

0: Not operating

1: In operation

Bit 1: Operation status of the thermostat:

0: Thermostat OFF

1: Thermostat ON

Bits 2 to 7: Reserved for future use.

The "thermostat OFF" state shall mean a state in which the air conditioner is in operation but the target temperature has been achieved (i.e. the difference between the room temperature and the room temperature setting is less than the specified value) and no heat exchange is being made. The "thermostat ON" state shall mean a state in which the difference between the room temperature and the room temperature setting is equal to or more than the specified value and heat exchange is being made to achieve the target temperature.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.39 Thermostat setting override function property

This property is used to specify whether or not the household air conditioner shall operate ignoring its thermostat setting.

Normal setting = 0x40, thermostat setting override function ON = 0x41, thermostat setting override function OFF = 0x42.

The "normal setting" mode is a mode in which the air conditioner is dynamically and automatically switched from the "thermostat ON" state to the "thermostat OFF" state or from the "thermostat OFF" state to the "thermostat ON" state, as appropriate, depending on the room and outdoor temperatures. (The air conditioner remains in operation even after it is switched to the "thermostat OFF" state.) The "thermostat setting override function ON" mode is a mode in which the air conditioner continues performing heat exchange ignoring the temperature setting. The "thermostat setting override function OFF" mode is a mode in which the air conditioner performs no heat exchange regardless of the temperature setting.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.40 Air purification mode setting property

This property is used to turn on (0x41)/off (0x42) the air purification function mode of the household air conditioner, and to acquire the current setting.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.41 Buzzer property

A buzzer sound is generated by setting 0x41 for this property for home air conditioners.

If generating a buzzer sound in conjunction with setting other property values, a control request message is sent by storing this property on the same message. In addition, a control request message for this property may be sent before or after transmission of control request messages for a different property value setting by a separate message. It is desired for a write request for this property to be transmitted within a period in which the buzzer can be recognized as indicating the operation execution of the different property value setting.

If setting only the generation of the buzzer sound, transmit a control request message for only this property.

As the operation of the device associated with the property value setting, the timing at which the buzzer is generated, the concrete type of buzzer sound, and the continuation period are dependent on the device, there are no specific provisions for these items.

9.14.42 ON timer-based reservation setting property

This property is used to specify whether or not to use the ON timer (time-based reservation function, relative time-based reservation function or both), and to acquire the current setting. This property is used in combination with the "ON timer setting (time)" or "ON timer setting (relative time)" property.

Both the time- and relative time-based reservation functions are ON = 0x41, both reservation functions are OFF = 0x42, time-based reservation function is ON = 0x43, relative time-based reservation function is ON = 0x44.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.43 ON timer setting (time) property

When the "'ON timer-based reservation' setting" property value is a value for using the time-based reservation function, this property is used to specify the time when the air conditioner will be turned on in the "hour (0x00 to 0x17 (0 to 23)): minute (0x00 to 0x3B (0 to 59))" format, and to acquire the current setting. The higher- and lower-order bytes shall be used for the "hour" and "minute" values, respectively.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.44 ON timer setting (relative time)

When the "'ON timer-based reservation' setting" property value is a value for using the relative time-based reservation function, this property is used to specify the time when the air conditioner will be turned on, in terms of a relative time relative to the current time, and to acquire the current setting. The "hour (0x00 to 0xFF (0 to 255)): minute (0x00 to 0x3B (0 to 59))" format shall be used, with the higher- and lower-order bytes used for the "hour" and "minute" values, respectively.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.45 OFF timer-based reservation setting property

This property is used to specify whether or not to use the OFF timer (time-based reservation function, relative time-based reservation function or both), and to acquire the current setting. This property is used in combination with the "OFF timer setting (time)" or "OFF timer setting (relative time)" property.

Both the time- and relative time-based reservation functions are ON = 0x41, both reservation functions are OFF = 0x42, time-based reservation function is ON = 0x43, relative time-based reservation function is ON = 0x44.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.46 OFF timer setting (time) property

When the "'OFF timer-based reservation setting" property value is a value for using the time-based reservation function, this property is used to specify the time when the air conditioner will be turned off in the "hour (0x00 to 0x17 (0 to 23)): minute (0x00 to 0x3B (0 to 59))" format, and to acquire the current setting. The higher- and lower-order bytes shall be used for the "hour" and "minute" values, respectively.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.14.47 OFF timer setting (relative time) property

When the "OFF timer-based reservation setting" property value is a value for using the relative time-based reservation function, this property is used to specify the time when the air conditioner will be turned off, in terms of a relative time relative to the current time, and to acquire the current setting. The "hour (0x00 to 0xFF (0 to 255)): minute (0x00 to 0x3B (0 to 59))" format shall be used, with the higher- and lower-order bytes used for the "hour" and "minute" values, respectively.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.15 Ventilation fan class specifications

9.15.1 General

The control commands of "ventilation fan" are shown in Table 31.

Class group code : 0x01

Class code : 0x33

Table 31 – List of ventilation fan properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	–	Set	○	○	
		ON = 0x30, OFF = 0x31				Get	○		
Ventilation automatic setting	0xBF	Automatic/Non-automatic	unsigned char	1 byte	–	Set/Get			
		Automatic = 0x41, Non-automatic = 0x42							
Set value of ventilation air flow rate	0xA0	Sets a level of ventilation air flow rate or ventilation air flow rate automatic mode. This property specifies ventilation air flow rate level with 8-steps.	unsigned char	1 byte	–	Set/Get			
		Ventilation air flow rate automatic mode = 0x41 Ventilation air flow rate level = 0x31 to 0x38							

9.15.2 Operation status property

This property indicates the operation/stop status of the air conditioner. The property value of 0x30/0x31 shall be associated with both operation and stop.

9.15.3 Ventilation automatic setting property

This property indicates either automatic or non-automatic for the automatic ventilating operation.

Automatic = 0x41, Non-automatic = 0x42

9.15.4 Set value of ventilation air flow rate property

This property indicates the level of ventilation air flow rate of the ventilation air flow rate automatic mode. The property value of the ventilation air flow rate automatic mode shall be 0x41. The air flow rate level shall be set with 8-steps and take a property value of 0x31 to 0x38. The values for the 8 levels may be defined freely, as long as 0x31 and 0x38 are used for the minimum and maximum air flow rates, respectively.

9.16 Air purifier class specifications

9.16.1 General

The control commands of "air purifier" are shown in Table 32.

Class group code : 0x01

Class code : 0x35

Table 32 – List of air purifier properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 bytes	–	Set	○	○	
		ON = 0x30, OFF = 0x31				Get	○		
Filter change notice	0xE1	Filter change time notice found/not found	unsigned char	1 byte	–	Get			
		Found = 0x41, Not found = 0x42							
Air flow rate setting	0xA0	Sets a level of ventilation air flow rate or ventilation air flow rate automatic mode. The ventilation air flow rate is specified with 8-steps.	unsigned char	1 byte	–	Set/Get			
		Ventilation air flow rate automatic mode = 0x41 Ventilation air flow rate level = 0x31 to 0x38							
Smoke (cigarette) detection status	0xC1	Indicates smoke (cigarette) detection status.	unsigned char	1 byte	–	Get			
		Smoke (cigarette) detection status found = 0x41 Smoke (cigarette) detection status not found = 0x42							
Optical catalyst operation setting	0xC2	Optical catalyst ON/OFF status	unsigned char	1 byte	–	Set/Get			
		Optical catalyst ON = 0x41 Optical catalyst OFF = 0x42							
Air pollution detection status	0xC0	Indicates air pollution detection status	unsigned char	1 byte	–	Get			
		Air pollution detected = 0x41 Air pollution non-detected = 0x42							

9.16.2 Operation status property

This property indicates the operation/stop status of the air purifier. The property value of 0x30/0x31 shall be associated with both operation and stop.

9.16.3 Filter change notice property

This property indicates whether notification of filter change shall be made or not. This property shall disclose that the time has come to change the air purifier filter.

The transition from "filter change time notice found" to "filter change time notice not found" shall be achievable using the reset switch on the air purifier body, etc. Found = 0x41, not found = 0x42.

9.16.4 Air flow rate setting property

This property indicates the level of ventilation air flow rate or the ventilation air flow rate automatic mode. The property value of the ventilation air flow rate automatic mode shall be 0x41. The ventilation air flow rate level shall be set with 8-steps and take a property value of 0x31 to 0x38. The values for the 8 levels may be defined freely, as long as 0x31 and 0x38 are used for the minimum and maximum air flow rates, respectively.

9.16.5 Smoke (cigarette) detection status property

This property indicates whether smoke (cigarette) detection status is found or not. "Smoke (cigarette) detection status found" = 0x41 and "smoke (cigarette) detection status not found" = 0x42 shall be specified.

9.16.6 Optical catalyst operation setting property

This property indicates the operation status of the optical catalyst function as ON/OFF. "Optical catalyst ON" = 0x41 and "optical catalyst OFF" = 0x42 shall be specified.

9.16.7 Air pollution detection status property

This property indicates air pollution detection status. Air pollution detected = 0x41 and air pollution non-detected = 0x42 shall be specified.

9.17 Humidifier class specifications

9.17.1 General

The control commands of "humidifier" are shown in Table 33.

Class group code : 0x01

Class code : 0x39

Table 33 – List of humidifier properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	–	Set	○	○	
		ON = 0x30, OFF = 0x31				Get	○		
Humidifying setting 1	0xC0	Sets value of relative humidity and get setting status	unsigned char	1 byte		Set/Get	○ ^a		
		0x00 to 0x64 (0 % to 100 %) Automatic setting = 0x70, Continuous operation = 0x71, intermittent operation = 0x72							
Humidifying setting 2	0xC1	Sets humidifying level by 3 steps	unsigned char	1 byte		Set/Get	○ ^a		
		Humidifying levels = 0x31 to 0x33 Automatic setting = 0x70, Continuous operation = 0x71, intermittent operation = 0x72							
Measured value of relative humidity	0xB4	Indicates measured value of relative humidity	unsigned char	1 byte	–	Get			
		0x00 to 0x64 (0 % to 100 %)							
Reservation set of OFF timer	0x94	Sets reservation ON/OFF and set setting status	unsigned char	1 byte		Set/Get			
		Reservation ON = 0x41, OFF = 0x42							
Relative time value set of OFF timer	0x96	Sets timer value HH:MM and gets updated time	unsigned char x 2	2 bytes		Set/Get			
		0 to 0x17: 0 to 0x3B (= 0 to 23): (= 0 to 59)							
Ion emission setting	0xC2	Sets ON/OFF of ion emission and gets setting status	unsigned char	1 byte	–	Set/Get			
		Emission ON= 0x41, OFF = 0x42							
Implemented ion emission method	0xC3	Sets ion emission method equipped in humidifier by bit map	unsigned char	1 byte	–	Get			
		bit 0: minus ion method, bit 1: cluster ion method							
Special operation mode setting	0xC4	Sets special operation mode and gets setting status. Specifies by bit map	unsigned short	1 byte		Set/Get			
		Specifies 1 for effective setting bit 0: throat dry prevention bit 1: quiet operation bit 2-7: reserved for future use							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Water amount level	0xC5	Indicates water amount level in water tank by 6 steps.	unsigned char	1 byte	—	Get			
		0x40: empty 0x41 to 0x45: minimum to maximum level							
^a Either "humidifying setting 1" or "humidifying setting 2" shall be mandatory.									

9.17.2 Operation status property

This property sets the operation of a humidifier ON/OFF and gets operation status. Operation ON/OFF corresponds to 0x30/0x31 respectively. When the property is OFF (0x31), the set and get values of other properties are guaranteed. For humidifiers, access rule "Set" shall be implemented.

9.17.3 Humidifying setting 1 property

This property sets relative humidity and continuous operation status and gets setting status. Relative humidity is set in percent (%) and the humidifier is operated according to the property value as a target. Furthermore, the property value when an automatic humidity detection algorithm of humidifier determines the target is 0x70, the property value of continuous operation is 0x71, and the property value of intermittent operation at a specified interval is 0x72. Detailed intermittent operation interval is not specified. Either the humidifying set 1 or the humidifying set 2 is mandatory to be implemented.

9.17.4 Humidifying setting 2 property

This property sets the humidifying level and continuous operation status, and gets the setting status. Humidifying levels are decided by 3 steps and take the property values of 0x31 to 0x33. Not every humidifying level has a specified value. The minimum humidifying is 0x31 and the maximum humidifying is 0x33.

The property value when the target value is automatically decided by a calculation algorithm for an automatic humidity setting value of the humidifier is 0x70. The property value when the humidifier is operated continuously is 0x71. The property value when the humidifier is operated off and on at a specified interval is 0x72. The details of operation interval are not specified when the humidifier is operated off and on.

Either "humidifying setting 1" or "humidifying setting 2" is mandatorily implemented.

9.17.5 Measured value of relative humidity property

This property expresses a measured value of relative humidity in increments of %. The value range of property is 0x00 to 0x64 (100 %). When the property value of actual equipment is over the value range of property, an overflow code 0xFF is used. When the property value is less than the value range of property, an underflow code 0xFE is used. When a measurement value cannot be returned, a code 0xFD is used.

9.17.6 Reservation setting of OFF timer property

This property sets an OFF timer on/off and gets setting status. The property is related to "relative time value setting of OFF timer". Reservation setting ON = 0x41, reservation setting OFF = 0x42.

9.17.7 Relative time value set of OFF timer property

This property sets the time when the humidifier turns to OFF and gets updated time when "reservation setting of OFF timer" is ON. The data format is hour: 0x00 to 0x17 (0 to 23) and minute: 0x00 to 0x3B (0 to 59). The property value is taken from the upper bytes in the order of hour and minute.

9.17.8 Ion emission setting property

This property sets the ion emitting function implemented in a humidifier ON/OFF and gets setting status. Ion emitting ON = 0x41, ion emitting OFF = 0x42.

9.17.9 Implemented ion emission method property

This property expresses an implemented method of ion emission functions by a bitmap. As realizing methods, the minus ion and cluster ion methods are specified. The details are as follows. Bit 0 means that the realizing method is not implemented, and bit 1 means that the realizing method is implemented. The meanings of each bit are shown in Figure 58.

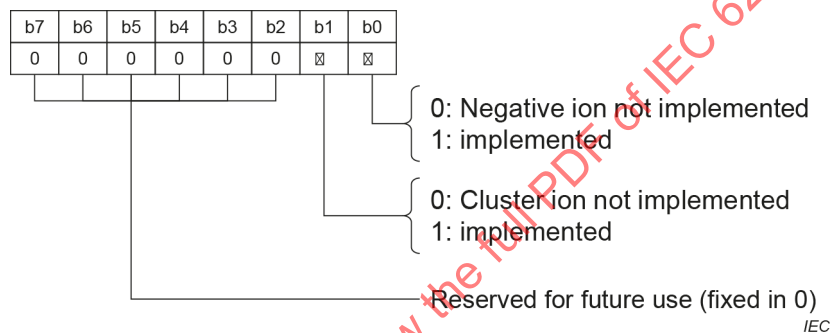


Figure 58 – Implemented ion emission method

9.17.10 Special operation mode setting property

The list of whether each special operation mode setting is enabled or disabled is shown in a bitmap. The "thirst prevention setting" and the "silent operation setting" are specified as special operation mode settings. The details of each are shown below. A bit value of "0" indicates that the setting is invalid, and the value "1" indicates that the setting is valid. The meanings of each bit are shown in Figure 59.

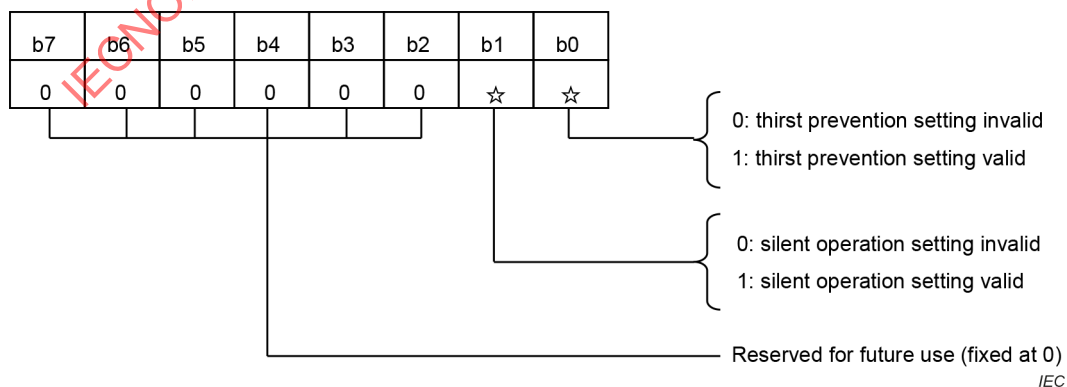


Figure 59 – Implemented special operation modes

9.17.11 Water amount level property

This property expresses the amount of water that remains in the tank in 6 steps. Not every level has a specified value. The empty status is 0x41 and full maximum amount status is 0x45.

9.18.1 General

Class code : 0x56

Table 34 – List of package-type commercial air conditioner (indoor unit) properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	—	Set/Get	○	○	
		ON = 0x30, OFF = 0x31							
Operation mode setting	0xB0	Used to specify the operation mode ("automatic," "cooling," "heating," "dehumidification" or "air circulation") and to acquire the current setting.	unsigned char	1 byte	—	Set/Get	○	○	
		The following values shall be used: Automatic: 0x41 Cooling: 0x42 Heating: 0x43 Dehumidification: 0x44 Air circulation: 0x45							
Temperature setting	0xB3	Used to set the temperature setting volume and to acquire the current setting.	signed char	1 byte	1 °C	Set/Get	○	○	
		0x00 to 0x32 (0 °C to 50 °C)							
Measured indoor unit temperature	0xBB	Used to acquire the measured indoor unit temperature.	signed char	1 byte	1 °C	Get			
		0x81 to 0x7D (−127 °C to 125 °C)							
Thermostat state	0xAC	Indicates the state (ON or OFF) of the thermostat.	unsigned char	1 byte	—	Get	○		
		Thermostat ON = 0x41 Thermostat OFF = 0x42							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Current function (automatic operation mode)	0xAE	Indicates, when the air conditioner is operating in the "automatic" operation mode, the function ("cooling," "heating," "dehumidification," "air circulation" or "other") that is currently being used.	unsigned char	1 byte	–	Get	○		
		The following values shall be used: Cooling: 0x42 Heating: 0x43 Dehumidification: 0x44 Air circulation: 0x45 Other: 0x40							
Group information	0xCA	Used to specify information to link indoor units with outdoor units.	unsigned char	1 byte	–	Get	○		
		No setting = 0x00 0x01 to 0xFD							
Power consumption range for indoor units	0xDB	Power consumption for indoor units is classified into five groups:	unsigned char	1 byte	–	Get			
		0x00: undefined 0x01: up to 50 W 0x02: 50 W to 100 W 0x03: 100 W to 150 W 0x04: 150 W to 200 W 0x05: more than 200 W							

9.18.2 Operation status property

This property is used to specify whether to turn on or off the package-type commercial air conditioner (indoor unit) and to acquire the current operation status. 0x30 and 0x31 shall be used for the ON and OFF states, respectively.

9.18.3 Operation mode setting property

This property is used to specify the operation mode of the package-type commercial air conditioner (indoor unit) ("automatic," "cooling," "heating," "dehumidification" or "air circulation") and to acquire the current setting. 0x41, 0x42, 0x43, 0x44 and 0x45 shall be used for "automatic," "cooling," "heating," "dehumidification" and "air circulation," respectively.

It is only required to implement the property values that correspond to the functions provided by the actual piece of equipment in which this class is implemented. For example, if the piece of equipment in which this class is implemented does not have an air circulation function, it is not necessary to implement the value for the air circulation mode (0x45).

This property indicates normal values regardless of whether the operation status property value (0x80) is ON (0x30) or OFF (0x31).

9.18.4 Temperature setting property

This property is used to set the temperature (in 1 °C increments) for the current operation mode of the indoor unit that is specified by the "operation mode setting (0xB0)" property, and to acquire the current setting. The air conditioner shall use the value of this property as the target temperature.

This property is the value of the operation mode set at "operation mode setting (0xB0)". This property indicates normal values regardless of whether the operation status property value (0x80) is ON (0x30) or OFF (0x31).

9.18.5 Measured indoor unit temperature property

This property indicates the measured indoor unit temperature in 1 °C increments. The property value range shall be 0x81 to 0x7D (–127 °C to 125 °C). When the property value of the actual piece of equipment is higher than the upper limit of the property value range, the overflow code 0x7F shall be used. When the property value is lower than the lower limit of the property value range, the underflow code 0x80 shall be used. When the measurement value cannot be returned, 0x7E shall be used.

This property indicates normal values only when the operation status property value (0x80) is ON (0x30).

9.18.6 Thermostat state property

This property indicates the state (ON or OFF) of the thermostat of the package-type commercial air conditioner (indoor unit). 0x41 and 0x42 shall be used for the ON and OFF states, respectively.

This property indicates normal values only when the operation status property value (0x80) is ON (0x30).

9.18.7 Current function (automatic operation mode) property

When "automatic" is specified by the "operation mode setting" property (EPC = 0xB0) for the package-type commercial air conditioner (indoor unit), this property is used to acquire information as to which function (of the actual piece of equipment) is currently being used (i.e. "cooling," "heating," "dehumidification" or "air circulation"). 0x42, 0x43, 0x44, 0x45 and 0x40 shall be used for "cooling," "heating," "dehumidification," "air circulation" and "other", respectively. "Other" shall mean that the air conditioner is in operation but is not performing any of the "cooling," "heating," "dehumidification" and "air circulation" functions.

It is only required to implement the property values that correspond to the functions provided by the actual piece of equipment in which this class is implemented. For example, if the piece of equipment in which this class is implemented does not have an air circulation function, it is not necessary to implement the value for the air circulation function (0x45).

This property indicates normal values only when the operation status property value (0x80) is ON (0x30) and operation mode setting property (0xB0) is automatic (0x41).

9.18.8 Group information property

Group information property values provide information to link air conditioners (indoor units) with air conditioners (outdoor units). Air conditioners (indoor units) and air conditioners (outdoor units) with the same property values shall be connected using the same refrigerant piping.

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Measured power consumption of outdoor unit	0xDB	Used to acquire the measured power consumption of the outdoor unit.	unsigned long	4 bytes	W	Get	○		
		0x00000000 to 0xFFFFFFFF (0 W to 4 294 967 293 W)							
Possible power savings for outdoor units	0xDD	Indicates possible power savings (W) based on current operation status.	unsigned long	4 bytes	W	Get	○		
		0x00000000 to 0xFFFFFFFF (0 W to 4 294 967 293 W)							
Settings restricting power consumption of outdoor units	0xDE	Setting/reading power (W) to be saved	unsigned long	4 bytes	W	Set/Get	○		
		Restricting power consumption: 0x00000000 0x00000001 to 0xFFFFFFFF (1 W to 4 294 967 293 W)							
Minimum power consumption for restricted outdoor unit	0xDF	Indicates the minimum possible power consumption savings.	unsigned long	4 bytes	W	Get			
		0x00000000 to 0xFFFFFFFF (0 W to 4 294 967 293 W)							

9.19.2 Operation status property

This property is used to specify whether to turn on or off the package-type commercial air conditioner, and to acquire the current operation status. 0x30 and 0x31 shall be used for the ON and OFF states, respectively. In cases where the package-type commercial air conditioner (outdoor unit) belongs to a node in which the "package-type commercial air conditioner (outdoor unit)" class is implemented and is ready to respond to user operation as soon as the node starts up, 0x30 may be implemented as the fixed value.

9.19.3 Rated power consumption of outdoor unit property

This property indicates, in W, the rated power consumption values (brochure values) for the "cooling" and "heating" modes. The range of rated power consumption value for each of the 3 modes shall be 0x00000000 to 0xFFFFFFFF (0 W to 4 294 967 293 W) and the bytes shall be used in such a manner that the two values are indicated in the order stated in the previous sentence. When the actual piece of equipment does not support one or more of the three modes, the underflow code 0xFFFFFEE shall be used for the unsupported mode(s).

9.19.4 Measured outdoor unit temperature property

This property indicates, in 1 °C increments, the measured air temperature where the outdoor unit of the package-type commercial air conditioner is installed. The property value range shall be 0x81 to 0x7D (–127 °C to 125 °C). When the property value of the actual piece of equipment is higher than the upper limit of the property value range, the overflow code 0x7F shall be used. When the property value is lower than the lower limit of the property value range, the underflow code 0x80 shall be used. When the measurement value cannot be returned, 0x7E shall be used.

This property indicates normal values only when the operation status property value (0x80) is ON (0x30).

9.19.5 Special state property

This property indicates when the package-type commercial air conditioner is in the "special" state. The value of a property in a normal state shall be 0x40, while the value of a property in a special state other than normal shall be 0x41. The term "special state" means an operation that is required for air conditioner functions and that cannot be changed by outside instructions.

This property indicates normal values only when the operation status property value (0x80) is ON (0x30).

9.19.6 Group information property

Group information property values provide information to link air conditioners (indoor units) with air conditioners (outdoor units). Air conditioners (indoor units) and air conditioners (outdoor units) with the same property values shall be connected using the same refrigerant piping.

9.19.7 Measured power consumption of outdoor unit property

This property indicates outdoor unit power consumption (W) (A in Figure 60). The property value range shall be 0x00000000 to 0xFFFFFFFF (0 W to 4 294 967 293 W). When the property value of the actual piece of equipment is higher than the upper limit of the property value range, 0xFFFFFFFF shall be used.

This property indicates normal values only when the operation status property value (0x80) is ON (0x30).

9.19.8 Possible power savings for outdoor units property

This property indicates possible power savings in W based on current operation status (B in Figure 60). This property indicates normal values only when the operation status property value (0x80) is ON (0x30). When the property value of the actual piece of equipment is higher than the upper limit of the property value range, 0xFFFF shall be used.

9.19.9 Settings restricting power consumption of outdoor units property

Setting power (W) to be saved/reading set value to restrict power consumption. As a rule, set a numerical figure equal to or smaller than the possible power savings for outdoor units (B in Figure 60). The range of property values shall be: 0x00000001 to 0xFFFFFFFF (1 W to 4 294 967 293 W).

Set 0x00000000 when cancelling the restriction. In some products, this property will be automatically reset to 0x00000000 at 30 min after setting. Controlling this property should take account of the accuracy of the clocks embedded in the devices.

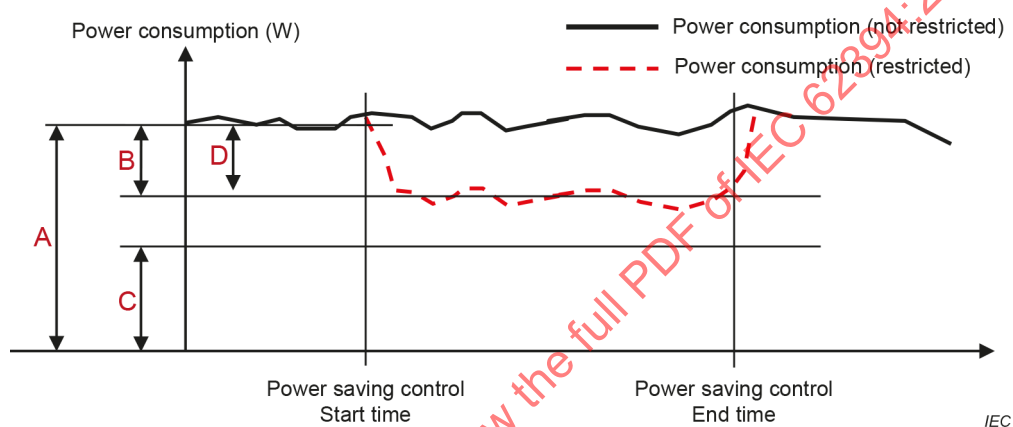
The outdoor unit operates at the minimum outdoor unit power consumption restriction (C in Figure 60), when the outdoor unit power consumption restriction setting is high and "minimum power consumption for restricted outdoor unit (C in Figure 60) > measured outdoor unit power consumption (A in Figure 60) – outdoor unit power consumption restriction setting (D in Figure 60)".

9.19.10 Minimum power consumption for restricted outdoor unit property

This property indicates minimum power consumption (W) at which the consumer-designated device can operate.

The property value range shall be 0x00000001 to 0xFFFFFFFF (1 W to 4 294 967 293 W). When the property value of the actual device is higher than the upper bound of the value range, 0xFFFFFFFF shall be used.

Figure 60 shows an example of power restriction control of commercial-use package air conditioner. The outdoor unit operates at the minimum outdoor unit power consumption restriction (C in Figure 60), when the outdoor unit power consumption restriction setting is high and "minimum power consumption for restricted outdoor unit (C in Figure 60) > measured outdoor unit power consumption (A in Figure 60) – outdoor unit power consumption restriction setting (D in Figure 60)".



Key

- A: Measured outdoor unit power consumption
- B: Saveable power consumption for outdoor unit
- C: Minimum consumption power for restricting outdoor unit (Power required by consumer to ensure minimally air-conditioned environment)
- D: Outdoor unit consumption power restriction setting

The following relationship shall be maintained: $A - D \geq C$

Figure 60 – Power restriction control of commercial-use package air conditioner (example)

9.20 Electric storage heater class specifications

9.20.1 General

The control commands of "electric storage heater" are shown in Table 36.

Class group code : 0x01
Class code : 0x55

Table 36 – List of electric storage heater properties

[illegible]

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Fan timer 2 ON time setting	0xD4	This property is used to set a timer value (HH:MM) and to acquire the setting status.	unsigned char × 2	2 bytes		Set/Get			
		0 to 0x17:0 to 0x3B (= 0 to 23):(= 0 to 59)							
Fan timer 2 OFF time setting	0xD5	This property is used to set a timer value (HH:MM) and to acquire the setting status.	unsigned char × 2	2 bytes		Set/Get			
		0 to 0x17:0 to 0x3B (= 0 to 23):(= 0 to 59)							

9.20.2 Operation status property

This property is used to start or stop an electric storage heater and to acquire the operation status. The start status corresponds to 0x30, and the stop status corresponds to 0x31.

9.20.3 Temperature setting property

This property is used to set the temperature under the current fan operation in °C and to acquire the setting status.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

A model with a fan installed requires this property.

9.20.4 Rated power consumption property

This property indicates the rated power consumption of heat storage, control, weak air flowing, and strong air flowing in W. The power consumption is from 0x0000 to 0xFFFFD (0 W to 65 533 W). The property value is for heat storage, control, weak air flowing, and strong air flowing from the high-order bytes. When the actual piece of equipment does not support one or more of the functions, the underflow code 0xFFFFE shall be used.

If the fan air flow rate cannot be switched, the underflow code 0xFFFFE shall be used for weak air flowing.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.20.5 Measured indoor temperature property

This property indicates the measured indoor temperature in °C. The value range for this property shall be from 0x81 to 0x7D (–127 °C to 125 °C). When the property value of the actual device is higher than the upper limit of the property value range, the overflow code 0x7F shall be used. When the property value is lower than the lower limit of the property value range, the underflow code 0x80 shall be used. When the measurement value cannot be returned, 0x7E shall be used.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

A model with a fan installed requires this property.

9.20.6 Measured outdoor temperature property

This property indicates the measured outdoor temperature in °C. The value range for this property shall be from 0x81 to 0x7D (–127 °C to 125 °C). When the property value of the actual device is higher than the upper limit of the property value range, the overflow code 0x7F shall be used. When the property value is lower than the lower limit of the property value range, the underflow code 0x80 shall be used. When the measurement value cannot be returned, 0x7E shall be used.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.20.7 Air flow rate setting property

This property is used to set the air flow level and air flow rate automatic setting and to acquire the setting status. The property value for air flow rate automatic setting shall be 0x41. The air flow rate is set to three levels and the property value shall be 0x31 to 0x33. The specific value for each air flow level is 0x31 for OFF, weak air flowing for 0x32, and strong air flowing for 0x33.

When the air flow rate cannot be changed, the value shall be 0x31 for OFF and 0x33 for ON.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.20.8 Fan operation status property

This property is used to acquire the fan operation status. The air flow rate is set to three levels and the property value shall be 0x31 to 0x33. The specific value for each air flow level is 0x31 for OFF, weak air flowing for 0x32, and strong air flowing for 0x33.

When the air flow rate cannot be changed, the value shall be 0x31 for OFF and 0x33 for ON.

9.20.9 Heat storage operation status property

This property is used to set the storage heater ON/OFF status. The property value shall be 0x30 for ON and 0x31 for OFF.

9.20.10 Heat storage temperature setting property

This property is used to set the heat storage temperature and to acquire the setting status. The value range for this property shall be from 0x0000 to 0x03E8 (0 °C to 1 000 °C).

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.20.11 Measured stored heat temperature property

This property indicates the measured heat storage temperature in °C. The value range for this property shall be from 0xFF37 to 0x03E8 (–200 °C to 1 000 °C). When the property value of the actual device is higher than the upper limit of the property value range, the overflow code 0x7FFF shall be used. When the property value is lower than the lower limit of the property value range, the underflow code 0x8000 shall be used.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.20.12 Daytime heat storage setting property

This property is used to set daytime heat storage by a storage heater to ON or OFF and to acquire the setting status. The property value shall be 0x30 for ON and 0x31 for OFF.

9.20.13 Daytime heat storage ability property

This property is used to acquire the status of whether the storage heater can store heat in the daytime. The property value shall be 0x30 when heat storage is possible and 0x31 when not.

9.20.14 Midnight power duration setting property

This property is used to set the midnight power duration and to acquire the setting status. The property value shall be 0x00 to 0x17 (0 h to 23 h).

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

Reference information: the current power menu of each power company presents three types of power duration. The duration is 5 h (0x05), 8 h (0x08), or 10 h (0x0A).

9.20.15 Midnight power start time setting property

This property is used to set the midnight power start time and to acquire the setting status. The value range for this property shall be 0x00 to 0x17 (00:00 to 23:00). This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

Reference information: the current power menu of each power company presents five types of midnight power start time. For the duration of 5 h or 8 h, the start time is 00:00 (0x00), 01:00 (0x01), 21:00 (0x15), 22:00 (0x16), or 23:00 (0x17). For the duration of 10 h, the start time is 22:00 (0x16) only.

9.20.16 Radiation method property

This property is used to acquire the fan installation status of an electric storage heater. The property value shall be 0x30 when a fan is installed and 0x31 when not.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.20.17 Child lock setting property

This property sets child lock and indicates the setting status. The property value shall be 0x30 for ON and 0x31 for OFF.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.20.18 Fan timer 1 setting property

This property is used to specify Reservation ON or OFF of Fan timer 1 and to acquire the setting status. The property value shall be 0x41 for Reservation ON or 0x42 for Reservation OFF.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.20.19 Fan timer 1 ON time setting property

This property is used to set the Fan timer 1 ON time (HH:MM) and to acquire the setting status. The value range for this property shall be from 0 to 0x17:0 to 0x3B (0 to 23):(0 to 59).

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.20.20 Fan timer 1 OFF time setting property

This property is used to set the Fan timer 1 OFF time (HH:MM) and to acquire the setting status. The value range for this property shall be from 0 to 0x17:0 to 0x3B (0 to 23):(0 to 59).

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.20.21 Fan timer 2 setting property

This property is used to specify Reservation ON or OFF of Fan timer 2 and to acquire the setting status. The property value shall be 0x41 for Reservation ON or 0x42 for Reservation OFF.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.20.22 Fan timer 2 ON time setting property

This property is used to set the Fan timer 2 ON time (HH:MM) and to acquire the setting status. The value range for this property shall be from 0 to 0x17:0 to 0x3B (0 to 23):(0 to 59).

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.20.23 Fan timer 2 OFF time setting property

This property is used to set the Fan timer 2 OFF time (HH:MM) and to acquire the setting status. The value range for this property shall be from 0 to 0x17:0 to 0x3B (0 to 23):(0 to 59).

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.21 Gas heat pump-type commercial air conditioner (indoor unit) class specifications

9.21.1 General

The control commands of "gas heat pump-type commercial air conditioner (indoor unit)" are shown in Table 37.

Class group code : 0x01

Class code : 0x58

Table 37 – List of gas heat pump-type commercial air conditioner (indoor unit) properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	–	Set/Get	○	○	
		ON = 0x30, OFF = 0x31							
Operation mode setting	0xB0	Used to set the automatic/cooling/heating/dehumidifying/ventilation operating mode and acquire the setting status.	unsigned char	1 byte	–	Set/Get	○	○	
		The following codes shall be assigned respectively: 0x41, 0x42, 0x43, 0x44, 0x45							
Temperature setting value	0xB3	Used to set the temperature setting volume and acquire the current setting.	unsigned char	1 byte	1 °C	Set/Get	○	○	
		0x00 to 0x32 (0 °C to 50 °C)							
Measured temperature value of indoor unit	0xBB	Used to acquire measurements of indoor unit.	signed char	1 byte	1 °C	Get			
		0x81 to 0x7D (–127 °C to 125 °C)							
Thermo status	0xAC	Indicates the ON/OFF status of the thermo.	unsigned char	1 byte	–	Get	○		
		Thermo ON=0x41, Thermo OFF=0x42							
Operation mode status during automatic operation	0xAE	Cooling / heating / dehumidifying / ventilation / other	unsigned char	1 byte	–	Get	○		
		Following codes shall be assigned respectively: 0x42, 0x43, 0x44, 0x45, 0x40							
Group information	0xCA	Information to link indoor units with outdoor units.	unsigned char	1 byte	–	Get	○		
		0x00: No setting 0x01 to 0xFD							
Power consumption range for indoor units	0xDB	Power consumption for indoor units is classified into five groups:	unsigned char	1 byte	–	Get			
		0x00: Undefined 0x01: Less than 50 W 0x02: 50 W to 100 W 0x03: 100 W to 150 W 0x04: 150 W to 200 W 0x05: Over 200 W							

9.21.2 Operation status property

This property is used to set the operation/stop status for the gas heat pump-type commercial air conditioner (indoor unit) and acquire the setting status. Property values "0x30" and "0x31" shall be assigned to the operation and stop states, respectively.

9.21.3 Operation mode setting property

This property is used to set the automatic/cooling/heating/dehumidifying/ventilation operating mode for the gas heat pump-type commercial air conditioner (indoor unit) and acquire the setting status. Property values 0x41/0x42/0x43/0x44/0x45 shall be assigned to each of these operating modes in that order.

As for the property values adopted, devices implementing this class need only implement property values that can be adopted as their functions. For example, if an actual device equipped with this class is not equipped with the ventilation function as one of its functions, there is no need to implement 0x45 for ventilation.

This property indicates normal values regardless of the operation status property value (0x80) is ON (0x30) or OFF (0x31).

9.21.4 Temperature setting value property

This property is used to set temperature setting at current "operation mode setting" (0xB0) of the indoor unit in increments of 1 °C and acquire the setting status. The air conditioners shall operate with the property value as a target temperature. This property is the value of the operation mode set at "operation mode setting (0xB0)". This property indicates normal values regardless of the operation status property value (0x80) is ON (0x30) or OFF (0x31).

9.21.5 Measured temperature value of indoor unit property

This property indicates the measured temperature value of indoor unit in increments of 1 °C. The property value range shall be from 0x81 to 0x7D (–127 °C to 125 °C). When the property value of the actual device exceeds this property value range, the overflow code 0x7F shall be used. When said value is below the property value range, the underflow code 0x80 shall be used. If the measured value cannot be sent, 0x7E shall be used.

This property indicates normal values only when the operation status property value (0x80) is ON (0x30).

9.21.6 Thermo status property

This property indicates the thermo ON/OFF status for the gas heat pump-type commercial air conditioner (indoor unit). Property values "0x41" and "0x42" shall be assigned to the thermo ON and OFF, respectively. This property indicates normal values only when the operation status property (0x80) is ON (0x30).

9.21.7 Operation mode status during automatic operation property

This property is used to acquire the operation mode of the actual device when "operation mode setting" (EPC = 0xB0) is in "automatic mode" for gas heat pump-type commercial air conditioners (indoor units). Property values 0x42 / 0x43 / 0x44 / 0x45 shall be assigned to cooling / heating / dehumidifying / ventilation in that order. As for the property values adopted, devices implementing this class need only implement property values that can be adopted as their functions. For example, if an actual device equipped with this class is not equipped with the ventilation function as one of its functions, there is no need to implement 0x45 for ventilation.

This property indicates normal values only when the operation status property value (0x80) is ON (0x30), and operation mode setting property value (0xB0) is automatic (0x41).

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Time slot operation factor setting	0xE0	Indicates the valid/invalid status of the operation factor setting. This property further indicates the operation factor to be set for outdoor units for the period between the start time and the end time. - Start time hh:mm - End time (hh:mm) - Operation factor pp % The first byte: Operation factor setting valid/invalid designation 0x30: valid, 0x31: invalid Successive bytes shall have no meaning only if the operation factor setting is "valid". The second to third bytes: Start time hh: 0x00 to 0x17 (0 to 23) mm: 0x00 to 0x3B (0 to 59) The fourth to fifth bytes: End time hh: 0x00 to 0x17 (0 to 23) mm: 0x00 to 0x3B (0 to 59) The sixth byte: Operation factor 0x00 to 0xC8 (0 % to 200 %)	unsigned char × 6	6 bytes		Set/Get			
Allowable operation factor	0xE1	The percentage of the lowest allowable operation factor can be set for the time slot operation factor setting, highest allowable percentage, and operation factor step percentage The first byte: lower limit of the operation factor 0x00 to 0xC8 (0 % to 200 %) The second byte: highest allowable operation factor 0x00 to 0xC8 (0 % to 200 %) The third byte: operation factor step 0x01 to 0x64 (1 % to 100 %), 0xFF (invalid)	unsigned char × 3	3 bytes	%	Get			

9.22.2 Operation status (inherited from the super class property) property

This property is used to set the operation/stop status for the gas heat pump-type commercial air conditioner (outdoor unit) and acquire the setting status. Property values "0x30" and "0x31" shall be assigned to the operation and stop states, respectively.

In cases where the commercial-use package air conditioner outdoor unit belongs to a node and the unit is ready to accept control as soon as the node starts up, this property may be implemented as the fixed value (0x30).

9.22.3 Measured temperature value of outdoor unit property

This property indicates the measured temperature value of the place where the gas heat pump-type commercial air conditioner (outdoor unit) is installed in increments of 1 °C. The property value range shall be from 0x81 to 0x7D (–127 °C to 125 °C). When the property value of the actual device exceeds this property value range, the overflow code 0x7F shall be used. When said value is below the property value range, the underflow code 0x80 shall be used. If the measured value cannot be sent, 0x7E shall be used.

This property indicates normal values only when the operation status property value (0x80) is ON (0x30).

9.22.4 Measured cumulative gas consumption property

This property indicates the cumulative gas consumption in increments of 0,001 m³. The property value range shall be from 0x00000000 to 0x3B9AC9FF (0 m³ to 999 999,999 m³). In the event of a cumulative gas consumption overflow, the counting of the cumulative gas consumption shall be restarted from 0x00000000.

9.22.5 Group information property

Group information property values provide information to link air conditioner indoor units with air conditioner outdoor units. Air conditioner indoor units and air conditioner outdoor units with the same property values shall be connected using the same refrigerant piping.

9.22.6 Time slot operation factor setting property

The time slot operation factor shall be set for gas heat pump-type commercial air conditioners (outdoor units). The time slot operation factor setting valid/invalid designation, start time and end time for the operation factor setting, and operation factor shall be designated. When setting the time slot operation factor, the operation factor setting valid/invalid designation shall be set to "valid". When cancelling the already-set operation factor setting, set the operation factor setting valid/invalid designation to "invalid". If the operation factor setting valid/invalid designation is set to "invalid", values for the second and successive bytes shall have no meaning.

If the time slot operation factor with operation factor setting valid/invalid designation is set to "valid", it means that the operation factor is set every day, from the start time to the end time. Therefore, when finishing the operation factor setting, it is necessary to set the time slot operation factor with operation factor setting valid/invalid designation set to "invalid". If the end time value is larger than the start time value, the end time shall be interpreted as the time on the same day as the start time. Setting a value smaller than the start time shall be possible. In such a case, the end time shall be interpreted as the time on the day following the start time.

Only one time slot operation factor setting shall be set. If the time slot operation factor is set once again for a gas heat pump-type commercial air conditioner (outdoor unit) whose time slot operation factor has already been set, the time slot operation factor setting that has been designated at the later time shall be valid.

The operation factor shall be defined as 100 % when not being controlled, while being defined as 0 % when in suspended operation as an outdoor unit. The status "in suspended operation as an outdoor unit" means that the air conditioner function is suspended. However, unlike the "operation status" being "suspended", acquiring and controlling properties are acceptable. Therefore, the actual status of the device shall depend on actual implementation.

The operation factors that can be set may be restricted depending on the devices. If the operation factors that can be set are discrete, the nearest operation factors not exceeding the designated operation factor shall be set.

This property indicates the upper limit value (%) and the lower limit value (%) of the operation factor that can be set with the "time slot operation factor setting", and the operation factor step (%) that can be set between the upper and lower limit values. The lower limit of the operation factor shall not be higher than the upper limit or operation factor.

9.23 Range hood class specifications

The control commands of "range hood" are shown in Table 39.

Class code : 0x5A

Table 39 – List of range hood properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	—	Set	○	○	
		ON = 0x30, OFF = 0x31				Get	○		
Range hood automatic setting	0xBF	automatic/non-automatic	unsigned char	1 byte	—	Set/Get			
		automatic = 0x41, non-automatic = 0x42							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Ventilation air flow rate setting	0xA0	Ventilation air flow rate level and ventilation air flow rate Sets Automatic setting. Designates ventilation Air flow level in 8 steps. Ventilation air flow rate automatic status = 0x41 Ventilation air flow rate level = 0x31 to 0x38	unsigned char	1 byte	–	Set/Get	○		
Lighting operation setting	0xD0	Indicates lighting operation status. Lighting = 0x41, lights-out = 0x42, flashing = 0x43	unsigned char	1 byte	–	Set/Get		○	
Light source colour setting	0xD1	Light source colours shall be set. Light bulb colour = 0x41, white = 0x42, neutral white = 0x43, daylight colour = 0x44, other = 0x40	unsigned char	1 byte	–	Set/Get			
Brightness level setting	0xD2	Indicates brightness level in "%". 0x00 to 0x64 (0 % to 100 %)	unsigned char	1 byte	%	Set/Get			
Lighting mode setting	0xD6	Automatic/normal lighting/coloured lighting Automatic = 0x41, normal lighting = 0x42, coloured lighting = 0x43	unsigned char	1 byte	–	Set/Get		○	
When in coloured lighting mode RGB setting	0xE0	Used to set the RGB values when in the coloured lighting mode and acquire the current setting. 1st byte: R, 2nd byte: G, 3rd byte: B 0x00 to 0xFF (0 to 255) Minimum brightness = 0x00, maximum brightness = 0xFF	unsigned char×3	3 bytes	–	Set/Get			
Measured value of indoor temperature	0xC0	Indicates the measured value of indoor temperature in increments of 0,1 °C. 0xF554 to 0x7FFE (-273,2 °C to 3 276,6 °C)	signed short	2 bytes	0,1 °C	Get			
Measured value of outdoor temperature	0xC1	Indicates the measured value of outdoor temperature in increments of 0,1 °C. 0xF554 to 0x7FFE (-273,2 °C to 3 276,6 °C)	signed short	2 bytes	0,1 °C	Get			

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Measured value of supply air temperature	0xC2	Indicates the measured value of supply air temperature in increments of 0,1 °C.	signed short	2 bytes	0,1 °C	Get			
		0xF554 to 0x7FFE (-273,2 °C to 3 276,6 °C)							
Measured value of cooking temperature	0xC3	Indicates the measured value of cooking temperature in increments of 0,1 °C.	signed short	2 bytes	0,1 °C	Get			
		0xF554 to 0x7FFE (-273,2 °C to 3 276,6 °C)							
Measured value of indoor relative humidity	0xC4	Indicates measured value of indoor relative humidity in %.	unsigned char	1 byte	%	Get			
		0x00 to 0x64 (0 % to 100 %)							
Measured value of outdoor air humidity	0xC5	Indicates measured value of outdoor air humidity in %.	unsigned char	1 byte	%	Get			
		0x00 to 0x64 (0 % to 100 %)							
Human detection threshold level setting	0xC6	Specifies detection threshold level in 8 steps.	unsigned char	1 byte	–	Set/Get			
		0x31 to 0x38							
Human detection status	0xC7	Indicates human motion status.	unsigned char	1 byte	–	Get		○	
		human motion status found = 0x41, human motion status not found = 0x42							
Measured value of CO ₂ concentration	0xC8	Indicates the measured value of CO ₂ concentration in ppm.	unsigned short	2 bytes	ppm	Get			
		0x0000 to 0xFFFD (0 to 65 533)							
Gas detection threshold level setting	0xC9	Specifies gas detection threshold level in 8 steps.	unsigned char	1 byte	–	Set/Get			
		Detection threshold level = 0x31 to 0x38							
Gas detection status	0xCA	Indicates gas detection status.	unsigned char	1 byte	–	Get		○	
		Gas leak occurrence status found = 0x41, Gas leak occurrence status not found = 0x42							
Error detection mode	0xCB	Indicates that the range hood detected an error.	unsigned char	1 byte	–	Get			
		Motor error status = 0x41, rectifier panel detection status = 0x42, normal state = 0x43, other = 0x40							

9.23.2 Operation status property

This property indicates range hood operation/stop status.

Property values 0x30 and 0x31 shall be assigned to the operation and stop states, respectively.

9.23.3 Range hood automatic setting property

This property sets automatic/non-automatic for the range hood. (Automatic = 0x41, non-automatic = 0x42)

Automatic = 0x41 is a range hood-specific mode, since it assumes automatic operation (ON/OFF) including lighting operation, while automatic operation is effective. (Specifically, range hood operation is automated using the sensor threshold.)

When non-automatic = 0x42, automatic operation shall be inactive.

9.23.4 Ventilation air flow rate setting property

This property indicates ventilation air flow rate level and ventilation air flow rate automatic status setting. The property value of the ventilation air flow rate automatic status shall be 0x41. Specifies gas air flow rate level in 8 steps and has the property value 0x31 to 0x38.

Although the specific values for the air flow rate level are not specified, 0x31 shall be the minimum value, while 0x38 shall be the maximum air flow rate level.

9.23.5 Lighting operation setting property

The status of whether the lights mounted on the range hood are lit or not is indicated as: lighting = 0x41, lights-out = 0x42, flashing = 0x43.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.23.6 Light source colour setting property

This property sets current light source colour (light bulb colour / white / neutral white / daylight colour / other) and acquires setting status.

Those indicated as "other" have light source colours that do not fall into any of these light source colours. As for the property values adopted, devices implementing this class need only implement property values that can be adopted as their functions. For example, if an actual device equipped with this class is not equipped with the neutral white as one of its functions, there is no need to implement 0x43 for neutral white.

However, the value of this property when the light source colour setting value indicated by this property becomes unknown in an automatic state shall be 0xFD (setting value unknown).

This property shall be effective, even when the value of the "operation status" property (0x80) is OFF (0x31), and lighting operation setting (0xD0) is light-out (0x42).

9.23.7 Brightness level setting property

This property indicates current brightness level in "%" Used to set lighting level and acquire the current setting.

If the brightness level of the actual device is higher or lower than the "%" unit, the property of the actual device shall be assigned to the property value of "%" unit specified in this property.

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31), and lighting operation setting (0xD0) is OFF (0x42).

This property shall be effective even when the value of the "operation status" property (0x80) is OFF (0x31).

9.23.8 Lighting mode setting property

This property sets automatic/normal lighting/coloured lighting and acquires the current setting.

Automatic (0x41): the state where lighting equipment automatically controls normal lighting/coloured lighting setting using a lighting sensor and automatic dimming algorithm.

Normal lighting (0x42): the mode where the main light source is lit.

Coloured lighting (0x43): the mode where coloured lighting is lit.

It is acceptable if actual devices implementing this property only implement property values that can be adopted as their functions.

For example, if automatic function is not implemented, there is no need to implement 0x41 for automatic.

9.23.9 When in coloured lighting mode RGB setting property

This property sets RGB values when "lighting mode setting" (EPC = 0xD6) is in coloured lighting mode (0x43) and acquires the current setting.

Specific values of RGB values are not stipulated. As for the property values adopted, actual devices implementing this class need only implement property values that can be adopted as their functions. In the case where it is not possible to set RGB values using the value specified by this property, the closest value that can be set shall be set. When this property is implemented, the current setting for the lighting mode setting (EPC = 0xD6) can be set/acquired, even it is other than coloured lighting mode (0x43).

9.23.10 Measured value of indoor temperature property

This property indicates the measured value of indoor temperature in increments of 0,1 °C. The property value range shall be 0xF554 to 0x7FFE (–273,2 °C to 3 276,6 °C). When the property value of the actual piece of equipment is higher than the upper limit of the property value range, the overflow code 0x7FFF shall be used. When the property value is lower than the lower limit of the property value range, the underflow code 0x8000 shall be used.

9.23.11 Measured value of outdoor temperature property

This property indicates the measured value of outdoor temperature in increments of 0,1 °C. The property value range shall be 0xF554 to 0x7FFE (–273,2 °C to 3 276,6 °C). When the property value of the actual piece of equipment is higher than the upper limit of the property value range, the overflow code 0x7FFF shall be used. When the property value is lower than the lower limit of the property value range, the underflow code 0x8000 shall be used.

9.23.12 Measured value of supply air temperature property

This property indicates the measured value of supply air temperature in increments of 0,1 °C. The property value range shall be 0xF554 to 0x7FFE (–273,2 °C to 3 276,6 °C). When the property value of the actual piece of equipment is higher than the upper limit of the property value range, the overflow code 0x7FFF shall be used. When the property value is lower than the lower limit of the property value range, the underflow code 0x8000 shall be used.

9.23.13 Measured value of cooking temperature property

This property indicates the measured value of cooking temperature in increments of 0,1 °C. The property value range shall be 0xF554 to 0x7FFE (–273,2 °C to 3 276,6 °C). When the property value of the actual piece of equipment is higher than the upper limit of the property value range, the overflow code 0x7FFF shall be used. When the property value is lower than the lower limit of the property value range, the underflow code 0x8000 shall be used.

9.23.14 Measured value of indoor relative humidity property

This property indicates measured value of indoor relative humidity in increments of %. The property value range shall be 0x00 to 0x64 (0 % to 100 %). When the property value of the actual piece of equipment is higher than the upper limit of the property value range, the overflow code 0xFF shall be used. When the property value is lower than the lower limit of the property value range, the underflow code 0xFE shall be used.

9.23.15 Measured value of outdoor air humidity property

This property indicates measured value of outdoor air humidity in increments of %. The property value range shall be 0x00 to 0x64 (0 % to 100 %). When the property value of the actual piece of equipment is higher than the upper limit of the property value range, the overflow code 0xFF shall be used. When the property value is lower than the lower limit of the property value range, the underflow code 0xFE shall be used.

9.23.16 Human detection threshold level setting property

This property sets the threshold value that causes EPC = 0xC7 "Human detection status" to be set to "Found" (8-step). The minimum value is 0x31 and the maximum value is 0x38. No concrete value is specified for each level.

If the detection threshold of the actual device is higher or lower than the 8-step range, the property of the actual device shall be assigned to the property value of the 8 steps specified in this property.

9.23.17 Human detection status property

This property indicates whether a human motion status is found. This property value shall be maintained until the status changes.

Human motion status found = 0x41, human motion status not found = 0x42

9.23.18 Measured value of CO₂ concentration property

This property indicates the measured value of CO₂ concentration in increments of ppm (parts per million). The property value range shall be 0x0000 to 0xFFFFD (0 ppm to 65 533 ppm). When the property value of the actual piece of equipment is higher than the upper limit of the property value range, the overflow code 0xFFFF shall be used. When the property value is lower than the lower limit of the property value range, the underflow code 0xFFFFE shall be used. It is only required to implement the property values that are supported by the actual piece of equipment in which this class is implemented.

9.23.19 Gas detection threshold level setting property

This property sets the threshold level of gas detection in 8 steps that causes EPC = 0xCA "Gas detection status" to be set to "found". The minimum value is 0x31 and the maximum value is 0x38. No concrete value is specified for each level.

If the detection threshold of the actual device is higher or lower than the 8-step range, the property of the actual device shall be assigned to the property value of the 8 steps specified in this property.

9.23.20 Gas detection status property

This property indicates whether gas leakage is found or not. If EPC = 0xC9 "Gas detection threshold level setting" is implemented, this property is set to "found" when the detected gas exceeds the threshold.

9.23.21 Error detection mode property

This property indicates that the range hood detected an error.

Property value = 0x41 shall be used when the motor has an error status (when the motor has stopped rotating), while property value = 0x42, normal state = 0x43, and other states = 0x40 shall be used for rectifier panel detection status (when the rectifier panel opens).

If motor error status = 0x41 and rectifier panel detection status = 0x42 are operated, no ON (0x30) of operation status (0x80) or write request from ventilation air flow rate setting (0xA0) shall be accepted.

As stated in Table 40, this property indicates the range hood-specific errors of EPC = 0x88 "fault status" for device object super class requirements.

Table 40 – Range hood-specific errors of EPC = 0x88 "fault status"

Property	EPC = 0x88: Fault status
0x41/0x42/0x40	Fault status "Fault occurred"
0x43	Fault status "No fault occurred"

9.24 Electrically operated shade class specifications

9.24.1 General

The control commands of "electrically operated shade" are shown in Table 41.

Class group code : 0x02

Class code : 0x60

Table 41 – List of electrically operated shade properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	—	Set		○	
		ON = 0x30, OFF = 0x31				Get	○		
Fault description (Recoverable faults)	0x89	Fault description	unsigned short	2 bytes	—	Get		○	
		Lower order one byte Restarting the device by performing a reset operation = 0x02 Higher-order one byte Obstacle caught = 0x04 Recovery from outage = 0x05 Time out = 0x06 Battery low = 0x07 0x45 to 0xFF: Defined by user							
Timer operation setting	0x90	Used to specify the timer operation ON or OFF.	unsigned char	1 byte	—	Set/Get		○	
		ON = 0x41, OFF = 0x42							
Wind detection status	0xC2	Indicates whether wind is detected.	unsigned char	1 byte	—	Get		○	
		Wind = 0x41, No wind = 0x42							
Sunlight detection status	0xC3	Indicates whether sunlight is detected.	unsigned char	1 byte	—	Get		○	
		Sunlight = 0x41, No sunlight = 0x42							
Opening (extension) speed setting	0xD0	Specifies the normal opening (extension) speed by levels.	unsigned char	1 byte	—	Set/Get			
		Low = 0x41, Medium = 0x42, High = 0x43							
Closing (retraction) speed setting	0xD1	Specifies the normal closing (retraction) speed by three levels.	unsigned char	1 byte	—	Set/Get			
		Low = 0x41, Medium = 0x42, High = 0x43							
Operation time	0xD2	Specifies the operation time in seconds.	unsigned char	1 byte	sec- ond	Set/Get			
		0x00 to 0xFD (0 s to 253 s)							
Automatic operation setting	0xD4	Automatic operation ON or OFF.	unsigned char	1 byte	—	Set/Get		○	
		ON = 0x41, OFF = 0x42							
Open/close (extension/retraction) setting	0xE0	Open/close/stop	unsigned char	1 byte	—	Set/Get	○	○	
		Open = 0x41, close = 0x42, stop = 0x43							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
One-time closing (retraction) speed setting	0xEF	Used to specify the speed of single closing operation by three levels.	unsigned char	1 byte	–	Set/Get			
		Low = 0x41, Medium = 0x42, High = 0x43, None = 0x44							

9.24.2 Operation status property

This property indicates whether an electrically operated shade is ready to accept control commands (ON) or not (OFF). The property value is 0x30 for ON and 0x31 for OFF. If the installed electrically operated shade becomes ready to accept control requests at the same time of the node starting, this property may have the fixed value 0x30.

9.24.3 Fault description property

The description here is limited to what is not defined in the super class. This property acquires the description of recoverable faults about an electrically operated shade up to the detailed fault classification. The general fault classification shall be fixed at the lower-order byte, and 0x02 indicates a fault that can be recovered from by restarting the device by performing a reset operation in the super class classification. The detailed fault classification shall be fixed at the higher-order byte.

Obstacle caught = 0x04, Recovery from outage = 0x05, Time out = 0x06, Battery low = 0x07, 0x45 to 0xFF are defined by the user.

9.24.4 Timer operation setting property

The property value shall be 0x41 (ON) to enable timer operation that starts opening or closing at a time preset to the device or 0x42 (OFF) to disable timer operation. Then the contents of the setting are acquired.

9.24.5 Wind detection status property

This property indicates whether the wind speed has reached the level preset in the device. The value shall be 0x41 (Wind) when the level has been reached and 0x42 (No wind) when not.

9.24.6 Sunlight detection status property

This property indicates whether the illuminance has reached the level preset in the device. The value shall be 0x41 (Sunlight) when the level has been reached and 0x42 (No sunlight) when not.

9.24.7 Opening (extension) speed setting property

This property specifies the speed in the opening (extension) direction as a repeatedly available value and indicates the speed by three levels (Low/Medium/High).

9.24.8 Closing (retraction) speed setting property

This property specifies the speed in the closing (retraction) direction as a repeatedly available value and indicates the speed by three levels (Low/Medium/High).

9.24.9 Operation time property

When operation is set by the selective opening (extension) operation setting property (0xE9), this property sets the operation time of an electrically operated shade in seconds and acquires the contents of the setting. The operation time shall be 0 s to 253 s (0x00 to 0xFD).

9.24.10 Automatic operation setting property

The property value shall be set to 0x41 (ON) to enable the automatic operation of a device supporting automatic operation or 0x42 (OFF) to disable it. Then the contents of the setting are acquired.

9.24.11 Open/close (extension/retraction) operation setting property

This property sets the open/close (extension/retraction) or stops operation of an electrically operated shade and acquires the contents of the setting. The property value shall be 0x41 for open (extension), 0x42 for close (retraction), and 0x43 for stop. The target of operation setting by this property is the fully open position after open (extension) and the fully closed position after close (retraction). For a stop at any other position, stop operation shall be set (0x43) during operation or the selective opening (extension) operation setting property (0xE9) shall be used.

9.24.12 Degree-of-opening property

This property sets the degree-of-opening of an electrically operated shade within the range from 0 % to 100 % and acquires the operation setting when the value of the selective opening (extension) operation setting property (0xE9) is 0x41 (open). The value 0x00 (degree-of-opening: 0 %) shall represent the state nearest to the fully closed state (i.e., not fully closed) and the value 0x64 (degree-of-opening: 100 %) shall represent the fully open state. During the process of the shade reaching the target position, the target degree-of-opening setting position shall be returned. In the case where an "energy service" or a "home amenity service" shall be supported, the implementation of this property is mandatory.

9.24.13 Shade angle setting property

This property indicates the blind angle of an electrically operated blind from the indoor side in degrees.

In the case of a horizontal electric blind, the blind slats shall be regarded as being in the 90° and 0° positions when blind slats are horizontal and at the highest position inside the room (the light blocking side (convex face outward) is vertical), respectively.

In the case of a vertical electric blind, the blind slats shall be regarded as being in the 0° and 180° positions when the outdoor side surfaces of the blind slats are in the rightmost and leftmost positions as seen from the inside, respectively. The blind slats shall be regarded as being in the 90° position when they are at the midpoint between the 0° and 180° positions.

9.24.14 Open/close (extension/retraction) speed property

This property indicates the open/close (extension/retraction) speed by three levels (Low/Medium/High).

9.24.15 Electric lock setting property

This property locks or unlocks an electrically operated shade and acquires the lock status. The property value shall be 0x41 for the locked status and 0x42 for the unlocked status.

9.24.16 Remote operation setting status property

This property acquires whether an electrically operated shade permits or prohibits remote operation from outside. The value shall be 0x41 (ON) when remote operation from outside is permitted and 0x42 (OFF) when it is prohibited. The value may be fixed at 0x41 (ON) at installation to use an electrically operated shade always by remote operation, not independently.

9.24.17 Selective opening (extension) operation setting property

This property indicates the setting to operate or stop an electrically operated shade as specified by another property or device. The property value shall be 0x41 for operation by "Degree-of-opening level" (0xE1), 0x42 for operation in the opening (extension) direction by "Operation time" (0xD2), 0x43 for operation in the closing (retraction) direction by "Operation time setting value" (0xD2), and 0x44 for stop at a position stored independently by the electrically operated shade. User definition shall be permitted for a stop by opening (extension) level setting using a single signal.

9.24.18 Open/closed (extended/retracted) status property

This property acquires the open/closed (extended/retracted) status of an electrically operated shade. In the fully open (extended) status, the shade is stopped at the upper limit and the property value shall be 0x41. In the fully closed (retracted) status, the shade is stopped at the lower limit and the property value shall be 0x42. In the opening (extension) operation status, the shade is being operated in the opening (extension) direction and the property value shall be 0x43. In the closing (retraction) operation status, the shade is being operated in the closing (retraction) direction and the property value shall be 0x44. When the shade is stopped not at the upper or lower limit but halfway, the property value shall be 0x45.

9.24.19 One-time opening (extension) speed setting property

This property specifies the speed in the opening (extension) direction once only by three levels (Low/Medium/High) and acquires the contents of the setting. The value shall be 0x41 for low speed, 0x42 for medium speed, 0x43 for high speed, and 0x44 for no setting. After single operation at the speed set by this property, the value changes to 0x44. When the value of this property is 0x44, the operation speed is as set by the opening speed setting property.

9.24.20 One-time closing (retraction) speed setting property

This property specifies the speed in the closing (retraction) direction once only by three levels (Low/Medium/High) and acquires the contents of the setting. The value shall be 0x41 for low speed, 0x42 for medium speed, 0x43 for high speed, and 0x44 for no setting. After single operation at the speed set by this property, the value changes to 0x44. When the value of this property is 0x44, the operation speed is as set by the closing speed setting property.

9.25 Electrically operated rain sliding door/shutter class specifications

9.25.1 General

The control commands of "electrically operated rain sliding door/shutter" are shown in Table 42.

Class group code : 0x02

Class code : 0x63

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Electric lock setting	0xE5	Locks or unlocks an electric lock.	unsigned char	1 byte	–	Set/Get			
		Lock = 0x41, Unlock = 0x42							
Remote operation setting status	0xE8	Indicates whether remote operation is permitted or prohibited.	unsigned char	1 byte	–	Get		○	
		ON (permitted) = 0x41 OFF (prohibited) = 0x42							
Selective degree of opening setting	0xE9	Sets a stop at a specified value.	unsigned char	1 byte	–	Set/Get		○	
		Degree-of-opening setting position: Open = 0x41 Operation time setting value: Open = 0x42 Operation time setting value: Close = 0x43 Local setting position = 0x44 Slit degree-of-opening setting = 0x45 Hereinafter, defined by user (Shortcut to degree-of-opening setting, etc.)							
Open/closed status	0xEA	Indicates the open/closed status.	unsigned char	1 byte	–	Get		○	
		Fully open = 0x41, Fully closed = 0x42, Opening = 0x43, Closing = 0x44, Stopped halfway = 0x45							
Slit degree of opening	0xED	Used to specify the degree-of-opening by 8 levels.	unsigned char	1 byte	–	Set/Get			
		0x31 to 0x38							
One-time opening speed setting	0xEE	Used to specify the speed of single opening operation by three levels.	unsigned char	1 byte	–	Set/Get			
		Low = 0x41, Medium = 0x42, High = 0x43, None = 0x44							
One-time closing speed setting	0xEF	Used to specify the speed of single closing operation by three levels.	unsigned char	1 byte	–	Set/Get			
		Low = 0x41, Medium = 0x42, High = 0x43, None = 0x44							

It is recommended that the electrically operated rain sliding door/shutter class is used when the shutter is mounted with windows, sliding doors, etc. and the electrically operated shutter class is used when the shutter is mounted alone.

9.25.2 Operation status property

This property indicates whether the electrically operated rain sliding door/shutter is in the ON state (i.e. the electrically operated rain sliding door/shutter responds to user operation) or OFF state. The property value shall be 0x30 for ON and 0x31 for OFF. If the installed electrically operated rain sliding door/shutter becomes ready to accept control requests at the same time of the node starting, this property may have the fixed value 0x30.

9.25.3 Fault description property

The description here is limited to what is not defined in the super class. This property acquires the description of recoverable faults about an electrically operated rain sliding door/shutter up to the detailed fault classification. The general fault classification shall be fixed at the lower-order byte, and 0x02 indicates a fault that can be recovered from by restarting the device by performing a reset operation in the super-class classification. The detailed fault classification shall be fixed at the higher-order byte.

Obstacle caught = 0x04, Recovery from outage = 0x05, Time out = 0x06, Battery low = 0x07, 0x45 to 0xFF are defined by the user.

9.25.4 Timer operation setting property

The property value shall be 0x41 (ON) to enable timer operation that starts opening or closing at a time preset to the device, or 0x42 (OFF) to disable timer operation. Then, the contents of the setting are acquired.

9.25.5 Opening speed setting property

This property specifies the speed in the opening direction as a repeatedly available value and indicates the speed by three levels (Low/Medium/High).

9.25.6 Closing speed setting property

This property specifies the speed in the closing direction as a repeatedly available value and indicates the speed by three levels (Low/Medium/High).

9.25.7 Operation time setting property

When operation is set by the selective degree-of-opening setting property (0xE9), this property sets the operation time of an electrically operated rain sliding door/shutter in seconds and acquires the contents of the setting. The operation time shall be 0 s to 253 s (0x00 to 0xFD).

9.25.8 Open/close operation setting property

This property sets the opening/closing or stop operation of an electrically operated rain sliding door/shutter and acquires the contents of the setting. The property value shall be 0x41 for opening, 0x42 for closing, and 0x43 for stop. The target of operation setting by this property is the fully open position after opening and the fully closed position after closing. For a stop at any other position, stop operation shall be set (0x43) during operation or the selective degree-of-opening setting property (0xE9) shall be used.

9.25.9 Degree-of-opening setting property

When "Degree-of-opening setting position: Open" (0x41) is set by the selective degree-of-opening property (0xE9), this property sets the degree-of-opening of an electrically operated rain sliding door/shutter within the range from 0 % to 100 % and acquires the operation result. The property value shall be 0x00 (Degree-of-opening: 0 %) for a status closest to the closed status (not fully closed) and 0x64 (Degree-of-opening: 100 %) for a status of the greatest opening (fully open). During the process of reaching the target position, the target of degree-of-opening setting position shall be returned.

9.25.10 Blind angle setting property

This property indicates the blind angle of an electrically operated rain sliding door/shutter from the indoor side in degrees.

In the case of a horizontal blind, the slats are horizontal at 90° and at the highest position inside the room (the light blocking side (convex face outward) is vertical) at 0°.

In the case of a vertical blind, the slats outside the room are at the rightmost position at 0° when viewed from inside the room, at the leftmost position at 180°, and in the middle between them at 90°.

9.25.11 Opening/closing speed setting property

This property indicates the opening/closing speed of an automatically operated rain sliding door/shutter by three levels (Low/Medium/High).

9.25.12 Electric lock setting property

This property locks or unlocks an electrically operated rain sliding door/shutter and acquires the lock status. The property value shall be 0x41 for the locked status and 0x42 for the unlocked status.

9.25.13 Remote operation setting status property

This property acquires whether an electrically operated rain sliding door/shutter permits or prohibits remote operation from outside. The value shall be 0x41 (ON) when remote operation from outside is permitted and 0x42 (OFF) when it is prohibited. The value may be fixed at 0x41 (ON) at installation to use an electrically operated rain sliding door/shutter always by remote operation, not independently.

9.25.14 Selective degree-of-opening setting property

This property indicates the setting to operate or stop an electrically operated rain sliding door/shutter as specified by another property or device. The property value shall be 0x41 for operation by "Degree-of-opening setting" (0xE1), 0x42 for operation in the opening direction by "Operation time setting value" (0xD2), 0x43 for operation in the closing (retraction) direction by "Operation time setting value" (0xD2), 0x44 for stop at a position stored independently by the electrically operated rain sliding door/shutter, and 0x45 for slit operation by the slit degree-of-opening setting property (0xED). User definition shall be permitted for a stop by opening level setting using a single signal.

9.25.15 Open/closed status property

This property acquires the open/closed status of an electrically operated rain sliding door/shutter. In the fully open status, the rain sliding door/shutter is stopped at the upper limit and the property value shall be 0x41. In the fully closed status, the rain sliding door/shutter is stopped at the lower limit and the property value shall be 0x42. When the rain sliding door/shutter has a slit, the slit should also be closed. In the opening operation status, the rain sliding door/shutter is being operated in the opening direction and the property value shall be 0x43. In the closing operation status, the rain sliding door/shutter is being operated in the closing direction and the property value shall be 0x44. When the rain sliding door/shutter is stopped not at the upper or lower limit but halfway, the property value shall be 0x45.

9.25.16 Slit degree-of-opening property

This property indicates the degree of slit opening of a rain sliding door/shutter with a slit by 8 levels and acquires the contents of the setting. The status on each level is not defined specifically. However, the property value shall be 0x31 for the most open status and 0x38 for the most closed status (not fully closed).

This property specifies the speed in the opening direction once only by three levels (Low / Medium / High) and acquires the contents of the setting. The value shall be 0x41 for low speed, 0x42 for medium speed, 0x43 for high speed, and 0x44 for no setting. After single operation at the speed set by this property, the value changes to 0x44. When the value of this property is 0x44, the operation speed is as set by the opening speed setting property.

This property specifies the speed in the closing direction once only and by three levels (Low / Medium / High) and acquires the contents of the setting. The value shall be 0x41 for low speed, 0x42 for medium speed, 0x43 for high speed, and 0x44 for no setting. After single operation at the speed set by this property, the value changes to 0x44. When the value of this property is 0x44, the operation speed is as set by the closing speed setting property.

9.26.1 General

Class group code : 0x02

Class code : 0x6B

Table 43 – List of electric water heater properties

[illegible]

Property name	EPC	Contents of property Value range (decimal notation)	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
Water heating temperature setting	0xB3	Used to specify (in °C) the temperature of heated water to be achieved, and to acquire the current setting.	unsigned char	1 byte	°C	Set/Get			
		0x00 to 0x64 (0 °C to 100 °C)							
Manual water heating stop days setting	0xB4	Used to specify manually the number of days to stop "automatic water heating".	Unsigned char	1 byte	day	Set/Get			
		0x00 to 0xFC (= 0 days to 252 days) No time limit: 0xFD							
Relative time setting value for manual water heating OFF	0xB5	Timer value, HH:MM	unsigned char × 2	2 bytes	–	Set/Get			
		0x00 to 0x17: 0x00 to 0x3B (= 0 h to 23 h):(= 0 min to 59 min)							
Tank operation mode setting	0xB6	Used to specify the setting of operation mode.	unsigned char	1 byte	–	Set/Get			
		Standard = 0x41 Saving = 0x42 Extra = 0x43							
Daytime reheating permission setting	0xC0	Used to specify whether or not to permit daytime reheating, and to acquire the current setting.	unsigned char	1 byte	–	Set/Get	○		
		Daytime reheating permitted: 0x41 Daytime reheating not permitted: 0x42							
Measured temperature of water in water heater	0xC1	Indicates the current temperature of the water in the water heater.	unsigned char	1 byte	°C	Get			
		0x00 to 0x64 (0 °C to 100 °C)							
Alarm status	0xC2	Indicates the status of an alarm.	unsigned char × 4	4 bytes	–	Get		○	
		First byte: Bit 0: Out of hot water 0 Normal 1 Alarm Bit 1: Water leaking 0 Normal 1 Alarm Bit 2: Water frozen 0 Normal 1 Alarm Bits 3 to 7: reserved for future use 2nd to 4th byte: reserved for future use							
Hot water supply status	0xC3	Indicates the status of supplying hot water.	unsigned char	1 byte	–	Get	○	○	
		Supplying hot water = 0x41 Not supplying hot water = 0x42							
Relative time setting for keeping bath temperature	0xC4	Timer value HH:MM	unsigned char × 2	2 bytes	–	Set/Get			
		0x00 to 0x17: 0x00 to 0x3B (= 0 h to 23 h):(= 0 min to 59 min)							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Manual lukewarm water temperature lowering function setting	0xE6	Used to specify whether or not to use the "lukewarm water temperature lowering" function, and to acquire the current setting. "Lukewarm water temperature lowering" function ON = 0x41 "Lukewarm water temperature lowering" function OFF = 0x42	unsigned char	1 byte	–	Set/Get			
Bath water volume setting 1	0xE7	Used to specify the bath water volume in litres, and to acquire the current setting. 0x00 to 0xFD (0 litres to 253 litres)	unsigned char	1 byte	litre	Set/Get			
Bath water volume setting 2	0xE8	Used to specify the bath water volume by selecting a level from the 8 predefined levels, and to acquire the current setting. 0x31 to 0x38	unsigned char	1 byte	–	Set/Get			
Bathroom priority setting	0xE9	Used to specify whether or not to use the function of "priority bathroom." Priority bath ON = 0x41 Priority bath OFF = 0x42	unsigned char	1 byte	–	Get			
Bath operation status monitor	0xEA	Indicates the status of bath operation. Filling hot water = 0x41 Stopped = 0x42 Keeping temperature = 0x43	unsigned char	1 byte	–	Get		○	
Bath water volume setting 3	0xEE	Used to specify the bath water volume in litres, and to acquire the current setting. 0x0000 to 0xFFFD (0 litres to 65 533 litres)	unsigned short	2 bytes	litre	Set/Get			
Bath water volume setting 4	0xD4	The bath hot water volume is specified by a number of steps. 0x01 to 0xFF	unsigned char	1 byte	–	Set/Get			
Bath water volume setting 4 Maximum settable level	0xD5	The maximum settable level is the top step of Bath water volume setting 4. 0x01 to 0xFF	unsigned char	1 byte	–	Get			
Sound volume setting	0xD6	Used to set the sound volume output from the operating units and to acquire the setting status. 0x00 to 0x64 (0 to 100)	unsigned char	1 byte	%	Set/Get			
Mute setting	0xD7	Used to set the volume mute status output from the operating units and to acquire the setting status. Mute ON = 0x30, Mute OFF = 0x31	unsigned char	1 byte	–	Set/Get			

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Remaining hot water volume	0xD8	Indicates the remaining hot water volume in litres. 0x0000 to 0xFFFF (0 litres to 65 533 litres)	unsigned short	2 bytes	litre	Get			
Surplus electric energy prediction value	0xD9	Indicates a series of predicted surplus electric energy in every 1-h, for 24-hours starting from a future time. The byte order is big-endian. 1st to 3rd byte: Starting date and time MM: DD: hh 4th to 51st byte: Predicted surplus electric energy in every 1-h slot (24 slots, 2 bytes each) -327 670 to +327 650 The value 0x8000 means no value available.	Month, date, hour unsigned char × 3 + short × 24	51 bytes	10 Wh	Set/Get			
Rated power consumption of HP unit in wintertime	0xDB	Indicates the rated power consumption of the heat pump in wintertime (Dec, Jan, Feb, Mar) to supply hot water. 0x0000 to 0xFFFF (0 to 65 533)	unsigned short	2 bytes	W	Get			
Rated power consumption of HP unit in in-between seasons	0xDC	Indicates the rated power consumption of the heat pump in in-between seasons (Apr, May, Oct, Nov) to supply hot water 0x0000 to 0xFFFF (0 to 65 533)	unsigned short	2 bytes	W	Get			
Rated power consumption of HP unit in summertime	0xDD	Indicates the rated power consumption of the heat pump in summertime (Jun, Jul, Aug, Sep) to supply hot water 0x0000 to 0xFFFF (0 to 65 533)	unsigned short	2 bytes	W	Get			
ON timer reservation setting	0x90	Reservation ON/OFF Reservation ON = 0x41 Reservation OFF = 0x42	unsigned char	1 byte	–	Set/Get			
ON timer setting	0x91	ON timer setting (HH:MM) 0 to 0x17: 0 to 0x3B (= 0 to 23): (= 0 to 59)	unsigned char x 2	2 bytes	–	Set/Get			
Participation in energy shift	0xC7	Indicates a response in energy shift. The value is set when a value is determined at participation request and cleared at the heating shift time (0x00). Participation / non-participation (0x01 / 0x00)	unsigned char	1 byte	–	Set/Get	○		a

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Consumption of electric energy per hour 1	0xCC	Indicates electric energies that the HP water heater consumes per hour when shifting to "daytime heating shift time 1". The value is set when a value is determined at a time to determine consumption of electric energy at every shift time and a data at every time is cleared (0x0000) at the daytime heating shift time 1. 0x0000 to 0xFFFD (0 W to 65 533 W) When shifting at 10:00, 13:00, 15:00, and 17:00 0x0000: cleared	unsigned short x 4	8 bytes	Wh	Get	○		a
Daytime heating shift time 2	0xCD	Indicates "daytime heating shift time" for the second time. The value when no setting shall be defined as 0x00. 0x0A: 10:00, 0x0B: 11:00, 0x0C: 12:00 0x0D: 13:00, 0x0E: 14:00, 0x0F: 15:00, 0x10: 16:00 0x11: 17:00, 0x00: cleared	unsigned char	1 byte	–	Set/Get	○		a b
Expected electric energy at daytime heating shift time 2	0xCE	Indicates the required electric energy for heating at "daytime heating shift time 2": predicted at "standard time to start heating". Indicates electric energies in Wh according to shift time, corresponding to these times in sequence: 13:00, 15:00, and 17:00. The value is set when a value is determined at a time to determine consumption of electric energy at every shift time and a data at every time is cleared (0x00000000) at the daytime heating shift time 2. 0x00000000 to 0xFFFFFFFF (0 W to 4 294 967 293 W) 13:00, 15:00, 17:00	unsigned long x 3	12 bytes	Wh	Get	○		a b

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Consumption of electric energy per hour 2	0xCF	Indicates electric energies that the HP water heater consumes per hour when shifting to "daytime heating shift time 2". The value is set when a value is determined at a time to determine consumption of electric energy at every shift time and a data at every time is cleared (0x0000) at the daytime heating shift time 2.	unsigned short × 3	6 bytes	Wh	Get	○		a b
		0x0000 to 0xFFFF (0 W to 65 533 W) When shifting at 13:00, 15:00, and 17:00 0x0000: cleared							
<									

This class is intended for use with storage-type electric water heaters (including the heat pump type). For instantaneous water heaters that use fossil fuels such as gases and kerosene, it is recommended that the "Instantaneous water heater" class (Class group code 0x02, Class code 0x72) be used.

When electric water heaters include both the functions of a water heater that has the function of mixing cold water from the water supply mains with hot water that has been heated by means of heat exchange using a heat source (such as an electric heater or heat pump and the like) and stored as hot water, and a bath water heater that has the function of circulating hot or cold water filled in the bathtub while heating by means of heat exchange using the bath heat source unit, or the function of adding stored hot water to the bathtub, these two shall be distinguished by using the terms "water heaters" (or water heating) and "bath water heaters (or bath water heating)."

9.26.2 Operation status property

This property indicates whether the function native to this class is operating or not (ON/OFF). In the node mounting this class, if the function of this class is started concurrently with the start of node operation, this property may be implemented at a fixed value of 0x30 (Operation status ON).

9.26.3 Automatic water heating setting property

This property sets whether the water heating operation in the tank using electric power is performed automatically or not. The automatic water heating function shall be 0x41, the non-automatic water heating function shall be 0x42 and the non-automatic water heating function stopped shall be 0x43.

9.26.4 Automatic water temperature control setting property

This property indicates as automatic or non-automatic the temperature value of the electric hot water in the tank depending on the algorithm, etc. Automatic shall be 0x41. Non-automatic shall be 0x42.

9.26.5 Water heater status property

This property indicates whether the electric hot water in the tank is presently being heated or not. Presently heating shall be 0x41. Not heating shall be 0x42.

9.26.6 Water heating temperature setting property

This property indicates the °C setting value for heating water in the tank. The property value range shall be 0x00 to 0x64 (0 °C to 100 °C). 0xFD shall be returned when the "Water heating temperature setting" is unknown or unfixed because the "Automatic water temperature control" setting has been specified.

9.26.7 Manual water heating stop days setting property

This property sets the number of days until return to "Automatic water heating" (= 0x41) when "Automatic water heating setting" (EPC = 0xB0) is "Manual water heating stop" (= 0x43), and acquires the updated number of days. The setting range shall be 0x00 to 0xFC (0 days to 252 days). When the number of days until return to "Automatic water heating" (= 0x41) is infinite, the property value shall be 0xFD. When the property value of the actual device is higher than the upper limit of the value range, the overflow code 0xFF shall be used. When the property value is lower than the lower limit of the value range, the underflow code 0xFE shall be used. This property is valid only when "Automatic water heating setting" (EPC = 0xB0) is "Manual water heating stop" (= 0x43).

9.26.8 Relative time setting value for manual water heating OFF property

This property indicates the time when "Automatic water heating setting" (EPC = 0xB0) returns from "Manual water heating" (= 0x42) to "Automatic water heating" (= 0x41) as a relative time and acquires the updated time. The data format is HH: 0x00 to 0x17 (0 to 23) and MM: 0x00 to 0x3B (0 to 59). The property value is HHMM in order from the highest-order byte. This property is valid only when "Automatic water heating setting" (EPC = 0xB0) is "Manual water heating" (= 0x42).

9.26.9 Tank operation mode setting property

This property indicates the setting of the operation mode for water heating in the tank. This property is valid only when "Automatic water heating setting" (EPC = 0xB0) is "Automatic water heating: 0x41." The property value is 0x41 for Standard, 0x42 for Saving, and 0x43 for Extra.

Saving: In this mode, less hot water is available than in Standard mode and the power consumption is smaller.

Extra: In this mode, more hot water is available than in Standard mode and the power consumption is greater.

9.26.10 Daytime reheating permission setting property

This property indicates permission / prohibition of the permission setting for daytime reheating of the water in the tank. Daytime reheating permission shall be 0x41. Daytime reheating prohibition shall be 0x42.

9.26.11 Measured temperature of water in water heater property

This property indicates the temperature in °C of the hot water inside the tank at the present time. The property value range shall be 0x00 to 0x64 (0 °C to 100 °C).

9.26.12 Alarm status property

The following alarms are defined. The value of each status is shown in Figure 61.

Out of hot water: if boiling prohibition is set or the possibility of a hot water shortage is detected during boiling control, this alarm is output.

Water leaking: if a continuous hot water outflow longer than usual daily use is detected, this alarm is output.

Water frozen: if a possibility of freezing inside equipment or external piping is detected, this alarm is output.

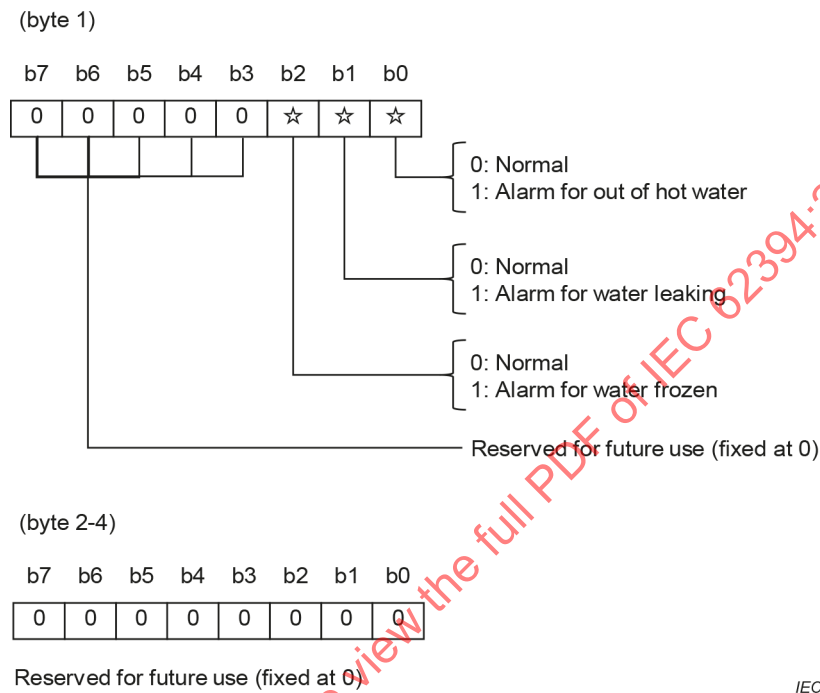


Figure 61 – Value of alarm status

9.26.13 Hot water supply status property

This property indicates whether hot water is supplied from a tap in the kitchen or a shower in the bathroom. The property value shall be 0x41 for "Supplying hot water" and 0x42 for "Not supplying hot water." This property does not apply to hot water for a bath.

For "Life watching service," "Announcement at status change" is mandatory.

9.26.14 Relative time setting for keeping bath temperature property

This property sets the hot water keeping time of "Bath operation status monitor" (EPC = 0xEA) as a relative value. The data format is HH: 0x00 to 0x17 (0 to 23) and MM: 0x00 to 0x3B (0 to 59). The property value is HHMM in order from the highest-order byte.

9.26.15 Temperature of supplied water setting property

This property indicates the temperature setting in °C for the electric water heater supply to a hot water supply terminal. The property value range shall be 0x00 to 0x64 (0 °C to 100 °C).

9.26.16 Bath water temperature setting property

This property indicates the bath water heating temperature setting in °C. The property value range shall be 0x00 to 0x64 (0 °C to 100 °C).

This property can double as a property for the bath heat keeping temperature when bath automatic mode is implemented in a water heater.

9.26.17 Hot water volume setting property

This property specifies the target volume of hot water in % relative to tank capacity. The property value range shall be 0x00 to 0x64 (0 % to 100 %).

9.26.18 Measured amount of water remaining in tank property

This property indicates the measured amount of water left in the tank in litres. The property value range shall be 0x0000 to 0xFFFFD (0 litres to 65 533 litres). When the property value of the actual device is higher than the upper limit of the property value range, the overflow code 0xFFFF shall be used. When the property value is lower than the lower limit of the property value range, the underflow code 0xFFFE shall be used.

9.26.19 Tank capacity property

This property indicates the tank capacity in litres. The property value range shall be 0x0000 to 0xFFFFD (0 litres to 65 533 litres). When the property value of the actual device is higher than the upper limit of the property value range, the overflow code 0xFFFF shall be used. When the property value is lower than the lower limit of the property value range, the underflow code 0xFFFE shall be used.

9.26.20 Automatic bath water heating mode setting property

This property indicates whether the bath automatic mode is ON or OFF. The property value shall be 0x41 (bath automatic mode ON) or 0x42 (bath automatic mode OFF). In the case where a "mobile service" shall be supported, the implementation of this property is mandatory.

Because of specification differences between water heaters, the definition of bath automatic operation mode shall depend on the implementation. In general, the mode refers to a series of operations of "supplying hot water, adding hot water, reheating, and keeping bath temperature" or "unplugging (draining), washing, plugging, supplying hot water, adding hot water, reheating, and keeping bath temperature."

9.26.21 Manual bath reheating operation setting property

This property indicates whether bath reheating is ON or OFF. The property value shall be 0x41 for "Bath reheating ON" and 0x42 for "Bath reheating OFF."

9.26.22 Manual bath hot water addition function setting property

This property indicates whether the bath hot water adding operation is ON or OFF. The property value shall be 0x41 (bath hot water adding operation ON) or 0x42 (bath hot water adding operation OFF).

9.26.23 Manual lukewarm water temperature lowering function setting property

This property indicates whether the bath hot water temperature lowering operation is ON or OFF. The value 0x41 indicates that the bath hot water temperature lowering operation is ON. The value 0x42 indicates that the bath hot water temperature lowering operation is OFF. When the bath hot water temperature lowering operation is ON, water will be added to the bath to lower the bath hot water temperature.

9.26.21 "Manual bath reheating operation setting," 9.26.22 "Manual bath hot water addition function setting," and 9.26.23 "Manual lukewarm water temperature lowering function setting" are possible, irrespective of 9.26.20 "Automatic bath water heating mode setting," except when the bath is being filled with hot water.

9.26.24 Bath water volume setting 1 property

This property indicates the bath hot water volume in litres. The property value range shall be 0x00 to 0xFD (0 litres to 253 litres). When the property value of the actual device is higher than the property value range, the overflow code 0xFF shall be used. When the property value is lower than the property value range, the underflow code 0xFE shall be used.

9.26.25 Bath water volume setting 2 property

This property sets the bath hot water volume. Eight different levels are available. The values 0x31 and 0x38 represent the minimum and maximum settings, respectively. Specific volume values for the 8 different levels are not stipulated.

9.26.26 Bathroom priority setting property

This property indicates whether a water heater is controlled or operated with priority to bath. The property value shall be 0x41 for Priority to bath ON and 0x42 for Priority to bath OFF. For safety, only Get shall be supported. The contents of priority shall depend on the implementation.

Example of device implementation: when Priority to bath is ON, the temperature of hot water can be changed only from the remote controller in the bathroom. It is prohibited to change the water temperature from any other remote controller.

9.26.27 Bath operation status monitor property

This property monitors the status of a bathtub in bath automatic mode.

When bath automatic mode is set (ON: 0x41), the bathtub status is monitored. The property value shall be 0x41 for "Filling hot water," 0x43 for "Keeping temperature," and 0x42 for "Stopped."

This property indicates the value of "Automatic bath water heating mode setting (EPC = 0xE3)" is Automatic ON (0x41).

Filling hot water (0x41): including reheating up to the target temperature after filling.

Keeping temperature (0x43): including water adding and reheating while keeping the temperature.

Bath operation status monitor property indicates "Stopped" when bath automatic mode is set to OFF.

9.26.28 Bath water volume setting 3 property

This property is used to specify the bath water volume in litres, and to acquire the current setting. The property value range shall be 0x0000 to 0xFFFFD (0 litres to 65 533 litres). When the property value of the actual device is higher than the upper limit of the property value range, the overflow code 0xFFFF shall be used. When the property value is lower than the lower limit of the property value range, the underflow code 0xFFFE shall be used.

9.26.29 Bath water volume setting 4 property

This property sets the bath water volume. The minimum value shall be 0x01 and the maximum value shall be "Bath water volume setting 4 – Maximum settable level." No actual value is specified for each level. This property is related to "Bath water volume setting 4 – Maximum settable level."

9.26.30 Bath water volume setting 4 – Maximum settable level property

This property indicates the maximum settable level of Bath water volume setting 4. The minimum value shall be 0x01 and the maximum value shall be 0xFF. No actual value is specified for each level. This property is related to "Bath water volume setting 4."

9.26.31 Sound volume setting property

"Set" of this property is used to set the volume of operating sounds, voice guidance, notification melodies, interphone and other outputs from remote controllers and other operating units, etc.

"Get" of this property is used to acquire the value of the current sound volume setting.

This property indicates the volume value by percentage. The value shall be 0 (0x00) for the minimum volume and 100 (0x64) for the maximum volume of each device.

9.26.32 Mute setting property

"Set" of this property is used to set the volume mute output from operating units ON and OFF.

"Get" of this property is used to acquire the value of the current mute status.

Mute ON indicates that voice is not output, mute OFF indicates that voice is output.

Property values 0x30 and 0x31 correspond to mute ON and OFF, respectively.

The correlation between the "mute setting" property and the "volume setting" property shall depend on implementation.

EXAMPLE 1

If the value of the volume setting property is 20 when the mute function is OFF, the value of the volume setting property remains unchanged at 20 even after the mute function is turned ON. On the other hand, when the mute function is ON, the value of the volume setting property can be 0 in some cases.

EXAMPLE 2

If the value of the volume setting property is 20 when the mute function is OFF, the value of the volume setting property remains 20 even after the mute function is turned from OFF to ON and back to OFF. On the other hand, the value of the volume setting property can be 0.

9.26.33 Remaining hot water volume property

This property indicates, in increments of litres, the volume of hot water that can be supplied by an electric water heater to a tap in the kitchen, a shower in the bathroom or other hot water outlet. The property value range shall be 0x0000 to 0xFFFFD (0 litres to 65 533 litres). If the property values of actual devices exceed the property value range, the overflow code 0xFFFF shall be used. If the property values of actual devices are lower than the lower limit of the property value range, the underflow code 0xFFFFE shall be used.

9.26.34 Surplus electric energy prediction value property

The "Surplus electric energy prediction value" is the value obtained upon subtracting the predicted electric energy consumption from the predicted electric energy generation amount of an electric power system to which an electric water heater is connected, and indicates a future 24-h period, including the time that serves as a base point, in increments of one hour in time series, beginning with the high-order byte.

The predicted electric energy consumption of an electric water heater that is subject to control is not included.

If there are multiple electric water heaters, there is to be only one electric water heater that is subject to control, which can be set in the controller instance.

Although the time at which to set the surplus electric energy prediction value is not specified, it is recommended for the value to be set before night-time for night devices.

9.26.35 Rated power consumption of HP unit in wintertime property

This property indicates the rated power consumption of the heat pump in wintertime (to supply hot water at 65 °C from water at 9 °C) in watts. The value range for this property shall be from 0x0000 to 0xFFFFD (from 0 to 65 533). When the property value of the actual device is higher than the upper bound of the value range, 0xFFFF (overflow code) shall be used. When the property value of the actual device is lower than the lower bound of the value range, 0xFFFE (underflow code) shall be used.

9.26.36 Rated power consumption of HP unit in in-between seasons property

This property indicates the rated power consumption of the heat pump in in-between seasons (to supply hot water at 65 °C from water at 17 °C) in watts. The value range for this property shall be from 0x0000 to 0xFFFFD (from 0 to 65 533). When the property value of the actual device is higher than the upper bound of the value range, 0xFFFF (overflow code) shall be used. When the property value of the actual device is lower than the lower bound of the value range, 0xFFFE (underflow code) shall be used.

9.26.37 Rated power consumption of HP unit in summertime property

This property indicates the rated power consumption of the heat pump in summertime (to supply hot water at 65 °C from water at 24 °C) in watts. The value range for this property shall be from 0x0000 to 0xFFFFD (from 0 to 65 533). When the property value of the actual device is higher than the upper bound of the value range, 0xFFFF (overflow code) shall be used. When the property value of the actual device is lower than the lower bound of the value range, 0xFFFE (underflow code) shall be used.

9.26.38 ON timer reservation setting property

This property indicates whether the bath automatic mode reservation is ON or OFF. The property value shall be 0x41 (reservation ON) or 0x42 (reservation OFF). This property is related to the "set value of ON timer time".

9.26.39 ON timer setting property

When the "ON timer reservation setting" is ON, this property indicates the time at which the bath automatic mode setting (EPC = 0xE3) turns ON (0x41). The time is indicated in hours and minutes (hour: 0x00 to 0x17 (0 to 23); minute: 0x00 to 0x3B (0 to 59)). The property value shall sequentially indicate the hours and minutes, beginning with the high-order byte.

9.26.40 Participation in energy shift property

The controller shall set a response to energy shift for the following day, until time to determine participation request.

Participation/non-participation (0x01/0x00).

Values other than the above are nullified (deemed as 0x00) and do not participate in energy shift.

HP water heater shall incorporate and fix values of this property at the time of determining participation request. Values incorporated after the time above are nullified and not to be carried out. The values of this property shall be set as "non-participation: 0x00" to daytime heating shift time 1 (devices with an energy shift) or daytime heating shift time 2 (devices with two energy shifts).

In cases where daytime heating shift time 1 (devices with an energy shift) or daytime heating shift time 2 (devices with two energy shifts) is set, energy shift participation property cannot be changed from the time to determine participation request to the daytime heating shift time 1 (devices with an energy shift), or during the daytime heating shift time 2 (devices with two energy shifts) as shown in Figure 62.

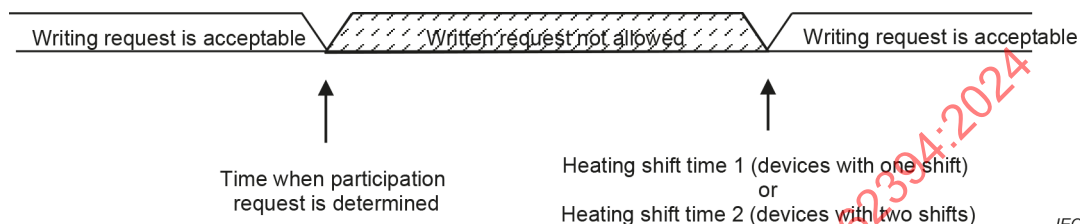


Figure 62 – Period that writing request is unacceptable

HP water heater can participate in energy shifts only when automatic heating setting is set to "automatic".

This property shall be changed to "non-participation" when the heating automatic setting property is set to "manual" or "manual stop", when the energy shift participation status property is set to "participation", as shown in Table 44.

Table 44 – Property change according to both heating automatic setting property and energy shift participation status property

Event		Period that writing request is unacceptable	
		Participation (0x01)	Non-Participation (0x00)
Heating Automatic setting	Automatic	Participation (energy shift)	Non-participation (automatic)
	Heating (manual)	Non-participation (manual heating)	Non-participation (manual heating)
	Heating manual stop	Non-participation (heating manual stop)	Non-participation (heating manual stop)

NOTE The device operates as a night-time heat accumulator as usual when it is not participating in energy shifts.

9.26.41 Standard time to start heating property

HP water heaters shall return to the standard time to start heating determined at the time of the energy shift contract established between the service provider and user.

The time to return shall be each of the following hours on the hour between 20:00 and 1:00:

20:00, 21:00, 22:00, 23:00, 24:00, 01:00 (0x14, 0x15, 0x16, 0x17, 0x18, 0x01)

Values other than the above are nullified and do not implement heating shift.

This property setting has no meaning if energy shift participation status is set to "non-participation".

9.26.42 Number of energy shifts property

Returns the number of energy shift times (daytime heating) that the device carries out.

The number of energy shifts shall be either one or two.

This property setting has no meaning if energy shift participation status is set to "non-participation".

9.26.43 Daytime heating shift time 1 property (D1 of Figure 63 and D1 of Figure 64)

Daytime heating shift time 1 is set for HP water heaters when energy shift participation status property is set to participation (0x01). Set value is nullified in case of non-participation (0x00), so that HP water heaters shall not carry out an energy shift.

Property values shall be any one of the following:

No energy shift (daytime heating) shall be carried out when any value other than the ones below is designated.

0x09: 9:00, 0x0A: 10:00, 0x0B: 11:00, 0x0C: 12:00

0x0D: 13:00, 0x0E: 14:00, 0x0F: 15:00, 0x10: 16:00

0x11: 17:00 (this value is nullified if number of energy shift is 2)

The controller writes a value of this property after the time to fix the standard time to start heating, while the HP water heater takes and fixes a value of this property to the standard time to start heating. The HP water heater clears value of this property (0x00) set to the daytime heating shift time 1.

Values incorporated after the time above are nullified and are not to be carried out.

No energy shift is carried out if a time other than the one above is written.

This property shall be cleared (0x00) when heating automatic setting property is set to "manual" or "manual stop", when energy shift participation status property is set to "participation".

This property setting has no meaning if energy shift participation status is set to "non-participation".

9.26.44 Expected electric energy at daytime heating shift time 1 property (C1 of Figure 63 and C1 of Figure 64)

Expected electric energy required for heating at every time indicated as daytime heating shift time 1 shall be indicated in Wh. The value is sorted in order of 10:00, 13:00, 15:00, and 17:00.

The property value range at every shift time shall be 0x00000000 to 0xFFFFFFFF (0 W to 4 294 967 293 W). When the property value of the actual device exceeds this property value range, the overflow code 0xFFFFFFFF shall be used. When said value falls below the property value range, the underflow code 0xFFFFFEE shall be used.

The value is set when a value is determined at a time to determine consumption power at every shift time and four values of this property are cleared (0x00000000) at the daytime heating shift time 1.

This property shall be cleared (0x00000000) in a similar manner when heating automatic setting property is set to "manual" or "manual stop", when energy shift participation status property is set to "participation".

This property setting has no meaning if energy shift participation status is set to "non-participation".

9.26.45 Consumption of electric energy per hour 1 property

This property indicates electric energies that the HP heater consumes per hour when shifting to "daytime heating shift time 1". The value is sorted in order of 10:00, 13:00, 15:00, and 17:00.

The property value range at every shift time shall be 0x0000 to 0xFFFFD (0 W to 65 533 W). When the property value of the actual device exceeds this property value range, the overflow code 0xFFFF shall be used. When said value falls below the property value range, the underflow code 0xFFFFE shall be used.

The value is set when a value is determined at a time to determine consumption of energy at every shift time and cleared (0x0000) at the daytime heating shift time 1.

The four values of this property shall be cleared (0x0000) when heating automatic setting property is set to "manual" or "manual stop", when energy shift participation status property is set to "participation".

This property setting has no meaning if energy shift participation status is set to "non-participation".

9.26.46 Daytime heating shift time 2 property (D2 of Figure 63 and D2 of Figure 64)

Daytime heating shift time 2 is set for HP water heater, when energy shift participation status property is participation (0x01). Set value is nullified in case of non-participation (0x00), so that HP water heater shall not carry out an energy shift.

The time shall be later than the daytime heating shift time 1. Daytime heating shift shall not be carried out when values other than the designated ones or times earlier than or equivalent to the daytime heating shift time 1 are designated.

It is recommended that about three hours are secured between daytime heating shift time 2 and daytime heating shift time 1.

The HP water heater requires a few hours to complete the energy shift process starting from the time designated as daytime heating shift time 1. Therefore, when daytime heating shift time 2 is set in the vicinity of the daytime heating shift time 1, the process at the daytime heating shift time 1 is suspended and it is possible that the energy shift will not reach the predetermined volume.

0x0A: 10:00, 0x0B: 11:00, 0x0C: 12:00, 0x0D: 13:00

0x0E: 14:00, 0x0F: 15:00, 0x10: 16:00, 0x11: 17:00

The controller writes a value of this property after the time to fix the standard time to start heating, while HP water heater takes and fixes a value of this property to the standard time to start heating. HP water heater clears value of this property (0x00) set to the daytime heating shift time 2.

Values incorporated after the time above are nullified and not to be carried out.

No energy shift is carried out if a time other than the above is written, either.

This property shall be cleared (0x00) when heating automatic setting property is set to "manual" or "manual stop", when energy shift participation property is set to "participation". The property is cleared to daytime heating shift time 2 (0x00).

This property setting has no meaning if energy shift participation status is set to "non-participation".

9.26.47 Expected electric energy at daytime heating shift time 2 property (C2 of Figure 64)

Expected electric energy required for heating in every time indicated as daytime heating shift time 2 shall be indicated in Wh. The value is sorted in order of 13:00, 15:00, and 17:00.

The property value range at every shift time shall be 0x00000000 to 0xFFFFFFFF (0 W to 4 294 967 293 W). When the property value of the actual device exceeds this property value range, the overflow code 0xFFFFFFFF shall be used. When said value falls below the property value range, the underflow code 0xFFFFFEE shall be used.

The value is set at a time to determine consumption power at every shift time, and cleared (0x00000000) at the daytime heating shift time 2.

The three values (for 13:00, 15:00, and 17:00) of this property shall be cleared (0x00000000) when heating automatic setting property is set to "manual" or "manual stop", when the energy shift participation status property is set to "participation".

This property setting has no meaning, if energy shift participation status is in a state of "non-participation".

9.26.48 Consumption of electric energy per hour 2 property

This property indicates electric energies that the HP heater consumes per hour when shifting to "daytime heating shift time 2". The value is sorted in order of 13:00, 15:00, and 17:00 at every shift time 2.

The property value range at every shift time shall be 0x0000 to 0xFFFF (0 W to 65 533 W). When the property value of the actual device exceeds this property value range, the overflow code 0xFFFF shall be used. When said value falls below the property value range, the underflow code 0xFFFFE shall be used.

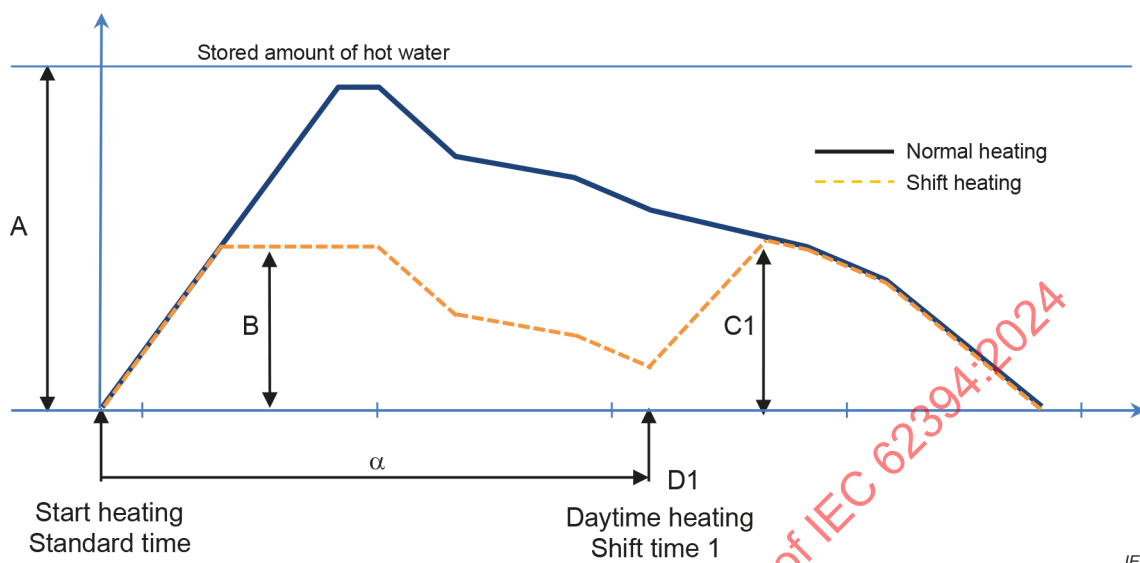
The value is set when a value is determined at a time to determine consumption of electric energy at every shift time and the three values (for 13:00, 15:00, and 17:00) of this property are cleared (0x0000) at the daytime heating shift time 2.

This property shall be cleared (0x0000) in a similar manner when heating automatic setting property is set to "manual" or "manual stop", when energy shift participation property is set to "participation".

This property setting has no meaning if energy shift participation status is set to "non-participation".

Example when shifting heating to α hour later or α hour(s) later.

- 1) Heat hot water (B) to be used during α time, to be shifted by the time midnight power service is complete.
- 2) Heated hot water (C) needs to satisfy the daily volume of hot water after time α .



Key

A: Tomorrow's total volume of hot water expected at the standard time to start heating

B: Hot water to be used during time α to be shifted

C1: Volume of hot water needed from the time that heating is completed (after starting heating after time α) to the standard time to start heating

D1: Time to carry out daytime heating 1 (daytime heating shift time 1)

α : Time to shift heating

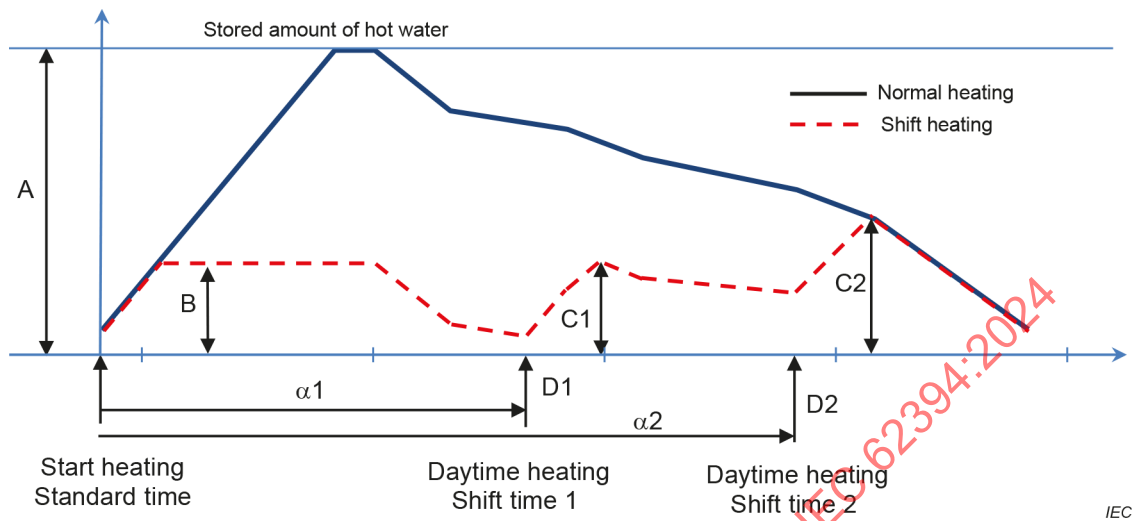
Energy to heat hot water (C) = Electrical power can be shifted

Hot water (A) = hot water (B) + hot water (C)

Figure 63 – Time to start accumulating hot water shift (daytime single shift)

Example when shifting heating to α hour later or α 2 h later.

- 1) Heat hot water (B) to be used during α1 time, to be shifted by the time midnight power service is complete.
- 2) Heat hot water (C) and (C2) needs to satisfy daily volume of hot water twice (after time α1 and α2).



Key

- A: Tomorrow's total volume of hot water expected at the standard time to start heating
- B: Hot water to be used during time α1 to be shifted
- C1+C2: Volume of hot water needed by the standard time to start heating (after completing heating after time α1 shift and α2 shift)
- D1: Time to carry out daytime heating 1 (daytime heating shift time 1)
- D2: Time to carry out daytime heating 2 (daytime heating shift time 2)
- α1: Time to shift heating
- α2: Time to shift heating
- Energy to heat hot water (C1) + hot water (C2) = Electrical power can be shifted
- Hot water (A) = hot water (B) + hot water (C1) + hot water (C2)

Figure 64 – Time to start accumulating hot water shift (daytime double shift)

9.27 Electric toilet seat class (warm-water washing toilet seat, heating toilet seat, etc.) specifications

9.27.1 General

The control commands of "electric toilet seat (warm-water washing toilet seat, heating toilet seat, etc.)" are shown in Table 45.

- Class group code : 0x02
- Class code : 0x6E

Table 45 – List of electric toilet seat (warm-water washing toilet seat, heating toilet seat, etc.) properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	–	Set		○	
		ON = 0x30, OFF = 0x31				Get	○		
Temperature level of toilet seat	0xE0	Low to high temperature (10 steps) 0x31 for the lowest level, 0x3A for the highest level.	unsigned char	1 byte	–	Set/Get			
		0x31 to 0x3A							
Heater setting of toilet seat	0xE1	ON/OFF	unsigned char	1 byte	–	Set/Get	○		
		ON = 0x41, OFF = 0x42							
Temporal halt setting of toilet seat heating	0xE2	Continuous setting/one time setting/no setting.	unsigned char	1 byte	–	Set/Get			
		Continuous setting = 0x41, one time setting = 0x42, no setting = 0x43							
Temporal halt start time of toilet seat heating	0xE3	Temporal halt start time of toilet seat timer value: HH:MM	unsigned char × 2	2 bytes	–	Set/Get			
		0 to 0x17: 0 to 0x3B (= 0 to 23): (= 0 to 59)							
Temporal halt time duration of toilet seat heating	0xE4	Temporal stop time duration of toilet seat timer value: HH:MM	unsigned char × 2	2 bytes	–	Set/Get			
		0 to 0x17: 0 to 0x3B (= 0 to 23): (= 0 to 59)							
Temperature level setting of room heating	0xE5	Low/medium/high temperature	unsigned char	1 byte	–	Set/Get			
		0x31 / 0x32 / 0x33							
Room heating setting	0xE6	Room heating ON/room heating OFF/timer mode setting	unsigned char	1 byte	–	Set/Get			
		0x41 / 0x42 / 0x43							
Room heating status	0xE7	Room heating ON/room heating OFF	unsigned char	1 byte	–	Get			
		ON = 0x41, OFF = 0x42							
Start time of room heating	0xE8	Timer value HH:MM	unsigned char × 2	2 bytes	–	Set/Get			
		0 to 0x17: 0 to 0x3B (= 0 to 23): (= 0 to 59)							
Duration time of room heating	0xE9	Duration time HH:MM	unsigned char × 2	2 bytes	–	Set/Get			
		0 to 0x17: 0 to 0x3B (= 0 to 23): (= 0 to 59)							
Special operation mode setting	0xEA	Used to set a special operation mode and get the status	unsigned char	1 byte	–	Set/Get			
		No setting: 0x40, Over-cool prevention: 0x41 reserved for future use: 0x42							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Human detection status	0xEB	Indicates detection of human body	unsigned char	1 byte	–	Get			
		Detected = 0x41 Not detected = 0x42							
Seating detection status	0xEC	Indicates detection of seating	unsigned char	1 byte	–	Get			
		Detected = 0x41 Not detected = 0x42							

9.27.2 Operation status property

This property indicates whether the heating toilet seat can accept the control (ON status) or not (OFF status). The ON status corresponds to 0x30, and the OFF status corresponds to 0x31. For the node equipped with the heating toilet seat class, it is also possible for the property to be implemented with the fixed value 0x30 if the heating toilet seat can accept the control as the node begins to work.

9.27.3 Temperature level of toilet seat property

This property indicates 0x31 to 0x3A for the 10 steps of low to high temperature of the toilet seat heating. The lowest level is 0x31 and the highest level is 0x3A. This property shall be effective even when the value of operation status property (0x80) is OFF (0x31).

9.27.4 Heater setting of toilet seat property

This property sets ON/OFF status for the toilet seat heater. The toilet seat heater ON = 0x41 and OFF = 0x42.

9.27.5 Temporal halt setting of toilet seat heating property

This property sets the mode of temporal halt of the toilet seat heating and gets the current setting. The modes are continuous setting, in which halt-related settings are always valid, and one-time setting, in which the settings turn to invalid when a temporal halt is cancelled. The property is related to "the temporal halt start time of toilet seat" and "the toilet seat temporal halt time duration setting".

Continuous setting = 0x41, one time setting = 0x42, no setting = 0x43

9.27.6 Temporal halt start time of toilet seat heating property

When the temporal halt setting of toilet seat is continuous or one time setting, the time at which the toilet seat heater turns OFF is indicated by hours: 0x00 to 0x17 (0 to 23), and minutes: 0x00 to 0x3B (0 to 59). The property value shall sequentially indicate the hour and minute, beginning with the high-order byte.

9.27.7 Temporal halt time duration of toilet seat heating property

This property sets the time from when temporal halt start of the toilet seat heating to when the toilet seat heater turns ON, and gets the status. The data format is hours: 0x00 to 0x17 (0 to 23), and minutes: 0x00 to 0x3B (0 to 59). The property value shall sequentially indicate the hour and minute, beginning with the high-order byte.

9.27.8 Temperature level setting of room heating property

This property indicates setting temperature by 0x31/0x32/0x33 for Low/Medium/High temperature for the room heating. This property shall be effective even when the value of operation status property (0x80) is OFF (0x31).

9.27.9 Room heating setting property

This property sets ON/OFF/timer mode of the room heating. The property is related to "room heating start time setting" or "room heating operation start setting".

Room heating ON = 0x41, room heating OFF = 0x42, and timer mode setting = 0x43.

9.27.10 Room heating status property

This property gets the status ON/OFF of room heating.

Room heating ON = 0x41, room heating OFF = 0x42

9.27.11 Start time of room heating property

This property indicates when the room heater turns ON using hours: 0x00 to 0x17 (0 to 23), and minutes: 0x00 to 0x3B (0 to 59), when the room heating timer mode is set. The property value shall sequentially indicate the hour and minute, beginning with the high-order byte.

9.27.12 Duration time of room heating property

This property indicates when the room heater turns ON using the operation time from the start time. The data format is hours: 0x00 to 0x17 (0 to 23), and minutes: 0x00 to 0x3B (0 to 59). The property value shall sequentially indicate the hour and minute, beginning with the high-order byte.

9.27.13 Special operation mode setting property

This property sets detail operation mode of the room heating and gets the status. The property value shall be 0x41 for over-cool prevention or 0x40 for no setting. Only possible value may be implemented for this property. This property shall be effective even when the value of operation status property (0x80) is OFF (0x31).

9.27.14 Human detection status property

This property indicates the detection of human body, detected/non detected. The property value is maintained until the status changes.

Human body detected = 0x41, not detected = 0x42

9.27.15 Seating detection status property

This property indicates the seating detection. The property value is maintained until the status changes.

Seating detected = 0x41, not detected = 0x42

9.28 Electric lock class specifications

9.28.1 General

The control commands of "electric lock" are shown in Table 46.

Class group code : 0x02

Class code : 0x6F

Table 46 – List of electric lock properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	–	Set		○	
		ON = 0x30, OFF = 0x31				Get	○		
Lock setting 1	0xE0	Lock/unlock of main electric lock	unsigned char	1 byte	–	Set/Get	○	○	
		lock = 0x41, unlock = 0x42							
Lock setting 2	0xE1	Lock/unlock of sub electric lock	unsigned char	1 byte	–	Set/Get			
		lock = 0x41, unlock = 0x42							
Lock status of door guard	0xE2	Lock status of door guard.	unsigned char	1 byte	–	Get			
		lock = 0x41, unlock = 0x42							
Door open/close status	0xE3	Open/close status of door	unsigned char	1 byte	–	Get			
		open = 0x41, close = 0x42							
Occupant/ non-occupant status	0xE4	Occupant/ non-occupant status of persons	unsigned char	1 byte	–	Get			
		occupant = 0x41, non-occupant = 0x42							
Alarm status	0xE5	Alarm status of electric lock	unsigned char	1 byte	–	Get		○	
		normal (no alarm) = 0x40, break open = 0x41, door open = 0x42, manual unlocked = 0x43, tampered = 0x44							
Automatic lock mode setting	0xE6	Sets ON/OFF of automatic lock mode and get the status	unsigned char	1 byte	–	Set/Get			
		ON = 0x41, OFF = 0x42							
Battery level	0xE7	Indicates the battery level to get the status of a battery level lower and in need of replacement.	unsigned char	1 byte	–	Set/Get		○	
		Ordinary level = 0x40 Notification of battery replacement = 0x41							

9.28.2 Operation status property

This property indicates whether the electric lock can accept the control (ON status) or not (OFF status). The ON status corresponds to 0x30 and the OFF status corresponds to 0x31. For the node equipped with the electric lock class, it is also possible for the property to be implemented with the fixed value 0x30 if the electric lock can accept the control as the node begins to work.

9.28.3 Lock setting 1 property

This property sets lock/unlock of the main electric lock and gets lock status. The locked status corresponds to 0x41 and the unlocked status corresponds to 0x42.

9.28.4 Lock setting 2 property

This property sets lock/unlock of the sub electric lock which is mounted on the same door as the main electric lock and gets lock status. The locked status corresponds to 0x41 and the unlocked status corresponds to 0x42.

9.28.5 Lock status of door guard property

This property gets the status of whether the electric lock is "door guard" status, in which the door can be opened up to a certain slit, or not. The "door guard" status corresponds to 0x41 and the "non door guard" status corresponds to 0x42.

9.28.6 Door open/closed status property

This property gets open/closed status of the door equipped with the main electric lock and the sub electric lock. The open status corresponds to 0x41, and the closed status corresponds to 0x42. This property indicates occupant/non-occupant status of persons. The occupant status corresponds to 0x41 and the non-occupant status corresponds to 0x42.

9.28.7 Occupant/non-occupant status property

This property indicates occupant/non-occupant status of persons. The occupant status corresponds to 0x41 and the non-occupant status corresponds to 0x42.

9.28.8 Alarm status property

This property indicates the alarm status. The normal status (no alarm) corresponds to 0x40, break open status corresponds to 0x41, door open status corresponds to 0x42, manual unlocked status corresponds to 0x43, and tampered status corresponds to 0x44. The meanings of individual alarms are shown as follows:

- break open: the locked door opened;
- door open: the door remains open over a certain period of time;
- manual unlocked: the door was unlocked manually when the door must be unlocked electrically;
- tampered: the door was tampered with; such as removal of the cover of the electric lock.

9.28.9 Automatic lock mode setting property

This property sets ON/OFF of the automatic lock mode of electric lock and gets the status. The ON of the automatic mode is that the door is automatically locked when the door closes, after the electric lock is unlocked. The OFF of the automatic mode is that the door remains unlocked when the door closes. In other words, the door keeps the status of the lock setting.

9.28.10 Battery level property

This property indicates the battery level of an electric lock driven by a battery. Depending on the acquired level, the property indicates 0x40 for an ordinary level and 0x41 for a level lower than the threshold for replacement (notification of battery replacement supported). Then the status is acquired.

9.29 Instantaneous water heater class specifications

9.29.1 General

The control commands of "instantaneous water heater" are shown in Table 47.

This class is intended for use with instantaneous water heaters that use fossil fuels such as gases and kerosene and heat pump-based instantaneous water heaters.

For water heaters that heat stored water, it is recommended that the "electric water heater" class (class group code = 0x02, class code = 0x6B) be used. For the purposes of this document, the term "instantaneous water heaters" shall include both "instantaneous water heaters having a heating unit in which water supplied from a water supply unit is heated by means of heat exchanging" and "instantaneous bath water heaters having a bath water heating unit that heats water or hot water filled in the bathtub by means of heat exchanging by continuously circulating the same water or hot water." The two types of instantaneous water heaters shall be distinguished by using the terms "water heaters" (or water heating) and "bath water heaters (or bath water heating)." The "addition of hot water" function shall belong to instantaneous water heaters of the former type. If both "water heaters" and "bath water heaters" are indicated, the term "instantaneous water heater" shall be used.

Class group code : 0x02

Class code : 0x72

Table 47 – List of household instantaneous water heater properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	—	Set		○	
		ON = 0x30, OFF = 0x31				Get	○		
Hot water heating status	0xD0	This property indicates the hot water heating status.	unsigned char	1 byte	—	Get	○		
		Hot water heating status found = 0x41 Hot water heating status not found = 0x42							
Set value of hot water temperature	0xD1	This property indicates the set value of the hot water temperature in °C.	unsigned char	1 byte	°C	Get/Set			
		0x00 to 0x64 (0 to 100)							
Hot water warmer setting	0xD2	Hot water warmer setting	unsigned char	1 byte	—	Get/Set			
		Hot water warmer operation = 0x41 Hot water warmer operation resetting = 0x42							
Duration of automatic operation setting	0xDA	Timer value (HH:MM)	unsigned char × 2	2 bytes	—	Get/Set			
		0 to 0x17: 0 to 0x3B (= 0 to 23); (= 0 to 59) Limitless: 0xFFFF							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Remaining automatic operation time	0xDB	Timer value (HH:MM)	unsigned char × 2	2 bytes	–	Get			
		0 to 0x17: 0 to 0x3B (= 0 to 23): (= 0 to 59)							
		Infinite: 0xFFFF							
Set value of bath temperature	0xE1	Indicates the set value of the bath temperature in °C.	unsigned char	1 byte	°C	Get/Set			
		0x00 to 0x64 (0 to 100)							
Bath water heater status	0xE2	Indicates whether or not the bath water heater is heating the bath water.	unsigned char	1 byte	–	Get	○		
		Heating = 0x41 Not heating = 0x42							
Bath automatic mode setting	0xE3	Bath automatic mode ON/OFF	unsigned char	1 byte	–	Set/Get			
		Automatic ON = 0x41 Automatic OFF = 0x42							
Bath additional boil-up operation setting	0xE4	Additional boil-up ON/OFF	unsigned char	1 byte	–	Set/Get			
		Additional boil-up ON = 0x41 Additional boil-up OFF = 0x42							
Bath hot water adding operation setting	0xE5	Hot water addition ON/OFF	unsigned char	1 byte	–	Set/Get			
		Hot water addition ON = 0x41 Hot water addition OFF = 0x42							
Bath water temperature lowering operation setting	0xE6	Hot water temperature lowering ON/OFF	unsigned char	1 byte	–	Set/Get			
		Hot water temperature lowering ON = 0x41 Hot water temperature lowering OFF = 0x42							
Bath hot water volume setting 1	0xE7	Indicates bath hot water volume in litres. 0x00 to 0xFD (0 litres to 253 litres)	unsigned char	1 byte	litre	Set/Get			
Bath hot water volume setting 2	0xE8	Indicates the bath hot water volume (in 8 steps). 0x31 to 0x38	unsigned char	1 byte	–	Set/Get			
Bath hot water volume setting 3	0xEE	Indicates the bath hot water volume in litres. 0x0000 to 0xFFFFD (0 litres to 65 533 litres)	unsigned short	2 bytes	litre	Set/Get			
Bath hot water volume setting 4	0xD4	The bath hot water volume is specified by the number of steps. 0x01 to 0xFF	unsigned char	1 byte	–	Set/Get			

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Bath hot water volume setting 4 – Maximum settable level	0xD5	The maximum settable level is the top step of Bath hot water volume setting 4.	unsigned char	1 byte	–	Get			
		0x01 to 0xFF							
Bathroom priority setting	0xE9	Bathroom priority ON/OFF	unsigned char	1 byte	–	Get			
		Bathroom priority ON = 0x41, Bathroom priority OFF = 0x42							
Shower hot water supply status	0xEA	Shower hot water supply ON/OFF	unsigned char	1 byte	–	Get			
		Shower hot water supply ON = 0x41 Shower hot water supply OFF = 0x42							
Kitchen hot water supply status	0xEB	Kitchen hot water supply ON/OFF	unsigned char	1 byte	–	Get			
		Kitchen hot water supply ON = 0x41 Kitchen hot water supply OFF = 0x42							
Hot water warmer ON timer reservation setting	0xEC	Reservation ON/OFF	unsigned char	1 byte	–	Get			
		Reservation ON = 0x41 Reservation OFF = 0x42							
Set value of hot water warmer ON timer time	0xED	Timer value (HH:MM)	unsigned char × 2	2 bytes	–	Set/Get			
		0 to 0x17:0 to 0x3B (= 0 to 23):(= 0 to 59)							
Bath operation status monitor	0xEF	Indicates the status of a bath.	unsigned char	1 byte	–	Get		○	
		Supplying hot water = 0x41, keeping bath temperature = 0x43, stopped = 0x42							
ON timer reservation setting	0x90	Reservation ON/Reservation OFF	unsigned char	1 byte	–	Set/Get			
		Reservation ON = 0x41 Reservation OFF = 0x42							
Set value of ON timer time	0x91	Timer value (HH:MM)	unsigned char × 2	2 bytes	–	Set/Get			
		0 to 0x17: 0 to 0x3B (= 0 to 23):(= 0 to 59)							
Set value of ON timer relative time	0x92	Timer value (HH:MM)	unsigned char × 2	2 bytes	–	Set/Get			
		0 to 0x17: 0 to 0x3B (= 0 to 23):(= 0 to 59)							
Sound volume setting	0xD6	Sets the sound output volume from the operating units and acquires the setting status.	unsigned char	1 byte	%	Set/Get			
		0x00 to 0x64 (0 to 100)							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Mute setting	0xD7	Sets the volume mute status output from the operating units and acquires the setting status.	unsigned char	1 byte	–	Set/Get			
		Mute ON = 0x30, Mute OFF = 0x31							

9.29.2 Operation status property

This property indicates whether the instantaneous water heater is in the ON state (i.e. the instantaneous water heater responds to user operation) or OFF state. 0x30 and 0x31 shall be used for the ON and OFF states, respectively. In cases where the instantaneous water heater belongs to a node in which the "instantaneous water heater" class is implemented and is ready to respond to user operation as soon as the node starts up, 0x30 may be implemented as the fixed value.

9.29.3 Water heating status property

This property indicates whether or not the water heater is heating water. 0x41 and 0x42 shall be used for the "heating" and "not heating" states, respectively.

In the case of a heat pump-based water heater, the property value shall be 0x41 ("heating" state) and 0x42 ("not heating" state) when the compressor is in operation and when the compressor is not in operation, respectively.

In cases where the water heater has a separate bath water heater, the "bath water heater status" property (EPC = 0xE2) shall be implemented to indicate whether or not the bath water heater is heating bath water.

9.29.4 Set value of hot water temperature property

This property indicates the temperature of water supplied from the water heater to the tap (outlet) unit in °C, and to acquire the current setting. The property value range shall be 0x00 to 0x64 (0 °C to 100 °C).

9.29.5 Hot water warmer setting property

This property indicates whether or not to use the water temperature maintenance function, and to acquire the current setting. 0x41 and 0x42 shall be used for the ON and OFF states, respectively. The water temperature maintenance function shall be defined as a function to maintain the temperature of water in the water heater and the tap (outlet) unit as well as in the section(s) in between using a sub tank or a water circulation system.

9.29.6 Duration of automatic operation setting property

This property indicates, in terms of a relative time, the period of time between a change in the value of the "bath automatic mode setting" property (EPC = 0xE3) to 0x41 (ON) and a change back to 0x42 (OFF), and to acquire the current setting. The "hour (0x00 to 0x17 (0 to 23)): minute (0x00 to 0x3B (0 to 59))" format shall be used, with the higher- and lower-order bytes used for the "hour" and "minute" values, respectively.

When the value of this property is "0xFFFF," the water heating status shall remain at 0x41 for an indefinite period of time.

The value of this property shall not change over time. The remaining time of automatic operation shall be acquired with the "remaining automatic operation time" property (EPC = 0xDB).

9.29.7 Remaining automatic operation time property

This property acquires the time remaining before the value of the "bath automatic mode setting" property (EPC = 0xE3) changes to 0x42 (OFF). The "hour (0x00 to 0x17 (0 to 23)):minute (0x00 to 0x3B (0 to 59))" format shall be used, with the higher- and lower-order bytes used for the "hour" and "minute" values, respectively.

When the value of this property is "0xFFFF," the water heating status shall remain at 0x41 for an indefinite period of time.

9.29.8 Set value of bath temperature property

This property indicates (in °C) the temperature up to which the water heater will heat bath water, and to acquire the current setting. The property value range shall be 0x00 to 0x64 (0 °C to 100 °C). When the water heater has a function to maintain the temperature of bath water by adding hot water, this property may also be used to specify and acquire the bath water temperature to be maintained.

9.29.9 Bath water heater status property

This property indicates whether or not the bath water heater is heating bath water. 0x41 and 0x42 shall be used for the "heating" and "not heating" states, respectively. The "bath water heater status" property value indicates the status of a separate water heater and is independent of the value of the "hot water heating status" property (EPC = 0xD0).

In the case of a water heater that does not have a bath water heater, the "bath water heater status" property value shall always be 0x42.

In the case of a heat pump-based water heater, the property value shall be 0x41 ("heating" state) and 0x42 ("not heating" state) when the compressor is in operation and when the compressor is not in operation, respectively.

In the case of a water heater with an integrated heat exchanger, this property may be used for the status of the switching valve instead.

9.29.10 Bath automatic mode setting property

This property indicates whether or not to use the "automatic bath water heating" mode, and to acquire the current setting. 0x41 and 0x42 shall be used for the ON and OFF states, respectively. Because there are wide differences between water heaters in terms of specifications relating to automatic bath water heating functions, the definition of the "automatic bath water heating" mode shall be implementation-dependent. However, an "automatic bath water heating" mode shall normally be a mode in which a series of processes is executed, such as the processes of "filling the bathtub with the specified volume of water, adding hot water as specified, reheating the water as specified and maintaining the temperature of the water at the specified level" or "unplugging the bathtub (draining the used bath water), cleaning the bathtub, plugging the bathtub, filling the bathtub with the specified volume of water, adding hot water as specified, reheating the water as specified and maintaining the temperature of the water at the specified level." In the case where a "mobile service" shall be supported, the implementation of this property is mandatory.

9.29.11 Bath additional boil-up operation setting property

This property indicates whether or not to use the bath water reheating function, and to acquire the current setting. 0x41 and 0x42 shall be used for the ON and OFF states, respectively.

9.29.12 Bath hot water adding operation setting property

This property indicates whether or not to use the function to add hot water to the bath water in the bathtub, and to acquire the current setting. 0x41 and 0x42 shall be used for the ON and OFF states, respectively.

9.29.13 Bath water temperature lowering operation setting property

This property indicates whether or not to use the "Bath water temperature lowering operation" function, and to acquire the current setting. 0x41 and 0x42 shall be used for the ON and OFF states, respectively. "Bath water temperature lowering operation" shall mean slightly lowering the temperature of the bath water by adding cold water or by using other appropriate means.

9.29.14 Bath hot water volume setting 1 property

This property indicates the bath water volume in litres, and to acquire the current setting. The property value range shall be 0x00 to 0xFD (0 litres to 253 litres). When the property value of the actual piece of equipment is higher than the upper limit of the property value range, the overflow code 0xFF shall be used. When the property value is lower than the lower limit of the property value range, the underflow code 0xFE shall be used.

In cases where implementation of the "Bath hot water volume setting 1" property is accompanied by the implementation of the "Bath hot water volume setting 2" property (EPC = 0xE8) or the "Bath hot water volume setting 3" property (EPC = 0xEE), the values of the properties shall be correlated.

9.29.15 Bath hot water volume setting 2 property

This property indicates the bath water volume by selecting a level from among the eight predefined levels, and to acquire the current setting. The bath water volume values for the eight levels may be defined freely, as long as 0x31 and 0x38 are used for the minimum and maximum volumes, respectively.

In cases where implementation of the "Bath hot water volume setting 2" property is accompanied by the implementation of the "Bath hot water volume setting 1" property (EPC = 0xE7) or the "Bath hot water volume setting 3" property (EPC = 0xEE), the values of the properties shall be correlated.

9.29.16 Bath hot water volume setting 3 property

This property indicates the bath water volume in litres, and to acquire the current setting. The property value range shall be 0x0000 to 0xFFFFD (0 litres to 65 533 litres). When the property value of the actual piece of equipment is higher than the upper limit of the property value range, the overflow code 0xFFFF shall be used. When the property value is lower than the lower limit of the property value range, the underflow code 0xFFFE shall be used.

In cases where implementation of the "Bath hot water volume setting 3" property is accompanied by the implementation of the "Bath hot water volume setting 1" property (EPC = 0xE7) or the "Bath hot water volume setting 2" property (EPC = 0xE8), the values of the properties shall be correlated.

9.29.17 Bath hot water volume setting 4 property

The bath hot water volume is set by level. The minimum value shall be 0x01 and the maximum value shall be "Bath hot water volume setting 4 – Maximum settable level". No actual value is specified for each level. This property is related to "Bath hot water volume setting 4 – Maximum settable level."

9.29.18 Bath hot water volume setting 4 – Maximum settable level property

This property indicates the maximum settable level of "Bath hot water volume setting 4." The minimum value shall be 0x01 and the maximum value shall be 0xFF. No actual value is specified for each level. This property is related to "Bath hot water volume setting 4."

9.29.19 Bathroom priority setting property

This property indicates whether or not to place the water heater in the "Bathroom priority" mode (a mode in which priority is given to bath water heating-related functions, controls and/or user operations), and to acquire the current setting. 0x41 and 0x42 shall be used for the "Bathroom priority" mode and the non-"Bathroom priority" mode, respectively. Determination of the bath water heating-related functions, controls and/or user operations to be given high priority and the manner in which high priority is allocated shall be implementation-dependent.

9.29.20 Shower hot water supply status property

This property indicates whether the shower water heating function is used or not (i.e. the shower is being used or not). 0x41 and 0x42 shall be used for the ON and OFF states, respectively.

9.29.21 Kitchen hot water heating status property

This property indicates whether the kitchen water heating function is used or not. 0x41 and 0x42 shall be used for the ON and OFF states, respectively.

9.29.22 Hot water warmer ON timer reservation setting property

This property indicates whether or not to use the water heating/water temperature maintenance reservation function. This property is used in combination with the "Set value of hot water warmer ON timer time" property.

9.29.23 Bath operation status monitor property

This property is used to monitor the status of a bath in automatic mode. The status of "Bath automatic mode setting property" (Automatic ON: 0x41) is monitored. This property indicates "supplying hot water: 0x41", "keeping bath temperature: 0x43", "stopped: 0x42".

This property indicates the bath operation status when "Automatic ON" is set in 9.29.10 "Bath automatic mode setting."

Supplying hot water: including hot water supply and reheating until the target temperature, until the completion of hot water supply is achieved.

Keeping bath temperature: including hot water addition and reheating to keep the bath temperature.

The bath operation status is "stopped" when "Automatic OFF" is set in 9.29.10 "Bath automatic mode setting."

9.29.24 Set value of hot water warmer ON timer time property

When the value of the "Hot water warmer ON timer reservation setting" property is ON, this property indicates, in the "hour (0x00 to 0x17 (0 to 23)):minute (0x00 to 0x3B (0 to 59))" format, the time at which the value of the "Hot water warmer setting" property (EPC = 0xD2) will change to 0x41 (ON). The higher- and lower-order bytes shall be used for the "hour" and "minute" values, respectively.

9.29.25 ON timer reservation setting property

This property indicates whether or not to use the "automatic bath water heating mode" reservation function. This property is used in combination with the "Set value of ON timer time" or "Set value of ON timer relative time" property.

9.29.26 Set value of ON timer time property

When the value of the "ON timer reservation setting" property is 0x41 (ON), this property indicates, in the "hour (0x00 to 0x17 (0 to 23)):minute (0x00 to 0x3B (0 to 59))" format, the time at which the value of the "Bath automatic mode setting" property (EPC = 0xE3) will change to 0x41 (ON). The higher- and lower-order bytes shall be used for the "hour" and "minute" values, respectively.

9.29.27 Set value of ON timer relative time property

When the value of the "ON timer reservation setting" property is 0x41 (ON), this property indicates, in terms of a time relative to the current time, the time at which the value of the "Bath automatic mode setting" property (EPC = 0xE3) will change to 0x41 (ON). The data format shall be "hour (0x00 to 0x17 (0 to 23)):minute (0x00 to 0x3B (0 to 59))." The higher- and lower-order bytes shall be used for the "hour" and "minute" values, respectively.

9.29.28 Sound volume setting property

"Set" of this property is used to set the volume of operating sounds, voice guidance, notification melodies, interphone and others output from remote controllers and other operating units, etc.

"Get" of this property is used to acquire the value of the current volume setting.

This property indicates the volume value by percentage. The value shall be 0 (0x00) for the minimum volume and 100 (0x64) for the maximum volume of each device.

9.29.29 Mute setting property

"Set" of this property is used to set the volume mute output from operating units ON and OFF.

"Get" of this property is used to acquire the value of the current mute status.

Mute ON indicates that voice is not output, mute OFF indicates that voice is output.

Property values 0x30 and 0x31 correspond to mute ON and OFF, respectively.

The correlation between the "mute setting" property and the "volume setting" property shall depend on implementation.

EXAMPLE 1

If the value of the volume setting property is 20 when the mute function is OFF, the value of the volume setting property remains unchanged at 20 even after the mute function is turned ON. On the other hand, when the mute function is ON, the value of the volume setting property can be 0 in some cases.

EXAMPLE 2

If the value of the volume setting property is 20 when the mute function is OFF, the value of the volume setting property remains 20 even after the mute function is turned from OFF to ON and back to OFF. On the other hand, the value of the volume setting property can be 0.

9.30 Bathroom heater and dryer class specifications

9.30.1 General

The control commands of "bathroom heater and dryer" are shown in Table 48.

Class group code : 0x02

Class code : 0x73

Table 48 – List of bathroom heater and dryer properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	–	Set			
		ON: 0x30 OFF: 0x31				Get			
Operation setting	0xB0	Used to set the operation mode (ventilation mode, bathroom pre-warmer mode, bathroom heater mode, bathroom dryer mode, cool air circulator mode, mist sauna mode, water mist mode or "stop"), and to acquire the current setting.	unsigned char	1 byte	–	Set/Get			
		Ventilation operation: 0x10 Bathroom pre-warmer operation: 0x20 Bathroom heater operation: 0x30 Bathroom dryer operation: 0x40 Cool air circulator operation: 0x50 Mist sauna operation: 0x60 Water mist operation: 0x61 Stop: 0x00							
Ventilation operation setting	0xB1	Used to set the ventilation air flow rate level for the ventilation mode and to acquire the current setting.	unsigned char	1 byte	–	Set/Get			
		Automatic: 0x41 Standard: 0x42 Air flow rate level: 0x31 to 0x38							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Measured relative bathroom humidity	0xBA	Used to acquire the measured relative humidity of the bathroom.	unsigned char	1 byte	%	Get			
		0x00 to 0x64 (0 % to 100 %)							
Measured bathroom temperature	0xBB	Used to acquire the measured temperature of the bathroom.	signed char	1 byte	°C	Get			
		0x81 to 0x7D (−127 °C to +125 °C)							
Ventilation air flow rate setting	0xC2	Used to set the air flow rate level for the around-the-clock ventilation function and to acquire the current setting.	unsigned char	1 byte	–	Set/Get			
		Automatic: 0x41 Air flow rate level: 0x31 to 0x38							
Filter cleaning reminder sign setting	0xCF	Used to set the filter cleaning reminder sign status (lit/not lit) and to acquire the current setting.	unsigned char	1 byte	–	Set/Get			
		Lit: 0x41 Not lit: 0x42							
Human body detection status	0xE0	Used to acquire the human body detection status.	unsigned char	1 byte	–	Get			
		Detected: 0x41 Not detected: 0x42							
ON timer-based reservation setting 1	0x90	Used to set the ON/OFF status of the ON timer-based reservation function and to acquire the current setting.	unsigned char	1 byte	–	Set/Get			
		Reservation function ON: 0x41 Reservation function OFF: 0x42							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
OFF timer setting (time)	0x95	Used to set the time setting for the time-based reservation function for the OFF timer (in the HH:MM format) and to acquire the current setting.	unsigned char × 2	2 bytes	–	Set/Get			
		0 to 0x17: 0 to 0x3B (= 0 to 23): (= 0 to 59)							
OFF timer setting (relative time)	0x96	Used to set the relative time setting for the relative time-based reservation function for the OFF timer (in the HH:MM format) and to acquire the current setting.	unsigned char × 2	2 bytes	–	Set/Get			
		0 to 0x17: 0 to 0x3B (= 0 to 23): (= 0 to 59)							

9.30.2 Operation status property

This property indicates whether the bathroom heater and dryer is ready to accept control commands (ON state) or not (OFF state).

The values "0x30" and "0x31" shall be assigned to the ON and OFF states, respectively.

In the case of a node implemented with the bathroom heater and dryer class whose bathroom heater and dryer becomes ready to accept control commands as soon as the node starts operating, this property may be implemented with the property value fixed at "0x30."

9.30.3 Operation setting property

This property is used to set the bathroom heater and dryer's operation mode (ventilation mode, bathroom pre-warmer mode, bathroom heater mode, bathroom dryer mode, cool air circulation mode, mist sauna mode, water mist mode or "stop"), and to acquire the current setting. Each of the operation modes shall be assigned with the respective code value specified below.

Ventilation operation	: 0x10
Bathroom pre-warmer operation	: 0x20
Bathroom heater operation	: 0x30
Bathroom dryer operation	: 0x40
Cool air circulation operation	: 0x50
Mist sauna operation	: 0x60
Water mist operation	: 0x61
Stop	: 0x00

It is only required to implement the property values that correspond to the functions supported by the actual device implemented with this class.

This property shall be effective even when the value of the "operation status" property ("0x80") is OFF ("0x31").

9.30.4 Ventilation operation setting property

This property is used to set the ventilation air flow rate level for the ventilation mode and to acquire the current setting.

- The property value for the "automatic" state shall be "0x41". This document does not specify requirements regarding the functions to be provided in relation to the "automatic" state.
- The property value for the "standard" state shall be "0x42". The "standard" state is a state in which the standard ventilation air flow rate level setting of the actual device implemented with this class is used.
- In addition, 8 predefined air flow rate levels shall be provided and the property values "0x31" to "0x38" shall be assigned to the 8 levels. The air flow rates that correspond to the 8 levels may be defined freely, as long as the property values "0x31" and "0x38" are assigned to the lowest and highest air flow rates, respectively.

It is only required to implement the property values that correspond to the functions supported by the actual device implemented with this class.

When this property is implemented, setting/acquisition shall be possible even when the current setting of the "operation setting" property ("0xB0") is other than the ventilation mode.

This property shall be effective even when the value of the "operation status" property ("0x80") is OFF ("0x31").

9.30.5 Bathroom pre-warmer operation setting property

This property is used to set the bathroom pre-warming level for the bathroom pre-warmer mode and to acquire the current setting.

- The property value for the "automatic" state shall be "0x41". This document does not specify requirements regarding the functions to be provided in relation to the "automatic" state.
- The property value for the "standard" state shall be "0x42". The "standard" state is a state in which the standard bathroom pre-warming level setting of the actual device implemented with this class is used.
- In addition, 8 predefined bathroom pre-warming levels shall be provided and the property values "0x31" to "0x38" shall be assigned to the 8 levels. The bathroom pre-warming strengths that correspond to the 8 levels may be defined freely, as long as the property values "0x31" and "0x38" are assigned to the lowest and highest bathroom pre-warming strengths, respectively.

It is only required to implement the property values that correspond to the functions supported by the actual device implemented with this class.

When this property is implemented, setting/acquisition shall be possible even when the current setting of the "operation setting" property ("0xB0") is other than the bathroom pre-warmer mode.

This property shall be effective even when the value of the "operation status" property ("0x80") is OFF ("0x31").

9.30.6 Bathroom heater operation setting property

This property is used to set the bathroom heating level for the bathroom heater mode and to acquire the current setting.

- The property value for the "automatic" state shall be "0x41". This document does not specify requirements regarding the functions to be provided in relation to the "automatic" state.
- The property value for the "standard" state shall be "0x42". The "standard" state is a state in which the standard bathroom heating level setting of the actual device implemented with this class is used.

- In addition, 8 predefined bathroom heating levels shall be provided and the property values "0x31" to "0x38" shall be assigned to the 8 levels. The bathroom heating strengths that correspond to the 8 levels may be defined freely, as long as the property values "0x31" and "0x38" are assigned to the lowest and highest bathroom heating strengths, respectively.

It is only required to implement the property values that correspond to the functions supported by the actual device implemented with this class.

When this property is implemented, setting/acquisition shall be possible even when the current setting of the "operation setting" property ("0xB0") is other than the bathroom heater mode.

This property shall be effective even when the value of the "operation status" property ("0x80") is OFF ("0x31").

9.30.7 Bathroom dryer operation setting property

This property is used to set the bathroom drying level for the bathroom dryer mode and to acquire the current setting.

- The property value for the "automatic" state shall be "0x41". This document does not specify requirements regarding the functions to be provided in relation to the "automatic" state.
- The property value for the "standard" state shall be "0x42". The "standard" state is a state in which the standard bathroom drying level setting of the actual device implemented with this class is used.
- In addition, 8 predefined bathroom drying levels shall be provided and the property values "0x31" to "0x38" shall be assigned to the 8 levels. The bathroom drying strengths that correspond to the 8 levels may be defined freely, as long as the property values "0x31" and "0x38" are assigned to the lowest and highest bathroom drying strengths, respectively.

It is only required to implement the property values that correspond to the functions supported by the actual device implemented with this class.

When this property is implemented, setting/acquisition shall be possible even when the current setting of the "operation setting" property ("0xB0") is other than the bathroom drying mode.

This property shall be effective even when the value of the "operation status" property ("0x80") is OFF ("0x31").

9.30.8 Cool air circulation operation setting property

This property is used to set the cool air circulation level for the cool air circulation mode and to acquire the current setting.

- The property value for the "automatic" state shall be "0x41". This document does not specify requirements regarding the functions to be provided in relation to the "automatic" state.
- The property value for the "standard" state shall be "0x42". The "standard" state is a state in which the standard cool air circulation level setting of the actual device implemented with this class is used.
- In addition, 8 predefined cool air circulation levels shall be provided and the property values "0x31" to "0x38" shall be assigned to the 8 levels. The cool air circulation strengths that correspond to the 8 levels may be defined freely, as long as the property values "0x31" and "0x38" are assigned to the lowest and highest cool air circulation strengths, respectively.

It is only required to implement the property values that correspond to the functions supported by the actual device implemented with this class.

When this property is implemented, setting/acquisition shall be possible even when the current setting of the "operation setting" property ("0xB0") is other than the cool air circulator mode.

This property shall be effective even when the value of the "operation status" property ("0x80") is OFF ("0x31").

9.30.9 Mist sauna operation setting property

This property sets operation capacity level of mist sauna operation mode and acquires the current setting.

- The "automatic" status property value shall be 0x41. The specific functions for "automatic" status are not stipulated here.
- The "standard" status property value shall be 0x42. The "standard" status shall be the standard operation capacity level of an actual device that implements this class.
- Also, capacity levels shall be set at eight levels, and take the property values of 0x31 through 0x38. No specific values for the capacity levels are stipulated. However, the minimum value shall be 0x31 while the maximum shall be 0x38.

As for the property values adopted, actual devices implementing this class need only implement property values that can be adopted as their functions.

In cases where this property is implemented, this property shall be settable or acquirable if the value of the operation setting property (0xB0) is set to modes other than mist sauna operation mode.

This property shall be effective even when the value of the operation status property (0x80) is OFF (0x31).

9.30.10 Water mist operation settings property

This property sets operation capacity level of water mist operation mode and acquire the current setting.

- The "automatic" status property value shall be 0x41. The specific functions for "automatic" status are not stipulated here.
- The "standard" status property value shall be 0x42. The "standard" status shall be the standard operation capacity level of an actual device that implements this class.
- Also, capacity levels shall be set at eight levels, and take the property values of 0x31 through 0x38. No specific values for the capacity levels are stipulated. However, the minimum value shall be 0x31 while the maximum shall be 0x38.

As for the property values adopted, actual devices implementing this class need only implement property values that can be adopted as their functions.

In cases where this property is implemented, this property shall be settable or acquirable if the value of the operation setting property (0xB0) is set to modes other than water mist operation mode.

This property shall be effective even when the value of the operation status property (0x80) is OFF (0x31).

9.30.11 Measured relative bathroom humidity property

This property indicates the measured relative bathroom humidity in %.

The property value range shall be "0x00" to "0x64" (0 % to 100 %). When the property value of the actual device is higher than the property value range, the overflow code value "0xFF" shall be used. When the property value of the actual device is lower than the property value range, the underflow code value "0xFE" shall be used. When it is not possible to return a measured value, the value "0xFD" shall be used.

This property shall be effective even when the value of the operation status property ("0x80") is OFF ("0x31").

9.30.12 Measured bathroom temperature property

This property indicates the measured bathroom temperature in °C.

The property value range shall be "0x81" to "0x7D" (–127 °C to +125 °C). When the property value of the actual device is higher than the property value range, the overflow code value "0x7F" shall be used. When the property value of the actual device is lower than the property value range, the underflow code value "0x80" shall be used.

When it is not possible to return a measured value, the value "0x7E" shall be used.

This property shall be effective even when the value of the operation status property ("0x80") is OFF ("0x31").

9.30.13 Human body detection status property

This property indicates the human body detection status (human body detection sensor).

Detected : 0x41

Not detected : 0x42

9.30.14 Filter cleaning reminder sign setting property

This property is used to set the filter cleaning reminder sign status (lit/not lit) and to acquire the current setting.

Lit : 0x41

Not lit : 0x42

This property shall be effective even when the value of the operation status property ("0x80") is OFF ("0x31").

9.30.15 Ventilation air flow rate setting property

This property is used to set the air flow rate level for the around-the-clock ventilation function and to acquire the current setting.

- The property value for the "automatic" state shall be "0x41."
- In addition, 8 predefined air flow rate levels shall be provided and the property values "0x31" to "0x38" shall be assigned to the 8 levels. The air flow rates that correspond to the 8 levels may be defined freely, as long as the property values "0x31" and "0x38" are assigned to the lowest and highest air flow rates, respectively.

This property shall be effective even when the value of the operation status property ("0x80") is OFF ("0x31").

9.30.16 ON timer-based reservation setting 1 property

This property is used to set the ON/OFF status of the ON timer-based reservation function and to acquire the current setting. The mode in which the device starts operating is not specified. This property works in combination with the "ON timer setting (time)" or "ON timer setting (relative time)" property.

Reservation function ON : 0x41

Reservation function OFF : 0x42

This property shall be effective even when the value of the "operation status" property ("0x80") is OFF ("0x31").

9.30.17 ON timer-based reservation setting 2 property

This property is used to set the ON/OFF status of the ON timer-based reservation function with the mode in which the device starts operating specified, and to acquire the current setting. This property works in combination with the "ON timer setting (time)" or "ON timer setting (relative time)" property. Each of the operation modes shall be assigned with the respective code value specified below.

Reservation function ON for the ventilation mode	: 0x10
Reservation function ON for the bathroom pre-warmer mode	: 0x20
Reservation function ON for the bathroom heater mode	: 0x30
Reservation function ON for the bathroom dryer mode	: 0x40
Reservation function ON for the cool air circulation mode	: 0x50
Reservation function ON for the mist sauna mode	: 0x60
Reservation function ON for the water mist mode	: 0x61
Reservation function OFF	: 0x00

It is only required to implement the property values that correspond to the functions supported by the actual device implemented with this class.

This property shall be effective even when the value of the "operation status" property ("0x80") is OFF ("0x31").

9.30.18 ON timer setting (time) property

This property indicates, when the "'ON timer-based reservation' setting 1" or "'ON timer-based reservation' setting 2" property value is a value for using the time-based reservation function, the time at which the bathroom heater and dryer will be turned on.

The "hour (0x00 to 0x17 (0 to 23)): minute (0x00 to 0x3B (0 to 59))" format shall be used, with the higher- and lower-order bytes used for the "hour" and "minute" values, respectively.

This property shall be effective even when the value of the "operation status" property ("0x80") is OFF ("0x31").

9.30.19 ON timer setting (relative time) property

This property indicates, when the "'ON timer-based reservation' setting 1" or "'ON timer-based reservation' setting 2" property value is a value for using the relative time-based reservation function, the time at which the bathroom heater and dryer will be turned on as a relative time with respect to the current time.

The "hour (0x00 to 0x17 (0 to 23)): minute (0x00 to 0x3B (0 to 59))" format shall be used, with the higher- and lower-order bytes used for the "hour" and "minute" values, respectively.

This property shall be effective even when the value of the "operation status" property ("0x80") is OFF ("0x31").

9.30.20 OFF timer-based reservation setting property

This property is used to set the ON/OFF status of the OFF timer-based reservation function. This property works in combination with the "OFF timer setting (time)" or "OFF timer setting (relative time)" property.

Reservation function ON : 0x41

Reservation function OFF : 0x42

This property shall be effective even when the value of the "operation status" property ("0x80") is OFF ("0x31").

9.30.21 OFF timer setting (time) property

This property indicates, when the "'OFF timer-based reservation' setting" property value is "ON," the time at which the bathroom heater and dryer will be turned off.

The "hour (0x00 to 0x17 (0 to 23)): minute (0x00 to 0x3B (0 to 59))" format shall be used, with the higher- and lower-order bytes used for the "hour" and "minute" values, respectively.

This property shall be effective even when the value of the "operation status" property ("0x80") is OFF ("0x31").

9.30.22 OFF timer setting (relative time) property

This property indicates, when the "'OFF timer-based reservation' setting" property value is "ON," the time at which the bathroom heater and dryer will be turned off as a relative time with respect to the current time.

The "hour (0x00 to 0x17 (0 to 23)): minute (0x00 to 0x3B (0 to 59))" format shall be used, with the higher- and lower-order bytes used for the "hour" and "minute" values, respectively.

This property shall be effective even when the value of the "operation status" property ("0x80") is OFF ("0x31").

9.31 Household solar power generation class specifications

9.31.1 General

The control commands of "household solar power generation" are shown in Table 49.

Class group code : 0x02

Class code : 0x79

Table 49 – List of household solar power generation properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	–	Set		○	
		ON = 0x30, OFF = 0x31				Get	○		
Identification number	0x83	A number that allows each object to be uniquely identified.	unsigned char	9 or 17 bytes	–	Get	○		
		First byte: lower-layer communication ID field 0x01 to 0xFD: If a unique number is assigned by the lower-layer communication protocols, an arbitrary ID number is set according to the protocol types. (Not used in control protocol 2nd shown in Clause 8). 0xFE: 2nd to 17th bytes are defined by the manufacturer, and are set according to the type. 0xFF: This ID number is used if 2nd through 9th bytes are randomly generated by the lower-layer communication protocols. 0x00: Identification number is not set. Second and succeeding bytes: unique number field							
Current time setting	0x97	Current time (HH:MM format)	unsigned char × 2	2 bytes	–	Set			
		0x00 to 0x17: 0x00 to 0x3B (= 0 to 23): (= 0 to 59)				Get	○ ^a		
Current date setting	0x98	Current date (YYYY:MM:DD format)	unsigned char × 4	4 bytes	–	Set			
		1 to 0x270F: 1 to 0x0C: 1 to 0x1F (= 1 to 9999): (= 1 to 12): (= 1 to 31)				Get	○ ^a		

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Output power control setting 1	0xA0	Used to set the output power control setting value in % of capacity approved by the equipment and acquire the current setting.	unsigned char	1 byte	%	Set/Get	☐ ^b		
		0x00 to 0x64 (0 % to 100 %)							
Output power control setting 2	0xA1	Used to set the output power control setting value in W and acquire the current setting.	unsigned short	2 bytes	W	Set/Get	☐ ^b		
		0x0000 to 0xFFFFD (0 to 65 533)							
Function to control purchase of excess electricity setting	0xA2	Enables/disables function to control the purchase of excess electricity.	unsigned char	1 byte	—	Set			
		Valid = 0x41, Invalid = 0x42				Get	☐ ^b		
Output power controlling schedule	0xB0	Indicates the output power control ratio every 30 min for the current date and the day following the current date.	unsigned char × 4 + unsigned char × 96	100 bytes	—	Get	☐ ^a		
		Current date (YYYY: MM: DD) + 0x00 to 0x64 (0 % to 100 %) × 96 (values every 30 min, for 2 days)							
Next access date and time	0xB1	Indicates the next date and time for updating the output power controlling schedule.	unsigned char × 7	7 bytes	—	Get	☐ ^a	☐	
		YYYYMMDDhhmmss 0x01 to 0x270F: 0x01 to 0x0C: 0x01 to 0x1F: 0x00 to 0x17: 0x00 to 0x3B: 0x00 to 0x3B (= 1 to 9999): (= 1 to 12): (= 1 to 31): (= 0 to 23): (= 0 to 59): (= 0 to 59)							
Type for function to control purchase of excess electricity	0xB2	Indicates enabling/disabling the function to control the purchase of excess electricity under the output power control by output power controlling schedule..	unsigned char	1 byte	—	Get	☐ ^a		
		Valid = 0x41, Invalid = 0x42							

[illegible]

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Resetting cumulative amount of electric energy generated	0xE2	Resets cumulative amount of electric energy generated by setting 0x00.	unsigned char	1 byte	–	Set			
		Reset = 0x00							
Measured cumulative amount of electric energy sold	0xE3	Indicates cumulative value of sold power in 0,001 kWh.	unsigned long	4 bytes	0,001 kWh	Get			
		0x0 to 0x3B9AC9FF (0 kWh to 999 999,999 kWh)							
Resetting cumulative amount of electric energy sold	0xE4	Resets cumulative amount of electric energy sold by setting 0x00.	unsigned char	1 byte	–	Set			
		Reset = 0x00							
Power generation output limit setting 1	0xE5	Specifies the power generation output as a percentage of the rated power generation output and to acquire the current setting	unsigned char	1 byte	%	Set/Get			
		0x00 to 0x64 (0 % to 100 %)							
Power generation output limit setting 2	0xE6	Specifies the power generation output in watts and to acquire the current setting	unsigned short	2 bytes	W	Set/Get			
		0x0000 to 0xFFFFD (0 to 65 533)							
Limit setting for the amount of electricity sold	0xE7	Specifies, in watts, the amount of electricity sold and to acquire the current setting.	unsigned short	2 bytes	W	Set/Get			
		0x0000 to 0xFFFFD (0 to 65 533)							
Rated power generation output (System interconnected)	0xE8	Indicates the rated power output in the system-interconnection status in watts.	unsigned short	2 bytes	W	Set			
		0x0000 to 0xFFFFD (0 to 65 533) 0xFFFF means no setting				Get	○		

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Rated power generation output (independent)	0xE9	Indicates the rated power output in the independent status in watts.	unsigned short	2 bytes	W	Set/Get			
		0x0000 to 0xFFFD (0 to 65 533)							
^a The installation shall be mandatory if output is controlled by the output power controlling schedule that is given to solar power generation. ^b The installation of either output power control setting 1 or output power control setting 2, and the function to control surplus electricity purchase setting shall be mandatory, if the output power of the solar power generation can be controlled. ^c The installation of either capacity approved by the equipment or the conversion coefficient shall be mandatory.									

In this class, power and electric energy values shall be those of AC. Figure 65 shows an example configuration.

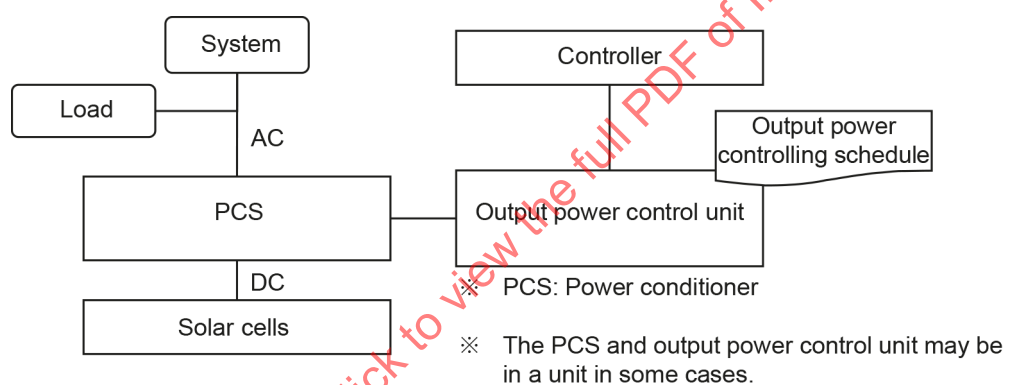


Figure 65 – An example of household solar power generation configuration

Definitions related to the term "output power control" are as follows

- Output power control implemented by output power control setting 1 and output power control setting 2
Output power control using the values set to output power control setting 1 or output power control setting 2
- Output power control through the output power controlling schedule
Output power control implemented by household solar power generation itself using the output power controlling schedule that is given to the household solar power generation.
- Output power control
The PCS suppresses the power output from household solar power generation below an upper limit determined by output power control setting 1 or output power control setting 2 or by output power controlling schedule.
- Output power restraint
The PCS suppresses the power output from household solar power generation by any reasons including output power control or factors such as rise in system voltage or PCS temperature, etc.

- Upper limit clip

This means the upper limit of the capable power output from household solar power generation, regardless to the value in the output power controlling schedule. In Japan, this shall be set only when the household solar power generation becomes a target of the output power control due to a reason such as PCS replacement.

- Function to control the purchase of excess electricity

A function to allow generating power more than the upper limit determined by the output power control, and to control the power generation less than or equal to the self-consumption. Figure 66 shows an example of power generation curve according to this function.

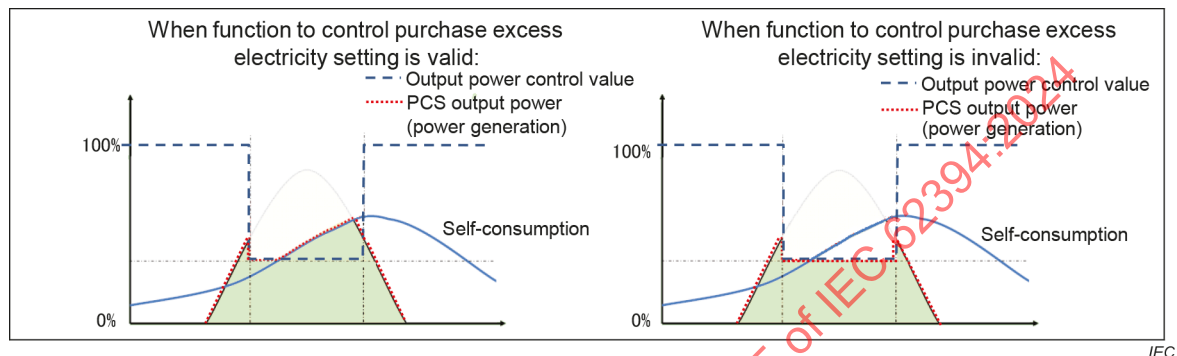


Figure 66 – Function to control purchase of excess electricity

- Function to control purchase of excess electricity setting

This setting enables/disables the function to control the purchase of excess electricity under the output power control by output power control setting 1 or output power control setting 2.

- Type for function to control the purchase of excess electricity

This type enables/disables the function to control the purchase of excess electricity under the output power control by output power controlling schedule.

9.31.2 Operation status property

This property indicates whether the function native to this class is operating or not (ON/OFF). In the node mounting this class, if the function of this class is started concurrently with the start of node operation, this property may be implemented at a fixed value of 0x30 (Operation status ON).

9.31.3 Identification number property

The "identification number" property is a number that allows each device object to be uniquely identified. The first byte indicates the format of the unique number.

In the case where the unique number type is 0xFE ("defined by the manufacturer"), the unique number is comprised of a 3-byte manufacturer code field, which contains the unique manufacturer code assigned by the ECHONET Consortium to the manufacturer in question, and a 13-byte unique ID field, which contains the unique identification number defined by the manufacturer. This property's data structure is shown in Figure 46. Each vendor shall ensure that there is no code value overlap.

9.31.4 Current time setting property

This property indicates the current local time using a value between 0x00 and 0x17 (0 to 23) for the hours and a value between 0x00 and 0x3B (0 to 59) for the minutes. The first byte of the property value indicates the hour and the second byte indicates the minute.

9.31.5 Current date setting property

This property indicates the current date using a value between 0x0001 and 0x270F (1 to 9 999) for the year, a value between 0x01 and 0x0C (1 to 12) for the month and a value between 0x01 and 0x1F (1 to 31) for the day. The first and second bytes are treated as one piece of unsigned short data which indicates the year (2 bytes). The third byte indicates the month (1 byte) and the fourth byte indicates the day (1 byte). Only Get is required for this class.

9.31.6 Output power control setting 1 property

The output power shall be set with the capacity approved by the equipment in increments of %, and setting status shall be acquired. The property value range shall be from 0 to 100 (0x00 to 0x64), and the unit is %. When the value of this property is 100, no output power control is required. In the case where it is not possible to limit the output power using the value specified by this property, the output power control shall be limited using a value that is closest to and lower than the value specified by this property.

9.31.7 Output power control setting 2 property

The output power shall be set in increments of W, and setting status shall be acquired. The property value range shall be from 0x0000 to 0xFFFFD (0 to 65 533). In the case where it is not possible to limit the output power using the value specified by this property, the output power control shall be limited using a value that is closest to and lower than the value specified by this property. If there is no need to restrict the outputs, values greater than those indicated by the rated power generation output (system-interconnected) shall be set.

9.31.8 Function to control purchase of excess electricity setting property

This property indicates enabling/disabling the function to control the purchase of excess electricity under the output power control by output power control setting 1 or output power control setting 2.

Valid = 0x41, Invalid = 0x42

Valid: if the reverse power flow of the interconnection point is zero or below (self-consumption $\geq$ output power), when generating in excess of output power control setting 1 and output power control setting 2, and if the reverse power flow of the interconnection point is greater than zero (self-consumption < output power), power generation shall be controlled not to exceed output power control setting 1 and output power control setting 2.

Invalid: power generation shall be controlled so as not to exceed output power control setting 1 and output power control setting 2

9.31.9 Output power controlling schedule property

The output power controlling schedule that shall be indicated shall be the solar power generation acquired from the system operator. The first four bytes indicate the current date; year: 0x0001 to 0x270F (1 to 9 999), month: 0x01 to 0x0C (1 to 12), day: 0x01 to 0x1F (1 to 31), and the remaining 96 bytes shall indicate the output power control rate of the solar power generation (0x00: 0 % to 0x64: 100 %) $\times$ 96 (value for every 30 min, current date 00:00 to 00:30, 00:30 to 01:00, ..., 23:30 to 00:00, the day following the current date 00:00 to 00:30, 00:30 to 01:00, ..., 23:30 to 00:00, two days in total) as a property value. In the case of 100 %, there is no need to implement output power control. For solar power generation that requires no output power control with the output power controlling schedule and cases where the output power controlling schedule has not been acquired, the first four bytes (current date) shall be: year: 0xFFFF, month: 0xFF, date: 0xFF, and 0xFF for output power control rate. If the output power controlling schedule given to the solar power generation is less than two days, the output power control rate for the time slot with shortage shall be 0xFF.

9.31.10 Next access date and time property

This property indicates the next date and time for updating of the output power controlling schedule in: year: 0x0001 to 0x270F (1 to 9 999), month: 0x01 to 0x0C (1 to 12), date: 0x01 to 0x1F (1 to 31), hour: 0x00 to 0x17 (0 to 23), minute: 0x00 to 0x3B (0 to 59), and second: 0x00 to 0x3B (0 to 59). Solar power generation that requires no output power control by output power controlling schedule and cases where output power controlling schedule has not been acquired shall be: year: 0xFFFF, month: 0xFF, date: 0xFF, minute: 0xFF, and second: 0xFF.

9.31.11 Type for function to control purchase of excess electricity property

This property indicates the enabling/disabling of the function to control the purchase of excess electricity under the output power control by output power controlling schedule.

Valid = 0x41, Invalid = 0x42

Valid: solar power generation is controlled to generate more power than the output power control ratio of the output power controlling schedule when the reverse power flow at the system-interconnection point is zero or below (i.e., when self-consumption is larger than the solar power generation output), or to generate less or equal power to the output power control ratio when the reverse power flow is greater than zero (i.e., when self-consumption is smaller than the solar power generation output).

Invalid: solar power generation is controlled to generate less or equal power to the output power control ratio of the output power controlling schedule.

9.31.12 Output power change time setting value property

This property indicates the time to change output power from 100 % to 0 % (0 % to 100 %) of the rated output power (when the system is interconnected) when the output power is controlled by output power controlling schedule in increments of seconds.

The property value range shall be from 0x0000 to 0xFFFFD (0 to 65 533).

9.31.13 Upper limit clip setting value property

This property indicates the upper limit clip setting value in increments of W, when controlling output power using the output power controlling schedule.

The property value range shall be from 0x0000 to 0xFFFFD (0 to 65 533), and 0xFFFF when there is no value set.

9.31.14 Operation power factor setting value property

This property indicates the setting value of the operation power factor (proportion of effective power against apparent power) in increments of %. The property value range shall be from 0x00 to 0x64 (0 to 100).

9.31.15 FIT contract type property

This property sets FIT contract type and indicates setting status.

FIT = 0x41, Non-FIT = 0x42, No setting = 0x43

9.31.16 Self-consumption type property

This property indicates the type of self-consumption.

If household solar power generation cannot recognize the existence of self-consumption, the type shall be "unknown".

With self-consumption = 0x41, without self-consumption = 0x42, and unknown = 0x43

9.31.17 Capacity approved by equipment property

This property indicates the capacity approved by equipment in increments of W. The capacity approved by equipment shall be whichever is the smaller of the rated power generation output (system-interconnected) and total capacity of the solar batteries, and its property value range shall be from 0x0000 to 0xFFFFD (0 to 65 533), and 0xFFFF when there is no value set.

An example of capacity approved by equipment is illustrated in Figure 67.

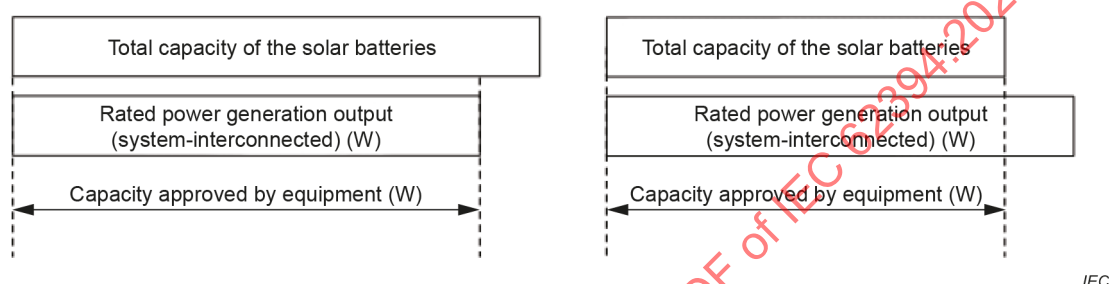


Figure 67 – An example of capacity approved by equipment

9.31.18 Conversion coefficient property

This property indicates the coefficient that converts the rated power generation output (system-interconnected) into the capacity approved by the equipment in increments of %. The conversion coefficient is a value that divides the capacity approved by the equipment by the rated power generation output (system-interconnected). The property value range shall be from 0 to 100 (0x00 to 0x64), and 0xFF when there is no value set.

9.31.19 System interconnection status property

This property indicates the current status of interconnection with the system (system interconnection). If the output power control unit does not have information related to the system interconnection status, then the value shall be "unknown".

System interconnected (reverse power flow acceptable) = 0x00, Independent = 0x01, System interconnected (reverse power flow not acceptable) = 0x02, unknown = 0x03.

9.31.20 Output power restraint status property

This property indicates the implementation status of the output power restraint. The cases shall be determined that are unable to distinguish controls other than the output power control as "ongoing restraint" (reason of restraint is unknown), and if the output power control units have no information regarding output power restraint status, determine them as "unknown".

Ongoing restraint (by output power control) = 0x41, ongoing restraint (except output power control) = 0x42, ongoing restraint (reason of restraint is unknown) = 0x43, not restraining = 0x44, unknown = 0x45.

9.31.21 Measured instantaneous amount of electricity generated property

This property indicates the instantaneous power generation output, in W. The property value range shall be 0x0000 to 0xFFFFD. When the property value of the actual piece of equipment is higher than the upper limit of the property value range, the overflow code 0xFFFF shall be used. When the property value is lower than the lower limit of the property value range, the underflow code 0xFFFE shall be used.

9.31.22 Measured cumulative amount of electricity generated property

This property indicates the cumulative amount of electric energy generated, in kWh. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 kWh to 999 999 999 kWh). When the cumulative amounts of electric energy overflows, the property value shall be incremented again from 0x00000000.

9.31.23 Resetting cumulative amount of electric energy generated property

Resets the cumulative amount of electric energy generated to zero by setting 0x00.

9.31.24 Measured cumulative amount of electric energy sold property

This property indicates the cumulative amount of electric energy sold, in kWh. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 kWh to 999 999 999 kWh). When the cumulative amounts of electric energy overflows, the property value shall be incremented again from 0x00000000.

9.31.25 Resetting cumulative amount of electric energy sold property

Resets the cumulative amount of electric energy generated to zero by setting 0x00.

9.31.26 Power generation output limit setting 1 property

This property is used to specify the power generation output as a percentage of the rated power generation output and to acquire the current setting. The value range for this property shall be from 0 to 100 (from 0x00 to 0x64), and the unit is %. When the value of this property is 100, no limit is imposed. In the case where it is not possible to limit the power generation output using the value specified by this property, the power generation output shall be limited using a value that is closest to and lower than the value specified by this property.

9.31.27 Power generation output limit setting 2 property

This property is used to specify the power generation output, in W, and to acquire the current setting. The value range for this property shall be from 0x0000 to 0xFFFFD (from 0 to 65 533). In the case where it is not possible to limit the power generation output using the value specified by this property, the power generation output shall be limited using a value that is closest to and lower than the value specified by this property.

9.31.28 Limit setting for the amount of electricity sold property

This property is used to specify, in W, the amount of electricity sold and to acquire the current setting. The value range for this property shall be from 0x0000 to 0xFFFFD (from 0 to 65 533). In the case where it is not possible to limit the amounts of electricity sold using the value specified by this property, the amount of electricity sold shall be limited using a value that is closest to and lower than the value specified by this property.

9.31.29 Rated power generation output (system interconnected) property

This property indicates the rated power generation output (catalogue value) in the system-interconnected status (reverse power flow acceptable or not acceptable), in W. The value range for this property shall be from 0x0000 to 0xFFFFD (from 0 to 65 533).

9.31.30 Rated power generation output (independent) property

This property indicates the rated power output (catalogue value) in the independent status in watts. The property value range shall be from 0x0000 to 0xFFFD (0 to 65 533), and 0xFFFF when there is no value set.

9.32 Floor heater class specifications

9.32.1 General

The control commands of "floor heater" are shown in Table 50.

Class group code : 0x02

Class code : 0x7B

Table 50 – List of floor heater properties

[illegible]

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
ON timer reservation setting	0x90	Reservation ON/OFF	unsigned char	1 byte	–	Set/Get			
		ON = 0x41, OFF = 0x42							
Time set by ON timer	0x91	Timer value HH:MM	unsigned char × 2	2 bytes	–	Set/Get			
		0 to 0x17: 0 to 0x3B (= 0 to 23):(= 0 to 59)							
Relative ON timer setting	0x92	Timer value HH:MM	unsigned char × 2	2 bytes	–	Set/Get			
		0 to 0x17: 0 to 0x3B (= 0 to 23):(= 0 to 59)							
OFF timer reservation setting	0x94	Reservation ON/OFF	unsigned char	1 byte	–	Set/Get			
		ON = 0x41, OFF = 0x42							
Time set by OFF timer	0x95	Timer value HH:MM	unsigned char × 2	2 bytes	–	Set/Get			
		0 to 0x17: 0 to 0x3B (= 0 to 23):(= 0 to 59)							
Relative OFF timer setting	0x96	Timer value HH:MM	unsigned char × 2	2 bytes	–	Set/Get			
		0 to 0x17: 0 to 0x3B (= 0 to 23):(= 0 to 59)							
a Either "temperature setting 1 EPC:0xE0" or "temperature setting 2 EPC:0xE1" shall be specified.									

9.32.2 Operation status property

This property indicates ON/OFF of the floor heater. ON/OFF shall correspond to the property value of 0x30/0x31. The access rule "SET" shall be implemented for floor heaters.

9.32.3 Measured instantaneous power consumption property

This property indicates the instantaneous power consumption of the floor heater in increments of watts. The value range for this property shall be 0x0000 to 0xFFFFD. When the property value of the actual device is higher than the property value range, overflow code 0xFFFF shall be used. When the property value of the actual device is lower than the property value range, underflow code 0xFFFE shall be used.

With floor heaters, if there is more than one class or instance inside a single node, the measured instantaneous power consumption for the whole node may be returned as a common value for any class or instance.

This property is related to the "Power consumption measurement method" property.

9.32.4 Measured cumulative energy consumption property

This property indicates the cumulative energy consumption of the floor heater in increments of 0,001 kWh. The value range for this property shall be 0x00000000 to 0x3B9AC9FF (0 kWh to 999 999,999 kWh). When the measured cumulative energy consumption overflows, the property value shall be incremented again from 0x00000000.

With floor heaters, if there is more than one class or instance inside a single node, the measured cumulative energy consumption for the whole node may be returned as a common value for any class or instance.

This property is related to the "Power consumption measurement method" property.

9.32.5 Temperature setting 1 property

This property indicates the setting value of temperature in °C and sets the property values to be 0 °C to 50 °C (0x00 to 0x32).

When this property indicates an automatic operation worked by an algorithm of automatic temperature setting of the floor heater, Automatic = 0x41 (automatic temperature) is set.

The type of temperature of this property is not specified. However, it shall be a temperature that the floor heater controls (such as room temperature or floor temperature).

This property shall be effective even when the value of operation status property (0x80) is OFF (0x31).

Either this property or temperature setting 2 (0xE1) shall be implemented.

9.32.6 Temperature setting 2 property

This property indicates the setting value of temperature by 15 steps and the property value shall be 0x31 to 0x3F. Each temperature level does not specify the values in °C and shall indicate 0x31 for the minimum temperature and 0x3F for the maximum temperature.

When this property indicates an automatic operation worked by an algorithm of automatic temperature setting of the floor heater, Automatic = 0x41 (automatic temperature) is set.

This property shall be effective even when the value of operation status property (0x80) is OFF (0x31).

Either this property or temperature setting 1 (0xE0) shall be implemented.

When implementing "temperature setting 2 – Maximum settable level", the minimum value shall be 0x31 and the maximum value shall be the temperature setting 2 – Maximum settable level. When "temperature setting 2" is in automatic status, the contents of the temperature setting 2 – Maximum settable level shall become invalid.

9.32.7 Temperature setting 2 – Maximum settable level property

This property indicates the maximum value of acceptable water temperature setting 2. Specifies the minimum value as 0x31 and the maximum value as 0x3F. Specific values of each level are not specified.

This property changes according to connected floor heater controllers and user operations. The floor heater controllers and timing of the change are not stipulated.

This property relates to "temperature setting 2" property. When "temperature setting 2" is in Automatic status, the contents of the temperature setting 2 – Maximum settable level shall become invalid.

9.32.8 Measured room temperature property

This property indicates the measured temperature, in °C. The range of the property value shall be –127 °C to 125 °C (0x81 to 0x7D). The property value shall use the overflow code 0x7F when the measured property value is over the range, and shall use the underflow code 0x80 when the measured property value is less than the range. 0x7E shall be used when the measured value cannot be returned.

This property shall be effective even when the value of operation status property (0x80) is OFF (0x31).

9.32.9 Measured floor temperature property

This property indicates the measured temperature in °C. The range of the property value shall be –127 °C to 125 °C (0x81 to 0x7D). The property value shall use the overflow code 0x7F when the measured property value is over the range, and shall use the underflow code 0x80 when the measured property value is less than the range. 0x7E shall be used when the measured value cannot be returned.

9.32.10 Zone change setting property

This property sets the target zone and gets the controllable zone when the target floor is divided into zones. The maximum number of zones for the floor is 8 and each zone is explained by a bit map. b0 to b7 are allocated to zones 0 to 7. Each bit shall be 1: with control, and 0: without control.

This property shall be effective even when the value of operation status property (0x80) is OFF (0x31).

When setting other properties such as operation status (0x80) or temperature setting 1 (0xE0) for each zone or acquiring the setting status, instances may be allocated to each zone.

9.32.11 Special operation setting property

This property sets normal/modest/high power operation and gets the status. This property corresponds to the property value of 0x41/0x42/0x43.

The modest operation temporarily sets the temperature value at a lower temperature for night time or for a time of absence. The high power operation temporarily sets the water temperature at a higher value.

9.32.12 Daily timer setting property

This property sets ON/OFF of the daily timer and gets the status.

2 kinds of daily timers can be used (for weekdays or holidays, for example).

Timer OFF: 0x40, timer 1 ON: 0x41, timer 2 ON: 0x42.

This property shall be effective even when the value of operation status property (0x80) is OFF (0x31).

9.32.13 Daily timer setting 1 property / Daily timer setting 2 property

These properties set the setting values of timer 1 and timer 2 for "daily time setting" and get the status respectively.

24 h are divided into 30-min segments. The timer is set in increments of 30 min and allocated 6 bytes. 1: in operation or 0: stopped is indicated for each bit. The definition of each bit is shown in Figure 68.

This property shall be effective even when the value of operation status property (0x80) is OFF (0x31).

The 1st byte

b0	b1	b2	b3	b4	b5	b6	b7
0:00-0:29	0:30-0:59	1:00-1:29	1:30-1:59	2:00-2:29	2:30-2:59	3:00-3:29	3:30-3:59

The 2nd byte

b0	b1	b2	b3	b4	b5	b6	b7
4:00-4:29	4:30-4:59	5:00-5:29	5:30-5:59	6:00-6:29	6:30-6:59	7:00-7:29	7:30-7:59

The 3rd byte

b0	b1	b2	b3	b4	b5	b6	b7
8:00-8:29	8:30-8:59	9:00-9:29	9:30-9:59	10:00-10:29	10:30-10:59	11:00-11:29	11:30-11:59

The 4th byte

b0	b1	b2	b3	b4	b5	b6	b7
12:00-12:29	12:30-12:59	13:00-13:29	13:30-13:59	14:00-14:29	14:30-14:59	15:00-15:29	15:30-15:59

The 5th byte

b0	b1	b2	b3	b4	b5	b6	b7
16:00-16:29	16:30-16:59	17:00-17:29	17:30-17:59	18:00-18:29	18:30-18:59	19:00-19:29	19:30-19:59

The 6th byte

b0	b1	b2	b3	b4	b5	b6	b7
20:00-20:29	20:30-20:59	21:00-21:29	21:30-21:59	22:00-22:29	22:30-22:59	23:00-23:29	23:30-23:59

IEC

Figure 68 – Daily timer setting

9.32.14 Rated power consumption property

This property indicates the rated power consumption (catalogue value) in watts. The value range for this property shall be 0x0000 to 0xFFFFD (0 to 65 533). When the property value of the actual device is higher than the property value range, overflow code 0xFFFF shall be used. When lower than the property value range, underflow code 0xFFFE shall be used.

This property shall be guaranteed effective even when the operation status property (0x80) is OFF (0x31).

When using more than one class or instance inside a single node (such as when the target floor is divided into zones for control), the rated power consumption for the whole node may be returned as a common value for any class or instance.

This property is related to the property of "Power consumption measurement method".

9.32.15 Power consumption measurement method property

This property indicates the method of measuring "Measured instantaneous power consumption", "Measured cumulative energy consumption" and "Rated power consumption". If returning common values inside the same node (if returning a common value for more than one class or instance inside the node), the node unit shall be 0x41.

If returning common values inside the same class (if returning a common value for more than one instance inside the class), the class unit shall be 0x42. The acquirable value is the value for the class in question, and that the total of values for each class is not necessarily the value for the whole node.

If returning different values for each instance, the instance unit shall be 0x43. The acquirable value is the value for the instance in question, and that the total of values for each instance is not necessarily the value for the whole node.

This property is related to "Measured instantaneous power consumption", "Measured cumulative energy consumption" and "Rated power consumption".

When this property is not installed, the method of measuring "Measured instantaneous power consumption", "Measured cumulative energy consumption" and "Rated power consumption" shall be based on the instance unit.

9.32.16 ON timer reservation setting property

This property sets the reservation ON/OFF of the ON timer. This property is related to "ON timer setting" and "relative ON timer setting".

Reservation ON = 0x41, OFF = 0x42.

This property shall be effective even when the value of operation status property (0x80) is OFF (0x31).

9.32.17 Time set by ON timer property

This property indicates the ON time of the floor heater by hours: 0x00 to 0x17 (0 to 23) and minutes: 0x00 to 0x3B (0 to 59) when "ON timer reservation setting" is ON. The property value shall sequentially indicate the hour and minute, beginning with the high-order byte.

This property shall be effective even when the value of operation status property (0x80) is OFF (0x31).

9.32.18 Relative ON timer setting property

This property indicates the ON time of the floor heater by relative time from the current time. The data format is hours: 0x00 to 0x17 (0 to 23) and minutes: 0x00 to 0x3B (0 to 59) when "ON timer reservation setting" is ON. The property value shall sequentially indicate the hour and minute, beginning with the high-order byte.

This property shall be effective even when the value of operation status property (0x80) is OFF (0x31).

9.32.19 OFF timer reservation setting property

This property sets reservation ON/OFF of the OFF timer. This property is related to "time set by OFF timer" and "relative OFF timer setting".

Reservation ON = 0x41, OFF = 0x42.

9.32.20 Time set by OFF timer property

This property shall be effective even when the value of operation status property (0x80) is OFF (0x31).

9.32.21 Relative OFF timer setting property

This property shall be effective even when the value of operation status property (0x80) is OFF (0x31).

9.33 Fuel cell class specifications

9.33.1 General

The control commands of "fuel cell" are shown in Table 51.

Class group code : 0x02

Class code : 0x7C

Table 51 – List of fuel cell properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	–	Set		○	
		ON = 0x30, OFF = 0x31				Get	○		
Measured temperature of water in water heater	0xC1	Indicates the current temperature of the water in the water heater in °C.	unsigned char	1 byte	°C	Get			
		0x00 to 0x64 (0 °C to 100 °C)							
Rated power generation output	0xC2	Indicates the rated power generation output in watts.	unsigned short	2 bytes	W	Get	○		
		0x0000 to 0xFFFF (0 W to 65 533 W)							
Heating value of hot water storage tank	0xC3	Indicates the heating value of the hot water storage tank in MJ.	unsigned short	2 bytes	MJ	Get			
		0x0000 to 0xFFFF (0 MJ to 65 533 MJ)							
Measured instantaneous power generation output	0xC4	Indicates the instantaneous power generation output in watts.	unsigned short	2 bytes	W	Get	○		
		0x0000 to 0xFFFF (0 W to 65 533 W)							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Measured cumulative energy generation output	0xC5	Indicates the cumulative energy generation output in increments of 0,001 kWh.	unsigned long	4 bytes	0,001 kWh	Get	○		
		0x0 to 0x3B9AC9FF (0 kWh to 999 999,999 kWh)							
Cumulative energy generation output reset setting	0xC6	Resets the cumulative energy generation output by writing 0x00.	unsigned char	1 byte	–	Set			
		Reset = 0x00							
Measured instantaneous gas consumption	0xC7	Indicates the instantaneous gas consumption in increments of 0,001 m³/h.	unsigned short	2 bytes	0,001 m³/h	Get			
		0x0 to 0xFFFFD (0 m³/h to 65,533 m³/h)							
Measured cumulative gas consumption	0xC8	Indicates the cumulative gas consumption in increments of 0,001 m³.	unsigned long	4 bytes	0,001 m³	Get			
		0x0 to 0x3B9AC9FF (0 m³ to 999 999,999 m³)							
Cumulative gas consumption reset setting	0xC9	Resets the cumulative gas consumption by writing 0x00.	unsigned char	1 byte	–	Set			
		Reset = 0x00							
Power generation setting	0xCA	Indicates the setting of start or stop of power generation.	unsigned char	1 byte	–	Set/Get			
		Power generation ON = 0x41, Power generation OFF = 0x42							
Power generation status	0xCB	Indicates the power generation status.	unsigned char	1 byte	–	Get	○	○	
		generating = 0x41, stopped = 0x42, starting = 0x43, stopping = 0x44, idling = 0x45							
Measured in-house instantaneous power consumption	0xCC	Indicates the measured in-house instantaneous power consumption in watts.	unsigned short	2 bytes	W	Get			
		0x0000 to 0xFFFFD (0 W to 65 533 W)							
Measured in-house cumulative energy consumption	0xCD	Indicates the measured in-house cumulative energy consumption in increments of 0,001 kWh.	unsigned long	4 bytes	0,001 kWh	Get			
		0x00000000 to 0x3B9AC9FF (0 kWh to 999 999,999 kWh)							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
In-house cumulative energy consumption reset	0xCE	By setting 0 to this property, the measured in-house cumulative energy consumption is reset. Reset = 0x00	unsigned char	1 byte		Set			
System interconnection status	0xD0	Indicates the status of interconnection with the system. System interconnected (reverse power flow acceptable) = 0x00, Independent = 0x01, System interconnected (reverse power flow not acceptable) = 0x02	unsigned char	1 byte	–	Get	○		
Power generation request time setting	0xD1	Start times and end times that are requested power generation by fuel cells shall be listed. Start time: End time: 0 to 0x17:0 to 0x3B:0 to 0x17: 0 to 0x3B (= 0 to 23)⊗ = 0 to 59)⊗ = 0 to 23)⊗ = 0 to 59) When not set: 0xFFFFFFFF	unsigned char × 4	4 bytes		Set/Get	○		
Designated power generation status	0xD2	Used to specify the power generation method when a fuel cell generates power within the power generation requested time. Power generation at the maximum rating: 0x41 Load following power generation: 0x42	unsigned char	1 byte		Set/Get	○		
Measured remaining hot water amount	0xE1	Indicates the measured amount of the remaining hot water in litres. 0x0000 to 0xFFFFD (0 litre to 65 533 litres)	unsigned short	2 bytes	litre	Get			
Tank capacity	0xE2	Indicates the tank capacity in litres. 0x0000 to 0xFFFFD (0 litre to 65 533 litres)	unsigned short	2 bytes	litre	Get			

9.33.2 Operation status property

This property indicates whether the functions specific to this class are operating (ON) or not (OFF). In the case of a node in which this class is implemented and the functions specific to this class start operating upon start-up of the node, this property may be implemented with the value fixed at 0x30 (operation status ON).

9.33.3 Measured temperature of water in water heater property

This property indicates the current hot water temperature in the hot water storage tank in °C. The property value range shall be 0x00 to 0x64 (0 °C to 100 °C).

9.33.4 Rated power generation output property

This property indicates the rated power generation output in watts. The property value range shall be 0x0000 to 0xFFFFD. When the property value of the actual device is higher than the upper bound of the value range, 0xFFFF (overflow code) shall be used. When the property value of the actual device is lower than the lower bound of the value range, 0xFFFE (underflow code) shall be used.

9.33.5 Heating value of hot water storage tank property

This property indicates the heating value of the hot water storage tank in MJ. The property value range shall be 0x0000 to 0xFFFFD. When the property value of the actual device is higher than the upper bound of the value range, 0xFFFF (overflow code) shall be used. When the property value of the actual device is lower than the lower bound of the value range, 0xFFFE (underflow code) shall be used.

9.33.6 Measured instantaneous power generation output property

This property indicates the instantaneous power generation output in watts. The property value range shall be 0x0000 to 0xFFFFD. When the property value of the actual device is higher than the upper bound of the value range, 0xFFFF (overflow code) shall be used. When the property value of the actual device is lower than the lower bound of the value range, 0xFFFE (underflow code) shall be used.

9.33.7 Measured cumulative energy generation output property

This property indicates the cumulative energy generation output in increments of 0,001 kWh. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 kWh to 999 999,999 kWh). In the event of a cumulative energy generation output overflow, the counting of the cumulative energy generation output shall be restarted from 0x00000000.

9.33.8 Cumulative energy generation output reset setting property

This property resets the cumulative energy generation output to zero by setting 0x00.

9.33.9 Measured instantaneous gas consumption property

This property indicates the instantaneous gas consumption in increments of 0,001 m³/h. The property value range shall be 0x0000 to 0xFFFFD (0 m³/h to 65,533 m³/h). When the property value of the actual device is higher than the upper bound of the value range, 0xFFFF (overflow code) shall be used. When the property value of the actual device is lower than the lower bound of the value range, 0xFFFE (underflow code) shall be used.

9.33.10 Measured cumulative gas consumption property

This property indicates the cumulative gas consumption in increments of 0,001 m³. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 m³ to 999 999,999 m³). In the event of a cumulative gas consumption overflow, the counting of the cumulative gas consumption shall be restarted from 0x00000000.

9.33.11 Cumulative gas consumption reset setting property

This property resets the cumulative gas consumption to zero by setting 0x00.

9.33.12 Power generation setting property

This property indicates the setting of power generation by the fuel cell. The property value for power generation ON shall be 0x41, and the property value for power generation OFF shall be 0x42.

9.33.13 Power generation status property

This property indicates the power generation status of the fuel cell. The property value for generating shall be 0x41, the property value for stopped shall be 0x42, the property value for starting shall be 0x43, the property value for stopping shall be 0x44 and the property value for idling shall be 0x45.

9.33.14 Measured in-house instantaneous power consumption property

This property indicates the in-house instantaneous power consumption in watts. The property value range shall be 0x0000 to 0xFFFF. When the property value of the actual device is higher than the value range of this property, the overflow code 0xFFFF shall be used. When the property value is lower than the value range of this property, the underflow code 0xFFFE shall be used.

In-house instantaneous power consumption is the sum of power where an anti-reverse power flow CT is installed and the power output.

9.33.15 Measured in-house cumulative energy consumption property

This property indicates the in-house cumulative energy consumption in increments of 0,001 kWh. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 kWh to 999 999,999 kWh) and increments again from 0x00000000 in the case of a cumulative energy consumption overflow.

In-house cumulative energy consumption is the sum of the cumulative energy at the reverse power flow protection CT and the cumulative energy of the generated energy output.

9.33.16 In-house cumulative energy consumption reset property

By setting 0x00 to this property, the in-house cumulative energy consumption is reset to zero.

9.33.17 System interconnection status property

This property indicates the status of interconnection with the system.

System interconnected (reverse power flow acceptable) = 0x00, Independent = 0x01, System interconnected (reverse power flow not acceptable) = 0x02.

"Reverse power flow acceptable" shall mean that a fuel cell is set to allow reverse power flow, while "reverse power flow not acceptable" shall mean that a fuel cell is set to not allow reverse power flow.

9.33.18 Power generation request time setting property

The time that a fuel cell generates power is determined based on the fuel cell's control algorithm. However, the time to request power generation (start time and end time) shall be set to fuel cells using this property. It is possible that power is not always generated even during the power generation request time, due to power usage status, the amount of hot water remaining in the tank, or device protection. Especially when the fuel cell has not been started, it is recommended to set a start time after a certain amount of time has elapsed, considering the start-up time of the fuel cell.

This property value shall have a list of start times and end times. When the value of this property has not been set the value shall be set to "0xFFFFFFFF" (not set). The property value for the fuel cell shall be set to "not set" when reaching the end time.

When a start time is set to a time earlier than the current time, the fuel cell shall interpret the start time as being for the following day. When an end time is set to a time earlier than the start time, the fuel cell shall interpret the end time as being for the following day.

The fuel cell shall determine whether generation occurs or not, for a time other than the power generation request time.

9.33.19 Designated power generation status property

When a fuel cell generates power during the time set by "power generation request time setting property", it shall set whether it generates power at maximum rating or load following. Then, the setting status shall be acquired. "Power generation at maximum rating" shall be set only when the value of the system interconnection status property is "system interconnected (reverse power flow acceptable)".

It is possible that power is not always generated at maximum rating under certain conditions, since the fuel cell determines the amount of power to be generated (including whether it generates power or not). These conditions include the amount of hot water remaining in the tank, reverse power flow acceptable or not, and power usage status of users.

9.33.20 Measured remaining hot water amount property

This property indicates the amount of hot water remaining in the tank in litres. The property value range shall be 0x0000 to 0xFFFFD (0 litres to 65 533 litres). When the property value of the actual device is higher than the upper bound of the value range, 0xFFFF (overflow code) shall be used. When the property value of the actual device is lower than the lower bound of the value range, 0xFFFFE (underflow code) shall be used.

9.33.21 Tank capacity property

This property indicates the tank capacity in litres. The property value range shall be 0x0000 to 0xFFFFD (0 litres to 65 533 litres). When the property value of the actual device is higher than the upper bound of the value range, 0xFFFF (overflow code) shall be used. When the property value of the actual device is lower than the lower bound of the value range, 0xFFFFE (underflow code) shall be used.

9.34 Storage battery class specifications

9.34.1 General

Class group code: 0x02

Class code: 0x7D

In this class, electric current, voltage, and energy values shall be those of AC. An example configuration is shown in Figure 69. The control commands of "storage battery" are shown in Table 52.

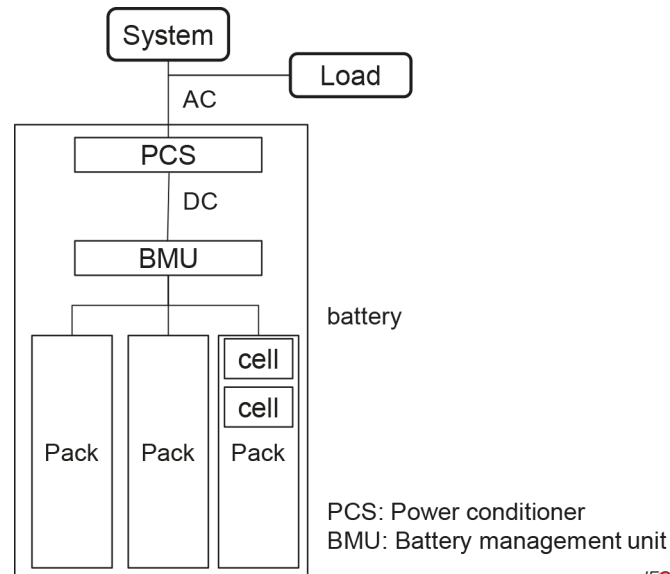


Figure 69 – Example of the battery configuration

A relational image of various properties related to electric energy that are handled in this class is shown in Figure 70. The actual chargeable/dischargeable amounts, upper limit for dischargeable amount, and lower limit for dischargeable amount (areas used) are based on specifications for the storage battery.

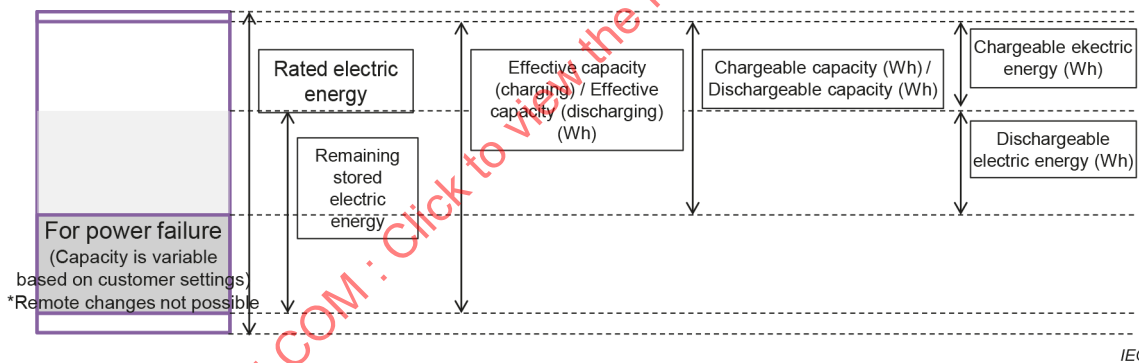


Figure 70 – Image of various properties related to electric energy handled in this class

To be exact, there are cases where the values for chargeable capacity and dischargeable capacity differ. There are also cases where effective capacity differs for charging and discharging.

Table 52 – List of storage battery properties

[illegible]

[illegible]

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
AC cumulative discharging electric energy	0xA9	Indicates the cumulative discharging electric energy (AC) in 0,001 kWh	unsigned long	4 bytes	0,001 kWh	Get	○		
		0x00000000 to 0x3B9AC9FF (0 kWh to 999 999,999 kWh)							
AC charge amount target value	0xAA	Indicates the electric energy for charging (AC) in Wh	unsigned long	4 bytes	Wh	Set/Get	○	○	
		0x00000000: Not set 0x00000001 to 0x3B9AC9FF (1 kWh to 999 999 999 Wh)							
AC discharge amount target value	0xAB	Indicates the electric energy for discharging (AC) in Wh	unsigned long	4 bytes	Wh	Set/Get	○	○	
		0x00000000: Not set 0x00000001 to 0x3B9AC9FF (1 Wh to 999 999 999 Wh)							
Charging method	0xC1	Indicates charging method when setting charging (0x42) to operation mode setting (EPC = 0xDA).	unsigned char	1 byte	–	Set		○	
		Maximum charging electric power charting = 0x01, Surplus electric power charging = 0x02, Designated electric power charging = 0x03, Designated current charging = 0x04, Others = 0x00				Get	○		
Discharging method	0xC2	Indicates discharging method when setting discharging (0x43) to operation mode setting (EPC = 0xDA).	unsigned char	1 byte	–	Set		○	
		Maximum discharging electric power discharging = 0x01, Load-following discharging = 0x02, Designated electric power discharging = 0x03, Designated current discharging = 0x04, Others = 0x00				Get	○		

[illegible]

[illegible]

[illegible]

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation mode setting	0xDA	Sets the battery to one of the following operation modes: "Rapid charging," "Charging," "Discharging," "Standby," "Test," "Automatic" or "Others." The operation modes of charging, discharging and standby are required. Rapid charging = 0x41, Charging = 0x42, Discharging = 0x43, Standby = 0x44, Test = 0x45, Automatic = 0x46, Restart = 0x48, Effective capacity recalculation processing = 0x49, Others = 0x40	unsigned char	1 byte	–	Set/Get	○ ^f	○	
System interconnection status	0xDB	Indicates the status of system interconnection. System interconnected (reverse power flow acceptable) = 0x00, Independent = 0x01, System interconnected (reverse power flow not acceptable) = 0x02	unsigned char	1 byte	–	Get	○		
Minimum/maximum charging electric power (independent)	0xDC	Indicates the minimum and maximum values of charging power battery in watts (AC) in the dependent status. 0x00000000 to 0x3B9AC9FF (0 W to 999 999 999 W) Minimum charging power: Maximum charging power	unsigned long × 2	8 bytes	W	Get			
Minimum/maximum discharging electric power (independent)	0xDD	Indicates the minimum and maximum values of discharging power from the battery in the independent status in watts (AC). 0x00000000 to 0x3B9AC9FF (0 W to 999 999 999 W) Minimum discharging power: Maximum discharging power	unsigned long × 2	8 bytes	W	Get			

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Remaining stored electricity 3	0xE4	Indicates the charging rate of the battery in %.	unsigned char	1 byte	%	Get	○		b
		0x00 to 0x64 (0 % to 100 %)							
Battery state of health	0xE5	Indicates the battery state of health in %.	unsigned char	1 byte	%	Get			
		0x00 to 0x64 (0 % to 100 %)							
Battery type	0xE6	Indicates the battery type.	unsigned char	1 byte		Get	○		
		Type = 0x00 to 0xFF							
Charging amount setting 1	0xE7	Specifies the charging electric energy in Wh (DC).	unsigned long	4 bytes	Wh	Set/Get			d
		0x00000000 to 0x3B9AC9FF (0 Wh to 999 999 999 Wh)							
Discharging amount setting 1	0xE8	Specifies the discharging electric energy in Wh (DC).	unsigned long	4 bytes	Wh	Set/Get			e
		0x00000000 to 0x3B9AC9FF (0 Wh to 999 999 999 Wh)							
Charging amount setting 2	0xE9	Specifies the charging capacity in increments of 0,1 Ah (DC).	unsigned short	2 bytes	0,1 Ah	Set/Get			d
		0x0000 to 0x7FFE (0 Ah to 3 276,6 Ah)							
Discharging amount setting 2	0xEA	Specifies the discharging capacity in increments of 0,1 Ah (DC).	unsigned short	2 bytes	0,1 Ah	Set/Get			e
		0x0000 to 0x7FFE (0 Ah to 3 276,6 Ah)							
Charging electric power setting	0xEB	Specifies the charging electric energy in watts (AC).	unsigned long	4 bytes	W	Set/Get			
		0x00000000 to 0x3B9AC9FF (0 Wh to 999 999 999 Wh)							
Discharging electric power setting	0xEC	Specifies the discharging electric power in watts (AC).	unsigned long	4 bytes	W	Set/Get			
		0x00000000 to 0x3B9AC9FF (0 Wh to 999 999 999 Wh)							
Charging current setting	0xED	Specifies the charging current in increments of 0,1 A (AC).	unsigned short	2 bytes	0,1 A	Set/Get			
		0x0000 to 0xFFFFD (0 A to 6 553,3 A)							
Discharging current setting	0xEE	Specifies the discharging current in increments of 0,1 A (AC).	unsigned short	2 bytes	0,1 A	Set/Get			
		0x0000 to 0xFFFFD (0 A to 6 553,3 A)							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Rated voltage (independent)	0xEF	Indicates the rated voltage of a battery in the independent status in volts (AC). 0x0000 to 0x7FFE (0 V to 32 766 V)	unsigned short	2 bytes	V	Get			
^a It is mandatory to install Remaining stored electricity 1, Remaining stored electricity 2, or Remaining stored electricity 3. The definition of effective capacity is effective capacity as of the present point in time. Calculation of effective capacity has not been standardized as of the point in time of creation of these specifications due to differences in calculation specifications for each device. It is recommended that users of this property obtain information separately for each device. ^b It is mandatory to install Remaining stored electricity 1, Remaining stored electricity 2, or Remaining stored electricity 3. ^c When Charging/discharging amount setting 1 (or 2) is used, Charging/discharging amount setting 2 (or 1), Charging amount setting 1, Discharging amount setting 1, Charging amount setting 2 and Discharging amount setting 2 shall not be used. ^d When Charging amount setting 1 (or 2) is used, Charging amount setting 2 (or 1) and Charging/discharging amount setting 1 and 2 shall not be used. ^e When Discharging amount setting 1 (or 2) is used, Discharging amount setting 2 (or 1) and Charging/discharging amount setting 1 and 2 shall not be used. ^f Among the property contents, incorporation of the operation modes of Charging, Discharging and Standby are required.									

9.34.2 Operation status property

This property indicates whether the functions specific to this class are operating (ON) or not (OFF). In the case of a node in which this class is implemented and the functions specific to this class start operating upon start-up of the node, this property may be implemented with the value fixed at 0x30 (operation status ON).

9.34.3 Identification number property

The "identification number" property is a number that allows each device object to be uniquely identified. The first byte indicates the format of the unique number.

In the case where the unique number type is 0xFE ("defined by the manufacturer"), the unique number is comprised of a 3-byte manufacturer code field, which contains the unique manufacturer code assigned by the ECHONET Consortium to the manufacture in question, and a 13-byte unique ID field, which contains the unique identification number defined by the manufacturer. This property's data structure is shown in Figure 46. Each vendor shall ensure that there will be no code value overlap.

9.34.4 Current time setting property

This property indicates the current local time using a value between 0x00 and 0x17 (0 and 23) for the hour and a value between 0x00 and 0x3B (0 and 59) for the minute. The first byte of the property value indicates the hour and the second byte indicates the minute. Only Get is required for this class.

9.34.5 Current date setting property

This property indicates the current date using a value between 0x0001 and 0x270F (1 and 9 999) for the year, a value between 0x01 and 0x0C (1 and 12) for the month and a value between 0x01 and 0x1F (1 and 31) for the day. The first and second bytes are treated as one piece of unsigned short data which indicates the year (2 bytes). The third byte indicates the month (1 byte) and the fourth byte indicates the day (1 byte). Only Get is required for this class.

9.34.6 AC effective capacity (charging) property

This property expresses the electric energy that can be charged to an empty storage battery in increments of Wh. The effective capacity indicated in this property is the AC value. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 Wh to 999 999 999 Wh). With regard to the relationship between the effective capacity defined in this property and other properties related to electric energy, such as rated electric energy, etc., refer to Figure 70. The effective capacity may change due to degradation over time. The method for calculating effective capacity of a storage battery and the timing at which to perform recalculations are not specified in these specifications.

9.34.7 AC effective capacity (discharging) property

This property expresses the dischargeable electric energy from a storage battery in a state where it is fully charged in increments of Wh. The effective capacity indicated in this property is the AC value. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 Wh to 999 999 999 Wh). With regard to the relationship between the effective capacity defined in this property and other properties related to electric energy, such as rated electric energy, etc., refer to Figure 70. The effective capacity can change owing to degradation over time. The method for calculating effective capacity of a storage battery and the timing at which to perform recalculations are not specified in this document.

9.34.8 AC chargeable capacity property

This property indicates the capacity that can be used for charging normally, which means the AC effective capacity (charging) excluding the energy always stored in preparation for power failure. The chargeable capacity indicated in this property is the AC value. With regard to the relationship between the chargeable capacity defined in this property and other properties related to electric energy, such as rated electric energy, etc., refer to Figure 70. The chargeable capacity may change due to degradation over time. The method for calculating chargeable capacity of a storage battery and the timing at which to perform recalculations are not specified in this document.

9.34.9 AC dischargeable capacity property

This property indicates the capacity that can be used for discharging normally, which means the AC effective capacity (discharging) excluding the energy always stored in preparation for power failure. The dischargeable capacity indicated in this property is the AC value. With regard to the relationship between the dischargeable capacity defined in this property and other properties related to electric energy, such as rated electric energy, etc., refer to Figure 70. The dischargeable capacity can change owing to degradation over time. The method for calculating dischargeable capacity of a storage battery and the timing at which to perform recalculations are not specified in this document.

9.34.10 AC chargeable electric energy property

This property indicates the electric energy that is actually chargeable. The chargeable electric energy indicated in this property is the AC value. With regard to the relationship between the chargeable electric energy defined in this property and other properties related to electric energy, such as rated energy, etc., refer to Figure 70.

9.34.11 AC dischargeable electric energy property

This property indicates the electric energy that is actually dischargeable. The dischargeable electric energy indicated in this property is the AC value. With regard to the relationship between the dischargeable electric energy defined in this property and other properties related to electric energy, such as rated energy, etc. refer to Figure 70.

9.34.12 AC charge upper limit setting property

This property sets the upper limit for the charge amount within the AC chargeable capacity. If the entire chargeable capacity is to be charged, the value for this property shall be set to 100.

9.34.13 AC discharge lower limit setting property

This property sets the lower limit for the discharge amount within the AC dischargeable capacity. If the entire dischargeable capacity is to be discharged, the value for this property shall be set to 0.

9.34.14 AC cumulative charging electric energy property

This property indicates the cumulative amount of electric energy when charging in increments of 0,001 kWh. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 kWh to 999 999,999 kWh). When the cumulative amounts of electric energy overflows, the property value shall be incremented again from 0x00000000. The cumulative amount of charging electric energy indicated in this property is the AC value.

9.34.15 AC cumulative discharging electric energy property

This property indicates the cumulative amount of electric energy when discharging in increments of 0,001 kWh. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 kWh to 999 999,999 kWh). When the cumulative amounts of electric energy overflows, the property value shall be incremented again from 0x00000000. The cumulative amount of discharging electric energy indicated in this property is the AC value.

9.34.16 AC charge amount target value property

This property designates the amount of electric energy charged in increments of Wh (this property does not designate the residual quantity of a storage battery after charging). When the operation mode is set to Charging, this target value shall be reflected in the discharging operation without having to set the operation mode again; when the operation mode is set to something other than Charging, this target value is reflected in the Charging operation when the operation mode is set to Charging. The property value range when the charging amount is set shall be 0x00000001 to 0x3B9AC9FF (1 Wh to 999 999 999 Wh). The property value shall be 0x00000000 when there is no value set, and the charge amount during charging is determined by the storage battery itself. During a charging operation based on this target value, there is no change in the value based on the charging energy (there is no successive change corresponding to the actual performance of the charging energy). Since there are cases where status change announcements are not made if the same value is set, it is recommended that the same value not be set for this target value. When charging operation based on this target value is completed, the operating status of the storage battery becomes "Standby", and this target value becomes 0. However, the value of the operation mode setting does not change. There are also cases where charging ends without the electric energy set for this target value being charged. If charging until the AC chargeable amount becomes 0, specify a value greater than the AC chargeable capacity for this target value. The charging amount indicated in this property is the AC value.

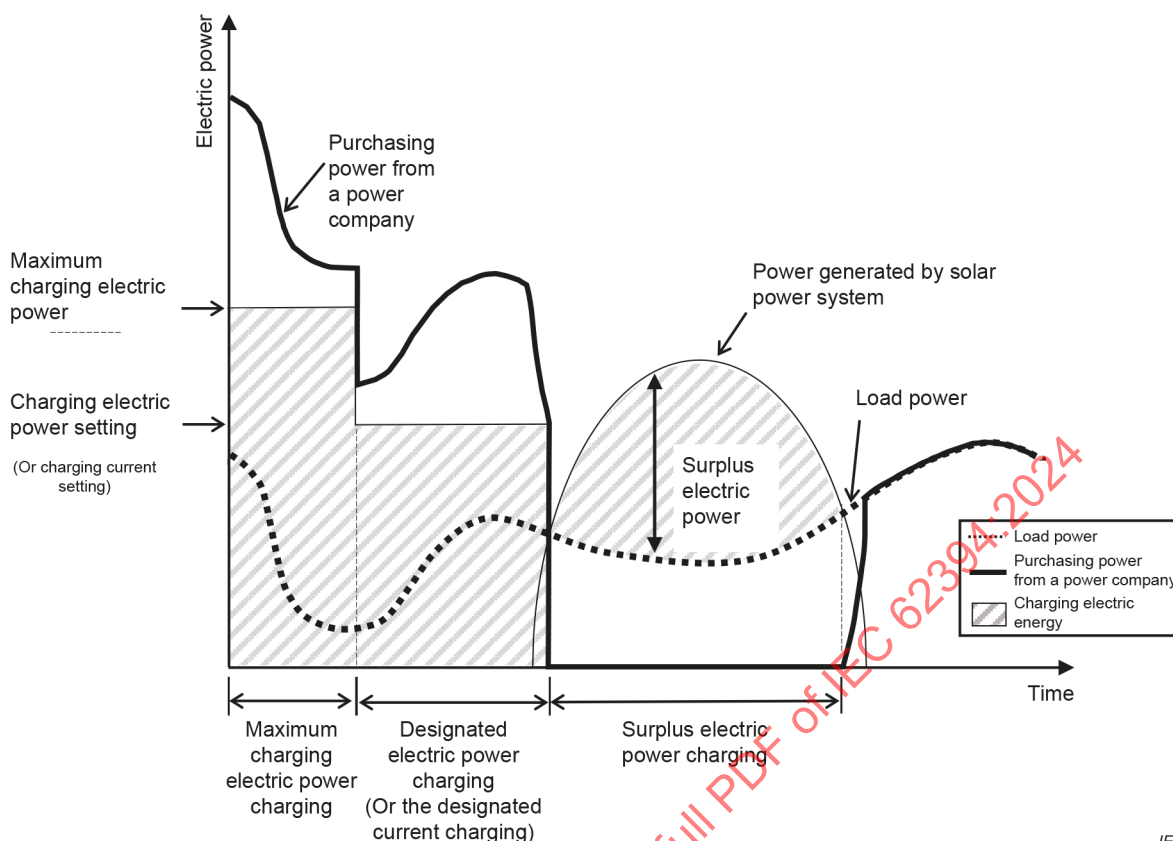
9.34.17 AC discharge amount target value property

This property designates the amount of electric energy discharged in increments of Wh (this property does not designate the residual quantity of a storage battery after discharging). When the operation mode is set to Discharging, this target value is reflected in the discharging operation without having to set the operation mode again; when the operation mode is set to something other than Discharging, this target value is reflected in the discharging operation when the operation mode is set to Discharging. The property value range when the discharging amount is set shall be 0x00000001 to 0x3B9AC9FF (1 Wh to 999 999 999 Wh). The property value shall be 0x00000000 when there is no value set, and the discharge amount during discharging is determined by the storage battery itself. During a discharging operation based on this target value, there is no change in the value based on the discharging energy (there is no successive change corresponding to the actual performance of the discharging energy). Since there are cases where status change announcements are not made if the same value is set, it is recommended that the same value not be set for this target value. When discharging operation based on this target value is completed, the operating status of the storage battery becomes "Standby", and this target value becomes 0. However, the value of the operation mode setting does not change. There are also cases where discharging ends without the electric energy set for this target value being discharged. If discharging until the AC dischargeable amount becomes 0, specify a value greater than the AC dischargeable capacity for this target value. The discharging amount indicated in this property is the AC value.

9.34.18 Charging method property

This property indicates the charging method when setting charging (0x42) to the operation mode setting (EPC = 0xDA). Charging methods include: charging (0x01) for maximum charging electric power (EPC = 0xC8), charging (0x02) for surplus electric power of solar power generation, etc., charging (0x03) for charging electric power setting (EPC = 0xEB), charging (0x04) for charging current setting (EPC = 0xED), and others (0x00). Those indicated as "other" are charging methods that do not fall into any of these charging methods. There are some storage batteries for which this property value changes to designated electric power charging (0x03) by setting the charging electric power setting (EPC = 0xEB), or this property value changes to designated current charging (0x04) by setting the charging current setting (EPC = 0xED).

An overview of charging methods handled by the storage battery class is shown in Figure 71.



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Figure 71 – Overview of charging methods

9.34.19 Discharging method property

This property indicates discharging method when setting discharging (0x43) to operation mode setting (EPC = 0xDA). Discharging methods include: discharging (0x01) for maximum discharging electric power (EPC = 0xC9), discharging (0x02) following to household load power, discharging (0x03) for discharging electric power setting (EPC = 0xEC), discharging (0x04) for discharging current setting (EPC = 0xEE), and others (0x00). Those indicated as "others" are discharging methods that do not fall into any of these discharging methods. If the storage batteries are not allowed for reverse power flow and when the maximum discharging electric power or designated discharging electric power setting exceeds the household load, the batteries perform load-following discharging but the property value remains same. There are some storage batteries for which this property value changes to designated electric power discharging (0x03) by setting discharging electric power setting (EPC = 0xEC), or this property value changes to designated current discharging (0x04) by setting discharging current setting (EPC = 0xEE).

An overview of discharging methods handled by the storage battery class are shown in Figure 72 and Figure 73.

Firstly, an overview of discharging methods for storage batteries in the case that reverse power flow is not allowed is given (Figure 72).

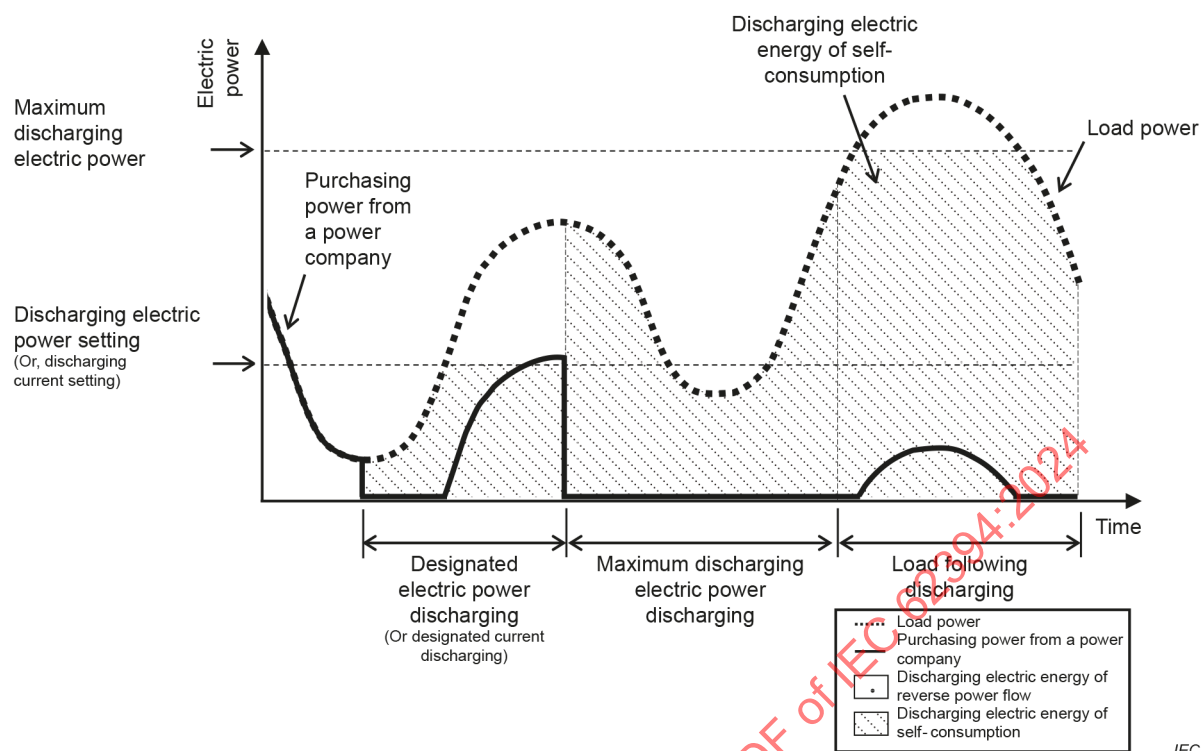


Figure 72 – Overview of discharging methods for storage battery if reverse power flow is not allowed

An overview of discharging methods for storage batteries in the case reverse power flow is allowed is given (Figure 73).

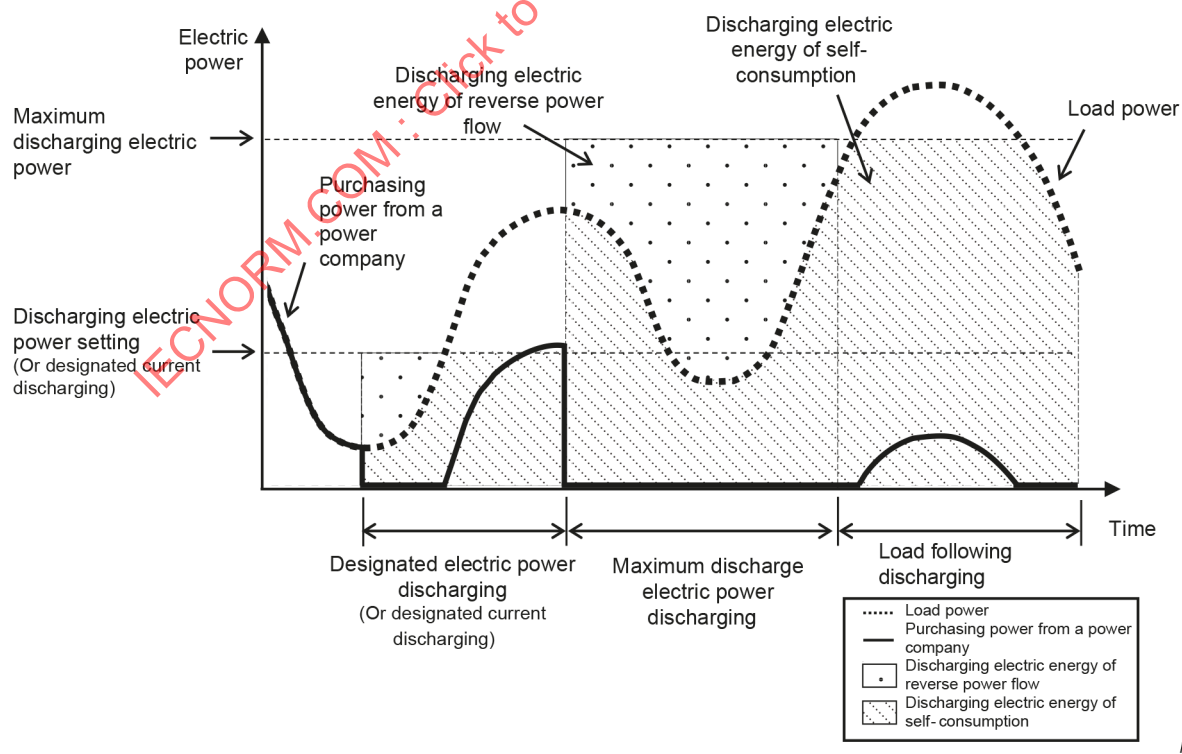


Figure 73 – Overview of discharging methods for storage battery if reverse power flow is allowed

9.34.20 Minimum/maximum charging electric power property

This property indicates the minimum/maximum electric power for charging in watts when the system interconnection status is system-interconnected (reverse power flow acceptable) or system-interconnected (reverse power flow not acceptable). The property value range shall be 0x00000000 to 0x3B9AC9FF (0 W to 999 999 999 W) and the property value shall be derived from the high-order bytes in order of minimum and maximum. When the property value of the actual device is higher than the upper limit of the value range, 0xFFFFFFFF (overflow code) shall be used. If the charging function is not supported, the value shall be 0. When the "Minimum/maximum charging electric power (independent)" property (EPC = 0xDC) is not used, the value of this property may also be used as the value in the independent status.

9.34.21 Minimum/maximum discharging electric power property

This property indicates the minimum/maximum electric power for discharging in watts when the system interconnection status is system-interconnected (reverse power flow acceptable) or system-interconnected (reverse power flow not acceptable). The value range of the property shall be from 0x00000000 to 0x3B9AC9FF (0 W to 999 999 999 W) and the property value shall be derived from the high-order bytes in order of minimum and maximum. When the property value of the actual device is higher than the upper limit of the value range, 0xFFFFFFFF (overflow code) shall be used. If the discharging function is not supported, the value shall be 0. When the "Minimum/maximum discharging electric power (independent)" property (EPC = 0xDD) is not used, the value of this property may also be used as the value in the independent status.

9.34.22 Minimum/maximum charging current property

This property indicates the minimum/maximum current for charging in increments of 0,1 A when the system interconnection status is system-interconnected (reverse power flow acceptable) or system-interconnected (reverse power flow not acceptable). The property value range shall be 0x0000 to 0x7FFE (0 A to 3 276,6 A) and the property value shall be derived from the high-order bytes in order of minimum and maximum. When the property value of the actual device is higher than the upper limit of the value range, 0xFFFF (overflow code) shall be used. If the charging function is not supported, the value shall be 0. When the "Minimum/maximum charging current (independent)" property (EPC = 0xDE) is not used, the value of this property may also be used as the value in the independent status.

9.34.23 Minimum/maximum discharging current property

This property indicates the minimum/maximum current for discharging in increments of 0,1 A when the system interconnection status is system-interconnected (reverse power flow acceptable) or system-interconnected (reverse power flow not acceptable). The property value range shall be from 0x0000 to 0x7FFE (0 A to 3 276,6 A) and the property value shall be derived from the high-order bytes in order of minimum and maximum. When the property value of the actual device is higher than the upper limit of the value range, 0xFFFF (overflow code) shall be used. If the discharging function is not supported, the value shall be 0. When the "Minimum/maximum discharging current (independent)" property (EPC = 0xDF) is not used, the value of this property may also be used as the value in the independent status.

9.34.24 Re-interconnection permission setting property

After system splitting of a storage battery due to power failure, there are cases where prior consultation with the power company is necessary regarding system interconnection (re-interconnection) after restoration of power. If system interconnection after restoration of power is not possible automatically, set the value for this property to (0x42) at the point in time when a splitting system occurs in the storage battery due to power failure, etc., and wait to receive a write request for re-interconnection permission (0x41) after restoration of power.

9.34.25 Operation permission setting property

In a case where a condition such that the storage battery shall not be operated arises due to some kind of requirement (contract, connection to a system, etc.), this property makes the storage battery function disabled (Prohibited = 0x42). In cases where the condition is such that operation as a storage battery is acceptable, set the value for this property to 0x41 (Permitted).

9.34.26 Independent operation permission setting property

This property sets permission (0x41) or prohibition (0x42) for independent operation of the storage battery when there is power failure due to disaster, etc.

9.34.27 Working operation status property

This property indicates the storage battery working operation status as Rapid charging (0x41), Charging (0x42), Discharging (0x43), Standby (0x44), Test (0x45), Automatic (0x46), Restart (0x48), Effective capacity recalculation processing (0x49), or Other (0x40). The Charging, Discharging, and Standby operation statuses are mandatory.

9.34.28 AC rated electric energy property

This property indicates the rated electric energy in Wh. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 Wh to 999 999 999 Wh). The rated electric energy indicated in this property is the AC value.

9.34.29 Rated electric energy property

This property indicates the rated electric energy (catalogue value) in Wh. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 Wh to 999 999 999 Wh). The rated electric energy indicated in this property is the DC value.

9.34.30 Rated capacity property

This property indicates the rated capacity (catalogue value) in increments of 0,1 Ah. The property value range shall be 0x0000 to 0x7FFE (0 Ah to 3 276,6 Ah). The capacity usable as a system can be smaller than the rated capacity, depending on the life of the battery, the provision of emergency backup, and other factors.

9.34.31 Rated voltage property

This property indicates the rated voltage (catalogue value) in volts when the system interconnection status is system-interconnected (reverse power flow acceptable) or system-interconnected (reverse power flow not acceptable). The property value range shall be 0x0000 to 0x7FFE (0 V to 32 766 V). When the "Rated voltage (independent)" property (EPC = 0xEF) is not used, the value of this property may also be used as the value in the independent status.

9.34.32 Measured instantaneous charging/discharging electric power property

This property indicates the measured instantaneous charging/discharging electric power in watts. The property value range shall be 0x00000001 to 0x3B9AC9FF (1 W to 999 999 999 W) for charging and 0xFFFFFFFF to 0xC4653601 (–1 W to –999 999 999 W) for discharging. When the property value of the actual device is higher than the upper limit of the value range, 0x7FFFFFFF (overflow code) shall be used. When the property value of the actual device is lower than the lower limit of the value range, 0x80000000 (underflow code) shall be used. When neither charging nor discharging is being performed, the property value shall be 0.

9.34.33 Measured instantaneous charging/discharging current property

This property indicates the measured instantaneous charging/discharging current in increments of 0,1 A. The property value range shall be 0x0001 to 0x7FFE (0,1 A to 3 276,6 A) for charging and 0xFFFF to 0x8001 (–0,1 A to –3 276,7 A) for discharging. When the property value of the actual device is higher than the upper limit of the value range, 0x7FFF (overflow code) shall be used. When the property value of the actual device is lower than the lower limit of the value range, 0x8000 (underflow code) shall be used. When neither charging nor discharging is being performed, the property value shall be 0.

9.34.34 Measured instantaneous charging/discharging voltage property

This property indicates the measured instantaneous charging/discharging voltage in volts. The property value range shall be 0x0001 to 0x7FFE (1 V to 32 766 V) for charging and 0xFFFF to 0x8001 (–1 V to –32 767 V) for discharging. When the property value of the actual device is higher than the upper limit of the value range, 0x7FFF (overflow code) shall be used. When the property value of the actual device is lower than the lower limit of the value range, 0x8000 (underflow code) shall be used. When neither charging nor discharging is being performed, the property value shall be 0.

9.34.35 Measured cumulative discharging electric energy property

This property indicates the measured cumulative discharging electric energy in increments of 0,001 kWh. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 kWh to 999 999,999 kWh). In the event of a cumulative discharging electric energy overflow, the counting of the cumulative discharging electric energy shall be restarted from 0x00000000. The DC value is recommended for the measured cumulative discharging electric energy value indicated in this property. Note that there are products which implement this property in AC values.

9.34.36 Measured cumulative discharging electric energy resetting property

This property resets "Measured cumulative discharging electric energy" to zero by setting 0x00.

9.34.37 Measured cumulative charging electric energy property

This property indicates the measured cumulative charging electric energy in increments of 0,001 kWh. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 kWh to 999 999,999 kWh). In the event of a cumulative charging electric energy overflow, the counting of the cumulative charging electric energy shall be restarted from 0x00000000. The DC value is recommended for the measured cumulative charging electric energy value indicated in this property. Note that there are products which implement this property in AC values.

9.34.38 Measured cumulative charging electric energy reset setting property

This property resets "Measured cumulative charging electric energy" to zero by setting 0x00.

9.34.39 Operation mode setting property

This property indicates the operation mode. The property value shall be Rapid charging (0x41), Charging (0x42), Discharging (0x43), Standby (0x44), Test (0x45), Automatic (0x46), Restart (0x48), Effective capacity recalculation processing (0x49), or Others (0x40). "Automatic" is the mode where the storage battery is assumed to operate autonomously. The various operating modes (charging, discharging, and standby) are mandatory. Depending on the system status, it may not always be possible to operate according to the operating mode setting. The actual status of storage battery charging or discharging, etc., is indicated by the working operation status. Even when operation according to the operating mode setting is not possible, it is recommended that the operating mode setting be kept.

9.34.40 System interconnection status property

This property indicates the status of interconnection with the system. This property indicates either one of the System interconnected (reverse power flow acceptable) = 0x00, Independent = 0x01, System interconnected (reverse power flow not acceptable) = 0x02.

"Reverse power flow acceptable" shall mean that a storage battery is set to allow reverse power flow, while "reverse power flow not acceptable" shall mean that a storage battery is set to not allow reverse power flow.

9.34.41 Minimum/maximum charging electric power (independent) property

This property indicates the minimum and maximum values of charging electric power in watts when the system interconnection status is independent. The range of each value shall be 0x00000000 to 0x3B9AC9FF (0 W to 999 999 999 W). From the higher-order bytes, the property value shall be in order from minimum to maximum values. When the property value of the actual device is higher than the value range of this property, the overflow code 0xFFFFFFFF shall be used. If no charging function is supported, the value shall be 0. When this property is not used, the "minimum/maximum charging electric power" property (EPC = 0xC8) may be used.

9.34.42 Minimum/maximum discharging electric power (independent) property

This property indicates the minimum and maximum values of discharging electric power in watts when the system interconnection status is independent. The range of each value shall be 0x00000000 to 0x3B9AC9FF (0 W to 999 999 999 W). From the higher-order bytes, the property value shall be in order from minimum to maximum values. When the property value of the actual device is higher than the value range of this property, the overflow code 0xFFFFFFFF shall be used. If no discharging function is supported, the value shall be 0. When this property is not used, the "minimum/maximum discharging electric power" property (EPC = 0xC9) may be used.

9.34.43 Minimum/maximum charging current (independent) property

This property indicates the minimum and maximum values of charging current in increments of 0,1 A when the system interconnection status is independent. The range of each value shall be 0x0000 to 0x7FFE (0 A to 3 276,6 A). From the higher-order bytes, the property value shall be in order from minimum to maximum values. When the property value of the actual device is higher than the value range of this property, the overflow code 0xFFFF shall be used. If no charging function is supported, the value shall be 0. When this property is not used, the "Minimum/maximum charging current" property (EPC = 0xCA) may be used.

9.34.44 Minimum/maximum discharging current (independent) property

This property indicates the minimum and maximum values of discharging current in increments of 0,1 A when the system interconnection status is independent. The range of each value shall be 0x0000 to 0x7FFE (0 A to 3 276,6 A). From the higher-order bytes, the property value shall be in order from minimum to maximum values. When the property value of the actual device is higher than the value range of this property, the overflow code 0xFFFF shall be used. If no discharging function is supported, the value shall be 0. When this property is not used, the "Minimum/maximum discharging current" property (EPC = 0xCB) may be used.

9.34.45 Charging/discharging amount setting 1 property

Specifies the charging/discharging electric energy in Wh (positive/negative). This property does not specify the battery level after charging or discharging. The property value range shall be 0x00000001 to 0x3B9AC9FF (1 Wh to 999 999 999 Wh) for charging and 0xFFFFFFFF to 0xC4653601 (–1 Wh to –999 999 999 Wh) for discharging. The charging/discharging status will not affect the value. When charging/discharging is completed, the operation status changes to Standby (however, cases where the operation mode setting changes to "Standby" are also permitted). For complete charging, this value shall be set equal to or greater than the rated electric energy. For complete discharging, this value shall be set equal to or greater than the rated electric energy with the negative sign. The charging/discharging amount setting 1 indicated in this property is the DC value.

9.34.46 Charging/discharging amount setting 2 property

Specifies the charging/discharging capacity in increments of 0,1 Ah (positive/negative). This property does not specify the battery level after charging or discharging. The property value range shall be 0x0001 to 0x7FFE (0,1 Ah to 3 276,6 Ah) for charging and 0xFFFF to 0x8001 (–0,1 Ah to –3 276,7 Ah) for discharging. The charging/discharging status will not affect the value. When charging/discharging is completed, the operation mode changes to Standby (however, cases where the operation mode setting changes to "Standby" are also permitted). For complete charging, this value shall be set equal to or greater than the rated electric energy. For complete discharging, this value shall be set equal to or greater than the rated electric energy with the negative sign.

9.34.47 Remaining stored electricity 1 property

This property indicates the remaining stored electric energy during discharging at the rated discharging current in Wh. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 Wh to 999 999 999 Wh). When the remaining stored electricity in Wh is calculated from the values of other remaining stored electricity properties, if the value of this object is provided when indicating the Wh units of remaining stored electricity in terminals, etc., the provided value shall be indicated. This is to avoid situations such as a discrepancy compared to the Wh indicated for the main unit. The Remaining stored electricity 1 indicated in this property is the DC value.

9.34.48 Remaining stored electricity 2 property

This property indicates the remaining capacity during discharging at the rated discharging current in increments of 0,1 Ah. The property value range shall be 0x0000 to 0x7FFE (0 Ah to 3 276,6 Ah). When the remaining stored electricity in Ah is calculated from the values of other remaining stored electricity properties, if the value of this object is provided when indicating the Ah units of remaining stored electricity in terminals, etc., the provided value shall be indicated. This is to avoid situations such as a discrepancy compared to the Ah indicated for the main unit.

9.34.49 Remaining stored electricity 3 property

This property indicates the charging rate of the battery in % ((remaining stored electricity) / (full charging capacity) × 100). The property value range shall be 0x00 to 0x64 (0 to 100). When the remaining stored electricity in % is calculated from the values of other remaining stored electricity properties, if the value of this object is provided when indicating the % units of remaining stored electricity in terminals, etc., the provided value shall be indicated. This is to avoid situations such as a discrepancy compared to the % indicated for the main unit.

9.34.50 Battery state of health property

This property indicates the deterioration (soundness) status of the battery in %. The property value range shall be 0x00 to 0x64 (0 to 100).

For example: ((full charging capacity after deterioration) / (initial full charging capacity) × 100).

9.34.51 Battery type property

This property indicates the battery type. The property value shall be 0x00 (unknown), 0x01 (lead), 0x02 (nickel-metal hydride), 0x03 (nickel-cadmium), 0x04 (lithium ion), 0x05 (zinc) or 0x06 (rechargeable alkaline). The values from 0x07 to 0xFF are reserved for future use.

9.34.52 Charging amount setting 1 property

This property specifies the charging electric energy in Wh. This property does not specify the battery level after charging. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 Wh to 999 999 999 Wh). The charging status will not affect the value. When charging is completed, the operation mode changes to Standby (however, cases where the operation mode setting changes to "Standby" are also permitted). For complete charging, this value shall be set equal to or greater than the rated electric energy. The Charging amount setting 1 indicated in this property is the DC value.

9.34.53 Discharging amount setting 1 property

This property specifies the discharging electric energy in Wh. This property does not specify the battery level after discharging. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 Wh to 999 999 999 Wh). The discharging status will not affect the value. When discharging is completed, the operation status changes to Standby (however, cases where the operation mode setting changes to "Standby" are also permitted). For complete discharging, this value shall be set equal to or greater than the rated electric energy. The Discharging amount setting 1 indicated in this property is the DC value.

9.34.54 Charging amount setting 2 property

This property specifies the charging capacity in increments of 0,1 Ah. This property does not specify the battery level after charging. The property value range shall be 0x0000 to 0x7FFE (0 Ah to 3 276,6 Ah). The charging status will not affect the value. When charging is completed, the operation status changes to Standby (however, cases where the operation mode setting changes to "Standby" are also permitted). For complete charging, this value shall be set equal to or greater than the rated capacity.

9.34.55 Discharging amount setting 2 property

This property specifies the discharging capacity in increments of 0,1 Ah. This property does not specify the battery level after discharging. The property value range shall be 0x0000 to 0x7FFE (0 Ah to 3 276,6 Ah). The discharging status will not affect the value. When discharging is completed, the operation status changes to Standby (however, cases where the operation mode setting changes to "Standby" are also permitted). For complete discharging, this value shall be set equal to or greater than the rated capacity.

9.34.56 Charging electric power setting property

This property specifies the charging electric power in watts. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 W to 999 999 999 W).

This property value shall be valid when the charging method (EPC = 0xC1) is "designated electric power charging (0x03)" (however, setting this property may automatically set the value of the charging method (EPC = 0xC1) to designated electric power charging (0x03)).

9.34.57 Discharging electric power setting property

This property specifies the discharging electric power in watts. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 W to 999 999 999 W).

This property value shall be valid when discharging method (EPC = 0xC2) is "designated electric power discharging (0x03)" (however, setting this property may automatically set the value of discharging method (EPC = 0xC2) to designated electric power discharging (0x03)).

9.34.58 Charging current setting property

This property specifies the charging current in increments of 0,1 A. The property value range shall be 0x0000 to 0xFFFFD (0 A to 6 553,3 A).

This property value shall be valid when charging method (EPC = 0xC1) is "designated current charging (0x04)" (however, setting this property may automatically set the value of charging method (EPC = 0xC1) to designated current charging (0x04)).

9.34.59 Discharging current setting property

This property specifies the discharging current in increments of 0,1 A. The property value range shall be 0x0000 to 0xFFFFD (0 A to 6 553,3 A).

This property value shall be valid when discharging method (EPC = 0xC2) is "designated current discharging (0x04)" (however, setting this property may automatically set the value of discharging method (EPC = 0xC2) to designated current discharging (0x04)).

9.34.60 Rated voltage (independent) property

This property indicates the rated voltage (catalogue value) in volts when the system interconnection status is independent. The property value range shall be 0x0000 to 0x7FFE (0 V to 32 766 V). When this property is not used, the "Rated voltage" property (EPC = 0xD2) may be used.

9.35 Electric vehicle charger/discharger class specifications

9.35.1 General

The control commands of "electric vehicle charger/discharger" are shown in Table 53.

Class group code: 0x02

Class code: 0x7E

Electric vehicle charger/discharger includes Electric Vehicle Power System (EVPS) connected to an electric vehicle. Since an electric vehicle connected to an electric vehicle charger/discharger can be changed, the property values of the electric vehicle charger/discharger vary in accordance with the electric vehicle connected to the electric vehicle charger/discharger. When the status (Connected to vehicle, Chargeable/Dischargeable) changes from "Not connected to vehicle" to "Connected to vehicle," the connected electric vehicle may be different. Therefore, it is preferable to acquire property values again for specifications that are determined by the electric vehicle and EVPS.

For example: used capacity of vehicle mounted battery 1, Dischargeable capacity of vehicle mounted battery 1, Remaining dischargeable capacity of vehicle mounted battery 1, and Remaining dischargeable capacity of vehicle mounted battery 3.

AC shall be assumed for currents, voltages, and electric energies handled in this class. A relationship between the properties related to electric energy that are handled in this class is shown in Figure 74. Actual capacities shall be determined based on information from the electric vehicle connected to a charger/discharger, considering the efficiency of the chargers/dischargers.

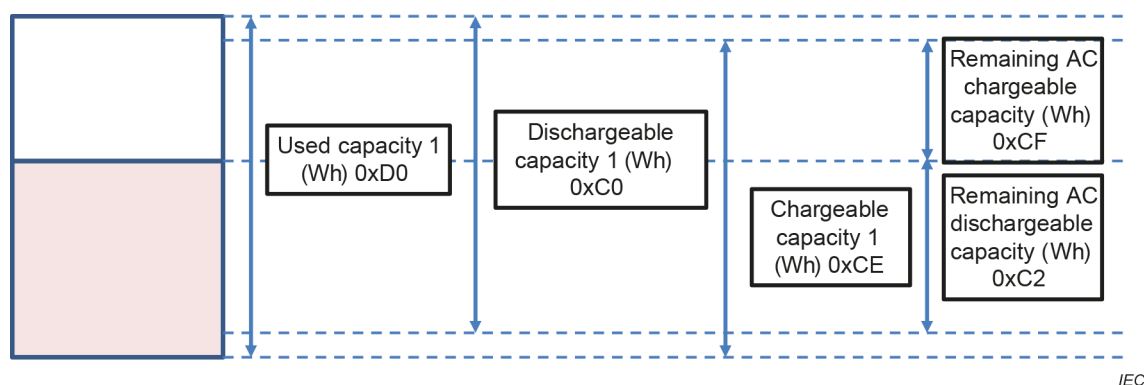


Figure 74 – Relationship between the properties related to electric energy handled in this class

The following properties are output as information of electric vehicle chargers/dischargers, instead of information acquired from the electric vehicles:

- 0x80: Operation status
- 0xC5: Rated charge capacity
- 0xC6: Rated discharge capacity
- 0xC8: Minimum/maximum charging electric power
- 0xC9: Minimum/maximum discharging electric power
- 0xCA: Minimum/maximum charging current
- 0xCB: Minimum/maximum discharging current
- 0xCC: Charger/discharger type
- 0xD2: Rated voltage
- 0xD3: Measured instantaneous charging/discharging electric power
- 0xD4: Measured instantaneous charging/discharging current
- 0xD5: Measured instantaneous charging/discharging voltage
- 0xD6: Measured cumulative amount of discharging electric energy
- 0xD8: Measured cumulative amount of charging electric energy
- 0xDA: Operation mode setting
- 0xDB: System interconnection status
- 0xDC: Charging method
- 0xDD: Discharging method
- 0xE0: Charging/discharging electric power setting
- 0xEB: Charging electric power setting
- 0xEC: Discharging electric power setting
- 0xED: Charging current setting
- 0xEE: Discharging current setting
- 0xEF: Rated voltage (independent)

For properties based on the information acquired from electric vehicles connected to the electric vehicle chargers/dischargers, an example of the conversion calculation is shown in each property description. The examples are based on DC-type AA vehicles and assume the maximum charge/discharge efficiency of the chargers/dischargers as 1.

The terms to be used in 9.35 are defined as follows.

- Table 53 – List of electric vehicle charger/discharger properties**

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remarks
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	–	Set		○	
		ON = 0x30, OFF = 0x31				Get	○		
Dischargeable capacity of vehicle mounted battery 1	0xC0	Indicates the dischargeable capacity of a vehicle battery connected to an electric vehicle charger/discharger in Wh.	unsigned long	4 bytes	Wh	Get	○		a
		0x00000000 to 0x3B9AC9FF (0 Wh to 999 999 999 Wh)							
Dischargeable vehicle mounted battery 2	0xC1	Indicates the dischargeable capacity of a vehicle battery connected to an electric vehicle charger/discharger in increments of 0,1 Ah.	unsigned short	2 bytes	0,1 Ah	Get			
		0x0000 to 0x7FFE (0 Ah to 3 276,6 Ah)							
Remaining dischargeable capacity of vehicle mounted battery 1	0xC2	Indicates the remaining dischargeable capacity of a vehicle battery connected to an electric vehicle charger/discharger in Wh.	unsigned long	4 bytes	Wh	Get	○		b
		0x00000000 to 0x3B9AC9FF (0 Wh to 999 999 999 Wh)							
Remaining dischargeable capacity of vehicle mounted battery 2	0xC3	Indicates the remaining dischargeable capacity of a vehicle battery connected to an electric vehicle charger/discharger in increments of 0,1 Ah.	unsigned short	2 bytes	0,1 Ah	Get			
		0x0000 to 0x7FFE (0 Ah to 3 276,6 Ah)							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Remaining dischargeable capacity of vehicle mounted battery 3	0xC4	Indicates the remaining dischargeable capacity of a vehicle battery connected to an electric vehicle charger/discharger in %.	unsigned char	1 byte	%	Get	○		b
		0x00 to 0x64 (0 % to 100 %)							
Rated charge capacity	0xC5	Indicates the rated charge capacity of an electric vehicle charger/discharger in W.	unsigned long	4 bytes	W	Get	○		
		0x00000000 to 0x3B9AC9FF (0 W to 999 999 999 W)							
Rated discharge capacity	0xC6	Indicates the rated discharge capacity of an electric vehicle charger/discharger in W.	unsigned long	4 bytes	W	Get	○		
		0x00000000 to 0x3B9AC9FF (0 W to 999 999 999 W)							
Vehicle connection and chargeable/dischargeable status	0xC7	Indicates whether an electric vehicle charger/discharger can be charged or discharged.	unsigned char	1 byte	–	Get	○	○	
		Undetermined = 0xFF Vehicle not connected = 0x30 Connected to vehicle, Not chargeable, Not dischargeable = 0x40 Connected to vehicle, Chargeable, Not dischargeable = 0x41 Connected to vehicle, Not chargeable, Dischargeable = 0x42 Connected to vehicle, Chargeable, Dischargeable = 0x43 Connected to vehicle, chargeable/dischargeable status unknown = 0x44							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Charger/ discharger type	0xCC	Indicates the type of electric vehicle charger/discharger	unsigned char	1 byte	–	Get	O		f
		AC_CPLT = 0x11 AC_HLC (charging only) = 0x12 AC_HLC (charging/discharging possible) = 0x13 DC_type AA (charging only) = 0x21 DC_type AA (charging/discharging possible) = 0x22 DC_type AA (discharging only) = 0x23 DC_type BB (charging only) = 0x31 DC_type BB (charging/discharging possible) = 0x32 DC_type BB (discharging only) = 0x33 DC_type EE (charging only) = 0x41 DC_type EE (charging/discharging possible) = 0x42 DC_type EE (discharging only) = 0x43 DC_type FF (charging only) = 0x51 DC_type FF (charging/discharging possible) = 0x52 DC_type FF (discharging only) = 0x53							
Vehicle connection confirmation	0xCD	Confirms the connection status between an electric vehicle charger/discharger and a vehicle	unsigned char	1 byte	–	Set	O		g
		Connection confirmation = 0x10							
Chargeable capacity of vehicle mounted battery	0xCE	Indicates the chargeable capacity of a vehicle battery connected to an electric vehicle charger/discharger in Wh.	unsigned long	4 bytes	Wh	Get	O		h
		0x00000000 to 0x3B9AC9FF (0 Wh to 999 999 999 Wh)							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Measured instantaneous charging/discharging voltage	0xD5	Indicates the instantaneous charging/discharging voltage in $\pm V$.	signed short	2 bytes	V	Get			
		0x0001 to 0x7FFE (1 V to 32 766 V): charging (positive), 0xFFFF to 0x8001 (−1 V to −32 767 V): discharging (negative)							
Measured cumulative amount of discharging electric energy	0xD6	Indicates the cumulative amount of discharging electric energy in increments of 0,001 kWh.	unsigned long	4 bytes	0,001 kWh	Get			
		0x00000000 to 0x3B9AC9FF (0 kWh to 999 999,999 kWh)							
Cumulative amount of discharging electric energy reset setting	0xD7	Resets the cumulative amount of discharging electric energy.	unsigned char	1 byte	–	Set			
		Reset = 0x00							
Measured cumulative amount of charging electric energy	0xD8	Indicates the cumulative amount of charging electric energy in increments of 0,001 kWh.	unsigned long	4 bytes	0,001 kWh	Get			
		0x00000000 to 0x3B9AC9FF (0 kWh to 999 999,999 kWh)							
Cumulative amount of charging electric energy reset setting	0xD9	Resets the cumulative amount of charging electricity energy.	unsigned char	1 byte	–	Set			
		Reset = 0x00							
Operation mode setting	0xDA	Sets the operation mode.	unsigned char	1 byte	–	Set/Get	○	○	
		Charging = 0x42, Discharging = 0x43, Standby = 0x44, Charging/Discharging = 0x46, Idle = 0x47, Preparation = 0x48, Automatic = 0x49, Other = 0x40							
System interconnection status	0xDB	Indicates the system interconnection status of an electric vehicle charger/discharger.	unsigned char	1 byte	–	Get			
		System interconnected (reverse power flow acceptable) = 0x00 Independent = 0x01 System interconnected (reverse power flow not acceptable) = 0x02							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Charging method	0xDC	Indicates the charging method when the operation mode setting (EPC=0xDA) is set to charging (0x42), Standby (0x44), or Charging/Discharging (0x46).	unsigned char	1 byte		Set		○	
		Maximum charging electric power charging = 0x01, Surplus electric power charging = 0x02, Designated electric power charging = 0x03, Designated electric current charging = 0x04, Designated purchasing electric power charging = 0x05, V2G = 0x06, Others = 0x00				Get	○		
Discharging method	0xDD	Indicates discharging method when the operation mode setting (EPC=0xDA) is set to discharging (0x43), Standby (0x44), or Charging/Discharging (0x46)	unsigned char	1 byte		Set		○	
		Maximum discharging electric power discharging = 0x01, Load-following discharging = 0x02, Designated electric power discharging = 0x03, Designated electric current discharging = 0x04, Designated purchasing electric power discharging = 0x05, V2G = 0x06, Others = 0x00				Get	○		
Purchasing electric power setting	0xDE	Specifies the upper limit of the purchasing electric power in W. This shall be effective when charging method is designated purchasing electric power charging (0x05), or discharging method is designated purchasing electric power discharging (0x05). 0x00000000 to 0x3B9AC9FF (0 to 999 999 999 W)	unsigned long	4 bytes	W	Set/Get			
Re-interconnection permission setting	0xDF	Sets permission and prohibition for interconnection to system.	unsigned char	1 byte		Set/Get			

[illegible]

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Discharging electric power setting	0xEC	Specifies the discharging electric power in W.	unsigned long	4 bytes	W	Set/Get			
		0x00000000 to 0x3B9AC9FF (0 W to 999 999 999 W)							
Charging current setting	0xED	Specifies the charging current in increments of 0,1 A.	unsigned short	2 bytes	0,1 A	Set/Get			
		0x0000 to 0xFFFFD (0 A to 6 553,3 A)							
Discharging current setting	0xEE	Specifies the discharging current in increments of 0,1 A.	unsigned short	2 bytes	0,1 A	Set/Get			
		0x0000 to 0xFFFFD (0 A to 6 553,3 A)							
Rated voltage (Independent status)	0xEF	Indicates the rated voltage of an electric vehicle charger/discharger in V when system interconnection status is independent.	unsigned short	2 bytes	V	Get			
		0x0000 to 0x7FFE (0 V to 32 766 V)							
^a The installation of "Dischargeable capacity of vehicle mounted battery 1" is mandatory in the case of output from an electric vehicle connected to an electric vehicle charger/discharger. Where no response can be returned, "Response impossible" is returned. ^b The installation of "Remaining dischargeable capacity of vehicle mounted battery 1" or "Remaining dischargeable capacity of vehicle mounted battery 3" is mandatory in the case of output from an electric vehicle connected to an electric vehicle charger/discharger. Where no response can be returned, "Response impossible" is returned. ^c The installation of "Used capacity of vehicle mounted battery 1" is mandatory in the case of output from an electric vehicle connected to an electric vehicle charger/discharger. Where no response can be returned, "Response impossible" is returned. ^d The installation of "Remaining stored electricity of vehicle mounted battery 1" or "Remaining stored electricity of vehicle mounted battery 3" is mandatory in the case of output from an electric vehicle connected to an electric vehicle charger/discharger. Where no response can be returned, "Response impossible" is returned. ^e When "Charging amount setting 1 (or 2)" is used, "Charging amount setting 2 (or 1)" shall not be used. ^f DC_type AA, DC_type BB, DC_type EE and DC_type FF chargers/dischargers shall be electric vehicle chargers/dischargers with connectors of the shape specified in Configuration AA, Configuration BB, Configuration EE and Configuration FF as defined in IEC 62196-3. ^g Vehicle connection confirmation is only mandatory when the charger/discharger type is DC_type AA. ^h The installation of "chargeable capacity of vehicle mounted battery" and "chargeable capacity of vehicle mounted battery" is mandatory in case of output from an electric vehicle connected to an electric vehicle charger/discharger.									

9.35.2 Operation status property

This property indicates whether an electric vehicle charger/discharger is ready to acquire status and accept settings (ON) or not (OFF). The property value shall be 0x30 for ON and 0x31 for OFF.

9.35.3 Dischargeable capacity of vehicle mounted battery 1 property

This property indicates the dischargeable capacity of a vehicle battery connected to an electric vehicle charger/discharger in Wh. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 Wh to 999 999 999 Wh).

Based on information obtained from the vehicle, calculation can be implemented using following formula (example):

$(\text{Total battery capacity} \times (\text{constant number for charging rate indication} - \text{discharge lower limit for charging rate}) \div 100) \times \text{electric vehicle charger/discharger discharge efficiency}$.

9.35.4 Dischargeable capacity of vehicle mounted battery 2 property

This property indicates the dischargeable capacity of a vehicle battery connected to an electric vehicle charger/discharger in increments of 0,1 Ah. The property value range shall be 0x0000 to 0x7FFE (0 Ah to 3 276,6 Ah).

9.35.5 Remaining dischargeable capacity of vehicle mounted battery 1 property

This property indicates the remaining dischargeable capacity of a vehicle battery connected to an electric vehicle charger/discharger in Wh. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 Wh to 999 999 999 Wh).

Based on information obtained from the vehicle, calculation can be implemented using following formula (example):

$(\text{Total battery capacity} \times (\text{charging rate of the battery} - \text{discharge lower limit for charging rate}) \div 100) \times \text{charger/discharger discharge efficiency}$

9.35.6 Remaining dischargeable capacity of vehicle mounted battery 2 property

This property indicates the remaining dischargeable capacity of a vehicle battery connected to an electric vehicle charger/discharger in increments of 0,1 Ah. The property value range shall be 0x0000 to 0x7FFE (0 Ah to 3 276,6 Ah).

9.35.7 Remaining dischargeable capacity of vehicle mounted battery 3 property

This property indicates the remaining dischargeable capacity of a vehicle battery connected to an electric vehicle charger/discharger in %. The property value range shall be 0x00 to 0x64 (0 % to 100 %).

Based on information obtained from the vehicle, calculation can be implemented using following formula (example):

$(\text{Charging rate of the battery} - \text{discharge lower limit for charging rate}) \times \text{charger/discharger discharge efficiency}$

9.35.8 Rated charge capacity property

This property indicates the rated charge capacity of an electric vehicle charger/discharger in W. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 W to 999 999 999 W). When no charging function is supported, the value shall be 0 W.

9.35.9 Rated discharge capacity property

This property indicates the rated discharge capacity of an electric vehicle charger/discharger in W. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 W to 999 999 999 W). When no discharging function is supported, the value shall be 0 W.

9.35.10 Vehicle connection and chargeable/dischargeable status property

This property indicates whether a vehicle is connected to an electric vehicle charger/discharger or not and whether it is chargeable or dischargeable. The property value shall be 0x30 when no vehicle is connected, 0x40 when a vehicle is connected but not chargeable and not dischargeable, 0x41 when the vehicle is chargeable but not dischargeable, 0x42 when the vehicle is not chargeable but dischargeable, 0x43 when the vehicle is chargeable and dischargeable, and 0x44 when chargeable/dischargeable status is unknown.

0x44 shall be used also, if the vehicle status is unknown until charging or discharging is started, the chargeable/dischargeable status shall be output when a charging or discharging start instruction is given. If the connection status of a vehicle cannot be determined, this property indicates 0xFF as an undetermined status. Vehicle connection and chargeable/dischargeable status shall be determined according to the combination of following information.

1) Vehicle connection/disconnection confirmation

Vehicles shall be considered "connected" when a charger/discharger connector is locked and/or a signal line between the charger/discharger and the vehicle is connected. Vehicles shall be considered "not connected" (0x30) when a charger/discharger connector is not locked and/or a signal line between the charger/discharger and the vehicle is not connected.

2) Dischargeable/not dischargeable determination

Dischargeable/not dischargeable determination shall be performed based on vehicle connection status.

When a vehicle does not support a discharging, the vehicle shall not be dischargeable. When a vehicle supports a discharging, and a charging rate is higher than the discharge lower limit for the charging rate, the vehicle shall be dischargeable.

When a vehicle supports a discharging, and a charging rate is lower or equal to the discharge lower limit for charging rate, the vehicle shall not be dischargeable.

3) Chargeable/not chargeable determination

Chargeable/not chargeable determination shall be performed based on vehicle connection status.

When a vehicle does not support a discharging, the vehicle shall be chargeable.

When a vehicle supports a discharging, and a charge upper limit for charging rate is not 0, and charging rate is lower than charge upper limit for charging rate, the vehicle shall be chargeable.

When a vehicle supports a discharging, and a charge upper limit for charging rate is 0, the vehicle shall be chargeable.

When a vehicle does not support charging, the vehicle shall not be chargeable.

9.35.11 Minimum/maximum charging electric power property

This property indicates the minimum and maximum charging electric powers to an electric vehicle charger/discharger in W. Each value range shall be 0x00000000 to 0x3B9AC9FF (0 W to 999 999 999 W). The property value represents minimum and maximum in order from the highest-order byte. When the property value of the actual device is higher than the upper limit of the value range, the overflow code 0xFFFFFFFF shall be used. When no charging function is supported, the value shall be 0.

9.35.12 Minimum/maximum discharging electric power property

This property indicates the minimum and maximum discharging electric powers to an electric vehicle charger/discharger in W. Each value range shall be 0x00000000 to 0x3B9AC9FF (0 W to 999 999 999 W). The property value represents minimum and maximum in order from the highest-order byte. When the property value of the actual device is higher than the upper limit of the value range, the overflow code 0xFFFFFFFF shall be used. When no discharging function is supported, the value shall be 0.

9.35.13 Minimum/maximum charging current property

This property indicates the minimum and maximum charging currents of an electric vehicle charger/discharger in increments of 0,1 A. Each value range shall be 0x0000 to 0x7FFE (0 A to 3 276,6 A). The property value represents minimum and maximum in order from the highest-order byte. When the property value of the actual device is higher than the upper limit of the value range, the overflow code 0xFFFF shall be used. When no charging function is supported, the value shall be 0.

9.35.14 Minimum/maximum discharging current property

This property indicates the minimum and maximum discharging currents of an electric vehicle charger/discharger in increments of 0,1 A. Each value range shall be 0x0000 to 0x7FFE (0 A to 3 276,6 A). The property value represents minimum and maximum in order from the highest-order byte. When the property value of the actual device is higher than the upper limit of the value range, the overflow code 0xFFFF shall be used. When no discharging function is supported, the value shall be 0.

9.35.15 Charger/discharger type property

This property indicates the type of electric vehicle charger/discharger. As the type of electric vehicle charger/discharger, it indicates one of AC_CPLT (0x11), AC_HLC (charging only) (0x12), AC_HLC (charging/discharging) (0x13), DC_type AA (charging only) (0x21), DC_type AA (charging/discharging) (0x22), DC_type AA (discharging only) (0x23), DC_type BB (charging only) (0x31), DC_type BB (charging/discharging) (0x32), DC_type BB (discharging only) (0x33), DC_type EE (charging only) (0x41), DC_type EE (charging/discharging) (0x42), DC_type EE (discharging only) (0x43), DC_type FF (charging only) (0x51), DC_type FF (charging/discharging) (0x52), and DC_type FF (discharging only) (0x53).

a) Explanation of charger/discharger types

- AC_CPLT (0x11): uses alternating current to charge the electric vehicle and CPLT signals to communicate with the electric vehicle.
- AC_HLC (charging only) (0x12): uses alternating current to charge the electric vehicle and both CPLT and HLC signals to communicate with the electric vehicle.
- AC_HLC (charging/discharging) (0x13): uses alternating current to charge the electric vehicle and to discharge from the electric vehicle to the charger/discharger and uses both CPLT and HLC signals to communicate with the electric vehicle.
- DC_type AA (charging only) (0x21): uses direct current to charge the electric vehicle and type AA signals to communicate with the electric vehicle.
- DC_type AA (charging/discharging) (0x22): uses direct current to charge the electric vehicle and to discharge from the electric vehicle to the charger/discharger and uses type AA signals to communicate with the electric vehicle.
- DC_type AA (discharging only) (0x23): uses direct current to discharge from the electric vehicle to the charger/discharger and type AA signals to communicate with the electric vehicle.
- DC_type BB (charging only) (0x31): uses direct current to charge the electric vehicle and type BB signals to communicate with the electric vehicle.
- DC_type BB (charging/discharging) (0x32): uses direct current to charge the electric vehicle and to discharge from the electric vehicle to the charger/discharger and uses type BB signals to communicate with the electric vehicle.
- DC_type BB (discharging only) (0x33): uses direct current to discharge from the electric vehicle to the charger/discharger and type BB signals to communicate with the electric vehicle.
- DC_type EE (charging only) (0x41): uses direct current to charge the electric vehicle and type EE signals to communicate with the electric vehicle.

- DC_type EE (charging/discharging) (0x42): uses direct current to charge the electric vehicle and to discharge from the electric vehicle to the charger/discharger and uses type EE signals to communicate with the electric vehicle.
 - DC_type EE (discharging only) (0x43): uses direct current to discharge from the electric vehicle to the charger/discharger and type EE signals to communicate with the electric vehicle.
 - DC_type FF (charging only) (0x51): uses direct current to charge the electric vehicle and type FF signals to communicate with the electric vehicle.
 - DC_type FF (charging/discharging) (0x52): uses direct current to charge the electric vehicle and to discharge from the electric vehicle to the charger/discharger and type FF signals to communicate with the electric vehicle.
 - DC_type FF (discharging only) (0x53): uses direct current to discharge from the electric vehicle to the charger/discharger and type FF signals to communicate with the electric vehicle.
- b) Explanation of the relationship between charger/discharger type and "vehicle connection and chargeable/dischargeable status" (0xC7)
- AC_CPLT (0x11): always undetermined (0xFF).
 - AC_HLC (charging only) (0x12) or AC_HLC (charging/discharging) (0x13): undetermined (0xFF) when only CPLT functions are installed in the connected vehicle. When both CPLT and HLC functions are installed in the vehicle, the content is as indicated under vehicle connection and chargeable/dischargeable status (0xC7).
 - DC_type AA (charging only) (0x21), DC_type AA (charging/discharging) (0x22) or DC_type AA (discharging only) (0x23): undetermined (0xFF) until information is acquired via vehicle connection confirmation (0xCD). After information is acquired, the content is as indicated under vehicle connection and chargeable/dischargeable status (0xC7).
 - DC_type BB (charging only) (0x31), DC_type BB (charging/discharging) (0x32), DC_type BB (discharging only) (0x33), DC_type EE (charging only) (0x41), DC_type EE (charging/discharging) (0x42), DC_type EE (discharging only) (0x43), DC_type FF (charging only) (0x51), DC_type FF (charging/discharging) (0x52) or DC_type FF (discharging only) (0x53): content is as indicated under vehicle connection and chargeable/dischargeable status (0xC7).

9.35.16 Vehicle connection confirmation property

This property confirms the connection status between an electric vehicle charger/discharger and an electric vehicle. "Connection status" shall mean a status that a charger/discharger connector is locked and/or a signal line between the charger/discharger and a vehicle is connected.

This property is only mandatory if the electric vehicle charger/discharger type is one of DC_type AA (charging only) (0x21), DC_type AA (charging/discharging) (0x22), and DC_type AA (discharging only) (0x23).

9.35.17 Used capacity of vehicle mounted battery 1 (total battery capacity) property

This property indicates the capacity of a vehicle battery connected to an electric vehicle charger/discharger in Wh. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 Wh to 999 999 999 Wh).

This property shall be output based on information acquired from the vehicle.

9.35.18 Used capacity of vehicle mounted battery 2 property

This property indicates the capacity of a vehicle battery connected to an electric vehicle charger/discharger in increments of 0,1 Ah. The property value range shall be 0x0000 to 0x7FFE (0 Ah to 3 276,6 Ah).

9.35.19 Rated voltage property

This property indicates the normal rated voltage of an electric vehicle charger/discharger in V. The property value range shall be 0x0000 to 0x7FFE (0 V to 32 766 V).

9.35.20 Measured instantaneous charging/discharging electric power

This property indicates the instantaneous charging or discharging electric power of an electric vehicle charger/discharger in W. The property value range shall be 0x00000001 to 0x3B9AC9FF (1 W to 999 999 999 W) for charging and 0xFFFFFFFF to 0xC4653601 (–1 W to –999 999 999 W) for discharging. When the property value of the actual device is higher than the upper limit of the value range, the overflow code 0x7FFFFFFF shall be used. When the property value is lower than the lower limit of the value range, the underflow code 0x80000000 shall be used. The value is 0 for no charging or discharging.

9.35.21 Measured instantaneous charging/discharging current property

This property indicates the instantaneous charging or discharging current of an electric vehicle charger/discharger in increments of 0,1 A. The property value range shall be 0x0001 to 0x7FFE (0,1 A to 3 276,6 A) for charging and 0xFFFF to 0x8001 (–0,1 A to –3 276,7 A) for discharging. When the property value of the actual device is higher than the upper limit of the value range, the overflow code 0x7FFF shall be used. When the property value is lower than the lower limit of the value range, the underflow code 0x8000 shall be used. The value is 0 for no charging or discharging.

9.35.22 Measured instantaneous charging/discharging voltage property

This property indicates the instantaneous charging or discharging voltage of an electric vehicle charger/discharger in V. The property value range shall be 0x0001 to 0x7FFE (1 V to 32 766 V) for charging and 0xFFFF to 0x8001 (–1 V to –32 767 V) for discharging. When the property value of the actual device is higher than the upper limit of the value range, the overflow code 0x7FFF shall be used. When the property value is lower than the lower limit of the value range, the underflow code 0x8000 shall be used. The value is 0 for no charging or discharging.

9.35.23 Measured cumulative amount of discharging electric energy property

This property indicates the cumulative amount of discharging electric energy of an electric vehicle charger/discharger in increments of 0,001 kWh. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 kWh to 999 999,999 kWh). When the cumulative amounts of electric energy overflows, the property value shall be incremented again from 0x00000000.

9.35.24 Cumulative amount of discharging electric energy reset setting

This property is set to 0x00 to reset the measured cumulative amount of discharging electric energy to zero.

9.35.25 Measured cumulative amount of charging electric energy property

This property indicates the cumulative amount of charging electric energy of an electric vehicle charger/discharger in increments of 0,001 kWh. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 kWh to 999 999,999 kWh). When the cumulative amounts of electric energy overflows, the property value shall be incremented again from 0x00000000.

9.35.26 Cumulative amount of charging electric energy reset setting property

This property is set to 0x00 to reset the measured cumulative amount of charging electric energy to zero.

9.35.27 Operation mode setting property

This property indicates the operation mode of an electric vehicle charger/discharger. The operation modes are Charging (0x42), Discharging (0x43), Standby (0x44), Charging/Discharging (0x46), Idle (0x47), Preparation (0x48), Automatic (0x49), and Other (0x40).

Operation mode "Other" indicates that the charger/discharger does not fall into any one of Charging, Discharging, Standby, Charging/Discharging, Idle, Preparation, or Automatic modes. Standby (0x44) indicates a state that the power converter is halted, and it can automatically switch to charging or discharging when it detects a chargeable/dischargeable electric vehicle connected.

Idle (0x47) indicates a state that the power converter operation is halted, and it is unable to automatically switch to charging or discharging even if it detects that a chargeable/dischargeable electric vehicle is connected to the charger/discharger. Note that "a state that it is unable to switch" depends on the implementation of the charger/discharger, such as being disconnected from the system power or being out of communication with the vehicle. However, if only one of Standby (0x44) or Idle (0x47) is implemented, Standby or Idle shall mean "a state that the power converter operation is halted".

Charging/Discharging mode (0x46) is a mode that the electric vehicle charger/discharger automatically switches to charging or discharging. Its operation may include load-following discharging for discharging and surplus electric power charging for charging in order to effectively use solar power generation as self-consumption. Figure 75 shows an operation concept of Charging/Discharging (0x46).

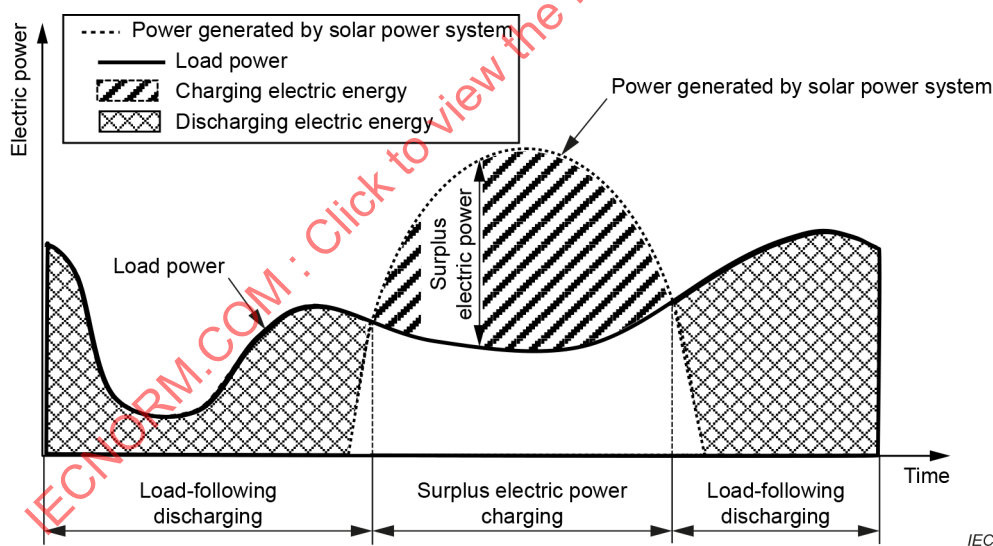


Figure 75 – Operation concept of Charging/Discharging (0x46).

Automatic (0x49) mode automatically switches between charging and discharging on the side of the electric vehicle charger/discharger, similar to Charging/Discharging (0x46). However, unlike Charging/Discharging (0x46), the charging and discharging methods do not depend on the Charging method property (EPC = 0xDC) or the Discharging method property (0xDD), but rather on the implementation of the electric vehicle charger/discharger.

Preparation (0x48) indicates a state in which the electric vehicle charger/discharger is unable to shift to charging or discharging upon receiving a charge, discharge, or charge/discharge write request. For example, the following conditions can be considered:

- Waiting time for intercepting system re-interconnection: a certain period of time after power is restored from a power failure;

- During local operation: when the main unit does not accept write requests. Or, when performing manual operations such as changing settings on the main unit;
- During fault status: when the fault status (0x88) is Detected (0x41);
- During internal processing of the main unit: When charging or discharging cannot be temporarily performed due to a firmware update or the like.

When a write request for Charging, Discharging, or Charging/Discharging is received in the Preparation (0x48) state, charging or discharging may be started after the situation in which charging or discharging cannot be started is resolved. However, the property value shall not be updated immediately when the write request is received.

9.35.28 System interconnection status property

This property indicates the current interconnection status of the electric vehicle charger/discharger to the system (system interconnection status). System interconnected (reverse power flow acceptable) = 0x00, Independent = 0x01, System interconnected (reverse power flow not acceptable) = 0x02.

9.35.29 Charging method property

This property indicates the charging method when the operation mode setting (EPC=0xDA) is set to Charging (0x42), Standby (0x44), or Charging/Discharging (0x46). Charging methods include: charging (0x01) with maximum charging electric power (EPC=0xC8), charging (0x02) with surplus electric power of solar power generation, charging (0x03) with designated power indicated by charging electric power setting (EPC=0xEB), charging (0x04) with designated current indicated by charging current setting (EPC=0xED), charging (0x05) with designated purchasing power indicated by purchasing electric power setting (EPC=0xDE), V2G (0x06) that charges at the charging/discharging electric power setting (EPC=0xE0), and others (0x00).

Those indicated as others are charging methods that do not fall into any other charging methods.

If charging/discharging (0x46) is specified, the electric vehicle charger/discharger shall autonomously perform charging (0x05) at equal to or less than the designated purchasing power indicated by purchasing electric power setting (EPC=0xDE) or charging (0x02) with surplus electric power of solar power generation.

There are some cases where this property value changes to designated electric power charging (0x03) by setting the charging electric power setting (EPC=0xEB), or this property value changes to designated current charging (0x04) by setting the charging current setting (EPC=0xED).

When this property value changes according to receiving a write request for this property, the operation mode setting property shall not be changed. However, in the case of a transition to V2G (0x06), if the property value of charging/discharging electric power setting (EPC = 0xE0) is 0, the operation mode setting shall transit to "standby" (0x44); if the property value is positive, the operation mode setting shall transit to charging (0x42).

In cases where charging/discharging is to be performed with the Charging/discharging electric power setting (EPC = 0xE0), the property value of this property shall be set to V2G (0x06) before sending a write request for the Charging/discharging electric power setting (EPC = 0xE0). When the value of this property is V2G (0x06), the write request to the Charging electric power setting (EPC = 0xEB) shall not be accepted so that charging/discharging will not start. When the value of this property is other than V2G, the write request to the Charging/discharging electric power setting (EPC = 0xE0) shall not be accepted so that charging/discharging will not start.

The relationship between the operation mode setting, charging method, and discharging method properties is shown in Figure 76 and Figure 77.

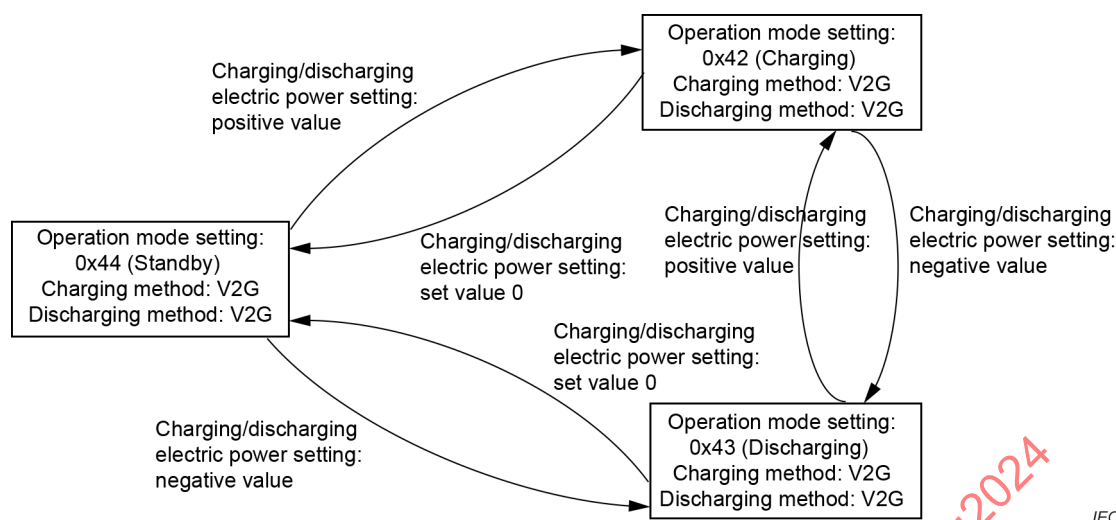


Figure 76 – Relationship between properties (transition).

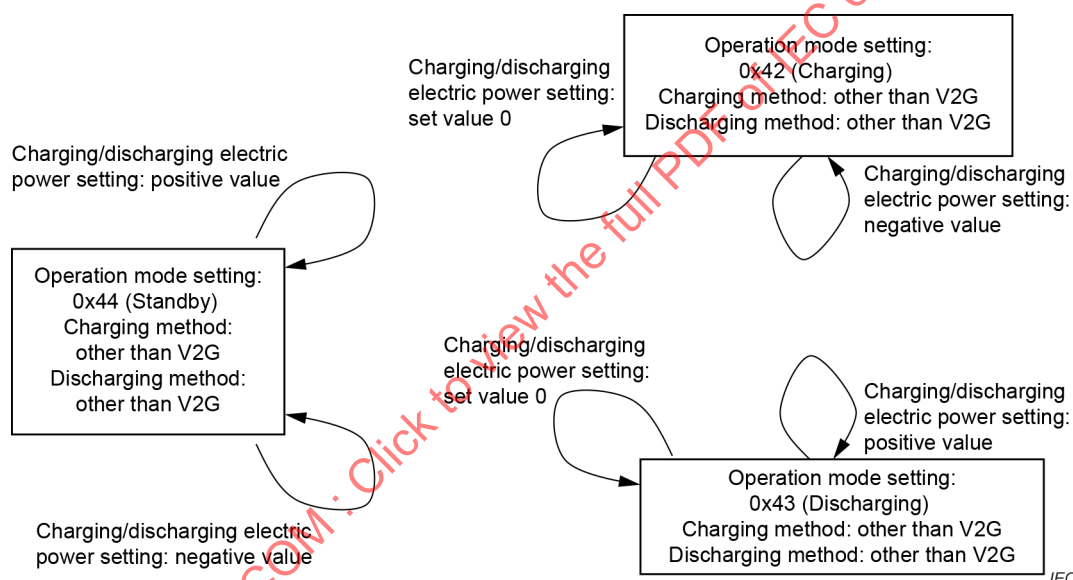


Figure 77 – Relationship between properties (no transition)

9.35.30 Discharging method property

This property indicates the discharging method when the operation mode setting (EPC=0xDA) is set to Discharging (0x43), Standby (0x44), or Charging/Discharging (0x46). Discharging methods include: discharging (0x01) with maximum discharging electric power (EPC=0xC9), discharging (0x02) following to household load power, discharging (0x03) with designated power indicated by discharging electric power setting (EPC=0xEC), discharging (0x04) with designated current indicated by discharging current setting (EPC=0xEE), discharging (0x05) with designated purchasing power indicated by purchasing electric power setting (EPC=0xDE), V2G (0x06) for discharging at the Charging/discharging electric power setting (EPC = 0xE0), and others (0x00).

"Others" means the discharging methods that do not fall into any of these discharging methods.

If Charging/Discharging (0x46) is specified, the electric vehicle charger/discharger shall autonomously perform discharging (0x05) at equal to or less than the designated purchasing power indicated by purchasing electric power setting (EPC=0xDE) or discharging (0x02) following to household load power.

There are some cases where this property value changes to designated electric power discharging (0x03) by setting discharging electric power setting (EPC=0xEC), or this property value changes to designated current discharging (0x04) by setting the discharging current setting (EPC=0xEE).

When the property value changes according to receiving a write request for this property, the operation mode setting shall not be changed. However, in the case of a transition to V2G (0x06), if the property value of Charging/discharging electric power setting (EPC = 0xE0) is 0, the operation mode setting shall transit to standby (0x44); if the property value is negative, the operation mode setting shall transit to discharging (0x43).

In cases where charging or discharging is to be performed with the Charging/discharging electric power setting (EPC = 0xE0), the property value of this property shall be set to V2G (0x06) before sending a write request for the Charging/discharging electric power setting (EPC = 0xE0). Note that when the value of this property is V2G (0x06), the write request to the Discharging electric power setting (EPC = 0xEC) shall not be accepted and charging or discharging will not start. When the value of this property is other than V2G, the write request to the Charging/discharging electric power setting (EPC = 0xE0) shall not be accepted and charging or discharging will not start.

9.35.31 Purchasing electric power setting property

This property specifies the upper limit of the purchasing electric power in W. The property value range is 0x00000000 to 0x3B9AC9FF (0 to 999 999 999 W).

Electric vehicle charger/discharger charges or discharges so that the household purchasing electric power reaches the setting value. If operation mode (EPC=0xDA) is set to discharging (0x43) and when the household purchasing electric power exceeds the setting value, the charger/discharger shall discharge the excess electric power. The charger/discharger will not discharge when the household purchasing electric power does not exceed the setting value and, in this case, the household purchasing electric power does not reach the setting value.

If the operation mode (EPC=0xDA) is set to charging (0x42) and when the household purchasing electric power is less than the setting value, the charger/discharger shall charge the shortage. The charger/discharger will not charge if the household purchasing electric power exceeds the setting value and, in this case, the household purchasing electric power does not become the setting value.

If the operation mode (EPC=0xDA) is set to charging/discharging (0x46), the charger/discharger shall discharge the excess electric power when the household purchasing electric power exceeds the setting value and shall charge the shortage when the household purchasing electric power is less than the setting value. This setting shall be effective when the charging method (EPC=0xDC) is designated purchasing electric power charging (0x05), or when the discharging method (EPC=0xDD) is designated purchasing electric power discharging (0x05).

Figure 78 shows the operation overview of discharging on designated purchasing electric power and Figure 79 shows the operation overview of charging on designated purchasing electric power.

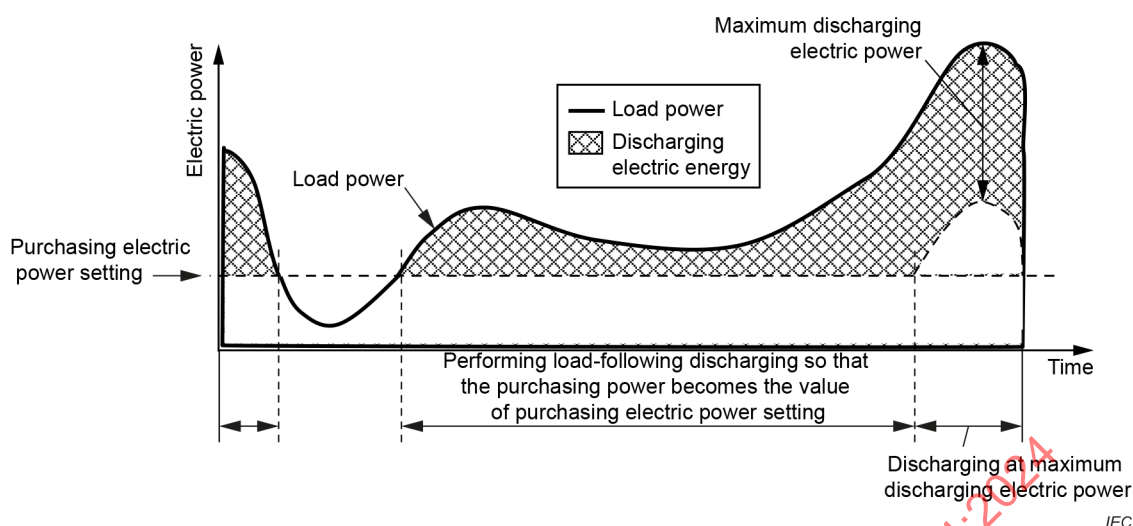


Figure 78 – Operation overview of discharging on designated purchasing electric power

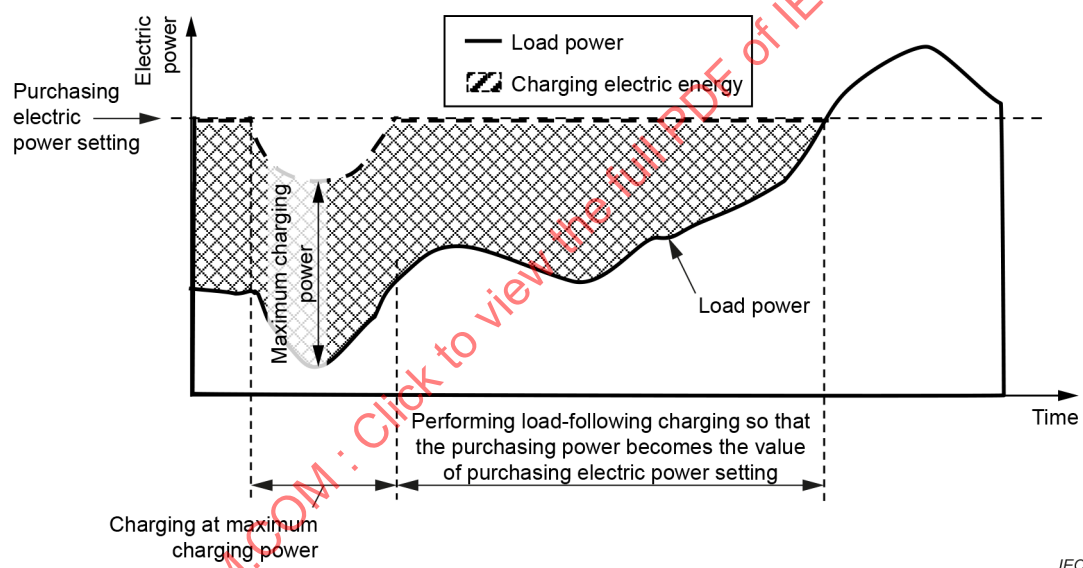


Figure 79 – Operation overview of charging on designated purchasing electric power

9.35.32 Re-interconnection permission setting property

After an electric vehicle charger/discharger splits from the system owing to power failure, there are cases where prior consultation with the power company is necessary regarding system interconnection (re-interconnection) after restoration of system power. If system re-interconnection after restoration of power is not possible automatically, set the value for this property to (0x42) at the point in time when a system splitting occurs in the electric vehicle charger/discharger owing to power failure, etc., and wait for receiving a write request for re-interconnection permission (0x41) after restoration of power.

9.35.33 Charging/discharging electric power setting property

This property specifies the charging/discharging electric power in W. The property value range shall be 0x00000001 to 0x3B9AC9FF (1 to 999 999 999): charging (positive), 0xFFFFFFFF to 0xC4653601 (–1 to –999 999 999): discharging (negative). The property value of the charging/discharging electric power setting shall not be changed except when a write request is received.

If the value of the charging method property (0xDC) is V2G (0x06) or the value of the discharging method property (0xDD) is V2G (0x06), the operation mode setting property (0xDA) shall be set to charging (0x42) when a write request specifying a positive value for this property is received. The operation mode setting property (0xDA) shall be set to discharging (0x43) when a write request specifying a negative value for this property is received. The operation mode setting property (0xDA) shall be set to standby (0x44) when a write request specifying 0 (zero) for this property is received.

If the value of the charging method property (0xDC) is other than V2G (0x06), the values of the operation mode setting property and this property shall not be changed even when a write request specifying a positive value or 0 (zero) for this property is received.

If the value of the discharging method property (0xDD) is other than V2G (0x06), the values of the operation mode setting property and this property shall not be changed even when a write request specifying a negative value or zero for this property is received.

9.35.34 Working operation status property

Working operation statuses of electric vehicle charger/discharger are Charging (0x42), Discharging (0x43), Standby (0x44), Idle (0x47), Preparation (0x48), Automatic (0x49) and Other (0x40). If this property is implemented, the operating statuses of Charging, Discharging, and either Standby or Halt are required.

Note that Charging/Discharging status is not included in the value range of this property since the charger/discharger takes one of the operation statuses of charging, discharging, standby, etc., when the operation mode setting is set to Charging/Discharging.

9.35.35 Remaining stored electricity of vehicle mounted battery 1 property

This property indicates the remaining stored capacity of a vehicle battery connected to an electric vehicle charger/discharger in Wh. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 Wh to 999 999 999 Wh).

Based on information obtained from the vehicle, calculation can be implemented using following formula (example) (the charge/discharge efficiency shall not be included in the electric vehicle charger/discharger):

Total battery capacity × charging rate of the battery ÷ 100

9.35.36 Remaining stored electricity of vehicle mounted battery 2 property

This property indicates the remaining stored capacity of a vehicle battery connected to an electric vehicle charger/discharger in increments of 0,1 Ah. The property value range shall be 0x0000 to 0x7FFE (0 Ah to 3 276,6 Ah).

9.35.37 Remaining stored electricity of vehicle mounted battery 3 (charging rate) property

This property indicates the remaining stored capacity (SOC: State of Charge) of a vehicle battery connected to a charger/discharger in %. The property value range shall be 0x00 to 0x64 (0 % to 100 %).

9.35.38 Charging amount setting 1 property

This property specifies the charging electric energy in Wh. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 Wh to 999 999 999 Wh). The property value "0x00000000" shall be "not set". During charging operation based on this setting value, there is no change in the value based on the charging energy (there is no successive change corresponding to actual performance of charging energy). If this property is set during charging operation based on this setting value, charging shall start based on the cumulative value of electric energy from the point in time indicated by the charging amount setting if reflected, regardless of the charged amount. When charging operation based on this setting value is completed, the operation mode setting becomes "Standby". There are also cases where charging ends without the electric energy set for this setting value being charged. If charging until the chargeable capacity of vehicle mounted battery becomes 0, specify a value greater than the chargeable capacity of vehicle mounted battery for this setting value.

9.35.39 Charging amount setting 2 property

This property specifies the charging capacity in increments of 0,1 Ah. The property value range shall be 0x0000 to 0x7FFE (0 Ah to 3 276,6 Ah). The property value "0x0000" shall be "not set". During charging operation based on this setting value, there is no change in the value based on the charging energy (there is no successive change corresponding to actual performance of charging energy). If this property is set during charging operation based on this setting value, charging shall start based on the cumulative value of electric energy from the point in time indicated by the charging amount setting if reflected, regardless of the charged amount. When charging operation based on this setting value is completed, the operation mode setting becomes "Standby". There are also cases where charging ends without the electric energy set for this setting value being charged. If charging until the chargeable capacity of vehicle mounted battery becomes 0, specify a value greater than the rated capacity.

9.35.40 Charging electric power setting property

This property specifies the charging electric power in W. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 W to 999 999 999 W).

9.35.41 Discharging electric power setting property

This property specifies the discharging electric power in the system interconnected status in W. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 W to 999 999 999 W). In the independent status, "Response impossible" is returned.

9.35.42 Charging current setting property

This property specifies the charging current in increments of 0,1 A. The property value range shall be 0x0000 to 0xFFFFD (0 A to 6 553,3 A).

9.35.43 Discharging current setting property

This property specifies the discharging current in the system interconnected status in increments of 0,1 A. The property value range shall be 0x0000 to 0xFFFFD (0 A to 6 553,3 A). In the independent status, "Response impossible" is returned.

9.35.44 Rated voltage (independent status) property

This property indicates the rated voltage (catalogue value) in V when the system interconnection status is "Independent." The property value range shall be 0x0000 to 0x7FFE (0 V to 32 766 V). In case this property is not used, the rated voltage (EPC = 0xD2) may be used instead.

9.35.45 Chargeable capacity of vehicle mounted battery property

This property indicates the chargeable capacity of a vehicle battery connected to an electric vehicle charger/discharger in increments of Wh. The property value range shall be 0x00000000 to 0x3B9AC0FF (0 Wh to 999 999 999 Wh).

Based on information obtained from the vehicle, calculation can be implemented using following formula (example):

$(\text{Total battery capacity} \times \text{charge upper limit for charging rate} \div 100) \div \text{charger/discharger charge efficiency}$

9.35.46 Remaining chargeable capacity of vehicle mounted battery property

This property indicates the remaining chargeable capacity of a vehicle battery connected to an electric vehicle charger/discharger in increments of Wh. The property value range shall be 0x00000000 to 0x3B9AC0FF (0 Wh to 999 999 999 Wh).

Based on information obtained from the vehicle, calculation can be implemented using following formula (example):

$(\text{Total battery capacity} \times (\text{charge upper limit for charging rate} - \text{charging rate of the battery}) \div 100) \div \text{charger/discharger charge efficiency}$

9.35.47 Vehicle ID property

This property stores the data size of the vehicle ID information of an electric vehicle connected to an electric vehicle charger/discharger and vehicle ID information. Data length shall be variable, and it shall be vehicle ID information + 1. If vehicle ID cannot be acquired, 0x00 shall be stored in the first byte (number of bytes of vehicle ID information). In this case, data size shall be 1 byte. Figure 80 illustrates the data structure of Vehicle ID.

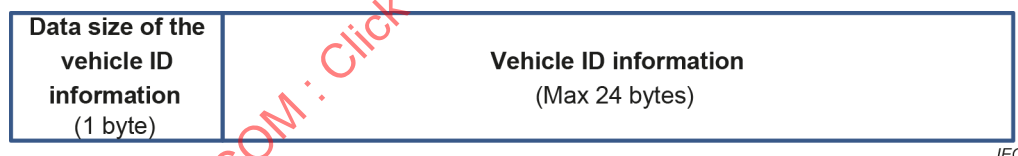


Figure 80 – Data structure of Vehicle ID in electric vehicle charger/discharger class

This property shall be effective when the value of the vehicle connection and chargeable/dischargeable status (0xC7) is 0x40 to 0x44. Using the vehicle ID for billing purposes is not recommended due to potential security issues.

9.35.48 Discharging amount setting property

This property specifies the discharging electric energy in increments of Wh. The property value range shall be 0x00000000 to 0x3B9AC0FF (0 Wh to 999 999 999 Wh). The property value "0x00000000" shall be "not set". During discharging operation based on this setting value, there is no change in the value based on the discharging energy (there is no successive change corresponding to actual performance of discharging energy). If this property is set while discharging operation is in progress based on this setting value, discharging shall be again started from the newly set timing and based on the new value, regardless of the cumulative discharging amount till the newly set timing. When discharging operation based on this setting value is completed, the operation mode setting becomes "Standby". There are also cases where discharging ends without the electric energy set for this setting value being discharged. If charging until the dischargeable capacity of vehicle mounted battery becomes 0, specify a value greater than the dischargeable capacity of the vehicle mounted battery for this setting value.

9.35.49 Maintenance status property

When maintenance is required, this property shall be set to Occurrence (0x41), but operation can be continued. Normal state with no necessity for maintenance is No occurrence = 0x42. For example, cases where consumables in the main unit need to be replaced due to dirty filters, lowered fan speed, or deteriorating batteries can be considered.

9.36 Engine cogeneration class specifications

9.36.1 General

The control commands of "engine cogeneration" are shown in Table 54.

Class group code: 0x02

Class code: 0x7F

Table 54 – List of engine cogeneration properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	–	Set		○	
		ON = 0x30, OFF = 0x31				Get	○		
Measured temperature of water in water heater	0xC1	Indicates the current temperature of the water in the water heater in °C.	unsigned char	1 byte	°C	Get			
		0x00 to 0x64 (0 °C to 100 °C)							
Rated power generation output	0xC2	Indicates the rated power generation output in watts.	unsigned short	2 bytes	W	Get			
		0x0000 to 0xFFFFD (0 W to 65 533 W)							
Heating value of hot water storage tank	0xC3	Indicates the heating value of the hot water storage tank in MJ.	unsigned short	2 bytes	MJ	Get			
		0x0000 to 0xFFFFD (0 MJ to 65 533 MJ)							
Measured instantaneous power generation output	0xC4	Indicates the instantaneous power generation output in watts.	unsigned short	2 bytes	W	Get	○		
		0x0000 to 0xFFFFD (0 W to 65 533 W)							
Measured cumulative energy generation output	0xC5	Indicates the cumulative energy generation output in increments of 0,001 kWh.	unsigned long	4 bytes	0,001 kWh	Get	○		
		0x00000000 to 0x3B9AC9FF (0 kWh to 999 999,999 kWh)							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
System interconnection status	0xD0	Indicates the status of system interconnection.	unsigned char	1 byte	–	Get			
		System interconnected (reverse power flow acceptable) = 0x00, Independent = 0x01, System interconnected (reverse power flow not acceptable) = 0x02							
Measured remaining hot water amount	0xE1	Indicates the measured amount of the remaining hot water in litres.	unsigned short	2 bytes	litre	Get			
		0x0000 to 0xFFFD (0 litres to 65 533 litres)							
Tank capacity	0xE2	Indicates the tank capacity in litres.	unsigned short	2 bytes	litre	Get			
		0x0000 to 0xFFFD (0 litres to 65 533 litres)							

9.36.2 Operation status property

This property indicates whether the functions specific to this class are operating (ON) or not (OFF). In the case of a node in which this class is implemented and the functions specific to this class start operating upon start-up of the node, this property may be implemented with the value fixed at 0x30 (operation status ON).

9.36.3 Measured hot water temperature of water heater property

This property indicates the current hot water temperature in the hot water storage tank in °C. The property value range shall be 0x00 to 0x64 (0 °C to 100 °C).

9.36.4 Rated power generation output property

This property indicates the rated power generation output in watts. The property value range shall be 0x0000 to 0xFFFD. When the property value of the actual device is higher than the upper bound of the value range, 0xFFFF (overflow code) shall be used. When the property value of the actual device is lower than the lower bound of the value range, 0xFFFE (underflow code) shall be used.

9.36.5 Heating value of hot water storage tank property

This property indicates the heating value of a hot water storage tank in MJ. The property value range shall be 0x0000 to 0xFFFD. When the property value of the actual device is higher than the upper bound of the value range, 0xFFFF (overflow code) shall be used. When the property value of the actual device is lower than the lower bound of the value range, 0xFFFE (underflow code) shall be used.

9.36.6 Measured instantaneous power generation output property

This property indicates the instantaneous power generation output in watts. The property value range shall be 0x0000 to 0xFFFFD. When the property value of the actual device is higher than the upper bound of the value range, 0xFFFF (overflow code) shall be used. When the property value of the actual device is lower than the lower bound of the value range, 0xFFFFE (underflow code) shall be used.

9.36.7 Measured cumulative energy generation output property

This property indicates the cumulative energy generation output in increments of 0,001 kWh. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 kWh to 999 999,999 kWh). In case the cumulative energy generation output goes overflow, the measured cumulative energy generation output shall be restarted from 0x00000000.

9.36.8 Cumulative energy generation output reset setting property

This property resets the cumulative energy generation output to zero by setting 0x00.

9.36.9 Measured instantaneous gas consumption property

This property indicates the instantaneous gas consumption in increments of 0,001 m³/h. The property value range shall be 0x0000 to 0xFFFFD (0 m³/h to 65,533 m³/h). When the property value of the actual device is higher than the upper bound of the value range, 0xFFFF (overflow code) shall be used. When the property value of the actual device is lower than the lower bound of the value range, 0xFFFFE (underflow code) shall be used.

9.36.10 Measured cumulative gas consumption property

This property indicates the cumulative gas consumption in increments of 0,001 m³. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 m³ to 999 999,999 m³). In the event of a cumulative gas consumption overflow, the counting of the cumulative gas consumption shall be restarted from 0x00000000.

9.36.11 Cumulative gas consumption reset setting property

This property resets the cumulative gas consumption to zero by setting 0x00.

9.36.12 Power generation setting property

This property indicates the setting of power generation by the engine cogeneration. The property value for power generation ON shall be 0x41, and the property value for power generation OFF shall be 0x42.

9.36.13 Power generation status property

This property indicates the power generation status of the engine cogeneration. The property value for generating shall be 0x41, the property value for stopped shall be 0x42 and the property value for idling shall be 0x45.

9.36.14 Measured in-house instantaneous power consumption property

This property indicates the in-house instantaneous power consumption in watts. The property value range shall be 0x0000 to 0xFFFFD. When the property value of the actual device is higher than the value range of this property, the overflow code 0xFFFF shall be used. When the property value is lower than the value range of this property, the underflow code 0xFFFFE shall be used.

In-house instantaneous power consumption is the sum of power where an anti-reverse power flow CT is installed and the power output.

9.36.15 Measured in-house cumulative energy consumption property

This property indicates the in-house cumulative energy consumption in increments of 0,001 kWh. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 kWh to 999 999,999 kWh) and shall increment again from 0x00000000 in the case of a cumulative energy consumption overflow.

In-house cumulative energy consumption is a sum of the cumulative energy at the reverse power flow protection CT and the cumulative energy of the generated energy output.

9.36.16 In-house cumulative energy consumption reset property

By setting 0x00 to this property, the in-house cumulative energy consumption is reset to zero.

9.36.17 System interconnection status property

This property indicates the current status of interconnection with the system.

System interconnected (reverse power flow acceptable) = 0x00, Independent = 0x01, System interconnected (reverse power flow not acceptable) = 0x02.

9.36.18 Measured remaining hot water amount property

This property indicates the amount of hot water remaining in the tank in litres. The property value range shall be 0x0000 to 0xFFFFD (from 0 litres to 65 533 litres). When the property value of the actual device is higher than the upper bound of the value range, 0xFFFF (overflow code) shall be used. When the property value of the actual device is lower than the lower bound of the value range, 0xFFFFE (underflow code) shall be used.

9.36.19 Tank capacity property

This property indicates the tank capacity in litres. The property value range shall be 0x0000 to 0xFFFFD (0 litres to 65 533 litres). When the property value of the actual device is higher than the upper bound of the value range, 0xFFFF (overflow code) shall be used. When the property value of the actual device is lower than the lower bound of the value range, 0xFFFFE (underflow code) shall be used.

9.37 Water flowmeter class specifications

9.37.1 General

The control commands of "water flowmeter" are shown in Table 55.

Class group code: 0x02

Class code: 0x81

Table 55 – List of water flowmeter properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	–	Set		○	
		ON = 0x30, OFF = 0x31				Get	○		
Water flowmeter classification	0xD0	Indicates the water flowmeter type.	unsigned char	1 byte	–	Set/Get			
		0x30: running water 0x31: recycled water 0x32: sewage water 0x33: other water							
Owner classification	0xD1	Indicates the owner of the meter in the form of owner classification.	unsigned char	1 byte	–	Set/Get			
		0x30: not specified 0x31: public waterworks company 0x32: private sector company 0x33: individual							
Measured cumulative amount of flowing water	0xE0	Indicates the cumulative amount (consumption) of flowing water using a 9-digit number.	unsigned long	4 bytes	m ³	Get	○		
		0 to 0x3B9AC9FF (0 to 999 999 999)							
Unit for measured cumulative amounts of flowing water	0xE1	Indicates the unit (multiplying factor) for the measured cumulative amount of flowing water and the historical data of measured cumulative amounts of flowing water.	unsigned char	1 byte	–	Get	○		
		0x00: 1 m ³ 0x01: 0,1 m ³ 0x02: 0,01 m ³ 0x03: 0,001 m ³ 0x04: 0,000 1 m ³ (initial value) 0x05: 0,000 01 m ³ 0x06: 0,000 001 m ³							
Historical data of measured cumulative amounts of flowing water	0xE2	Indicates the historical data of measured cumulative amounts (consumptions) of running water, which consist of 48 pieces of half-hourly data for the preceding 24 h.	unsigned long × 48	192 bytes	0,001 m ³	Get			
		0x0 to 0x3B9AC9FF (0 m ³ to 999 999,999 m ³)							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Detection of abnormal value in metering data	0xE3	Indicates whether the meter has detected an abnormal value in the metering data.	unsigned char	1 byte	–	Get		○	
		Abnormal value detected: 0x41 No abnormal value detected: 0x42							
Security data information	0xE4	Provides security information about the abnormal states detected by the meter in form of security data that identifies the abnormal states by means of bit assignments.	unsigned long	4 bytes	–	Get			
		0 to 0xFFFFFFFF							
ID number setting	0xE5	Indicates the ID number of the meter.	unsigned char	6 bytes		Set/Get			
		The ID number is specified using ASCII code. (Initial value: "000000")							
Verification expiration information	0xE6	Indicates the month and year in which the verification of the meter will expire.	unsigned char	6 bytes		Set/Get			
		The month and year are specified using ASCII code. xxxx xx Year Month							
Historical data of measured cumulative amounts of flowing water 2	0xE7	Indicates the historical data of measured cumulative amounts (consumptions) of running water, which consists of 48 pieces of half-hourly data for the preceding 24 h.	unsigned long × 48	192 bytes	m ³	Get			
		0x00000000 to 0x3B9AC9FF (0 to 999 999 999)							

9.37.2 Operation status property

This property indicates whether the functions specific to this class are operating (ON) or not (OFF). In the case of a node in which this class is implemented and the functions specific to this class start operating upon start-up of the node, this property may be implemented with the value fixed at 0x30 (operation status ON).

9.37.3 Water flowmeter classification property

This property indicates the type of the flowing water being metered in the form of meter classification.

9.37.4 Owner classification property

This property indicates the owner of the water flowmeter in the form of owner classification.

9.37.5 Measured cumulative amount of flowing water property

This property indicates the measured cumulative amount of running water using a 9-digit decimal notation number. The unit is indicated by the "unit for measured cumulative amounts of flowing water" property (EPC = 0xE1). When the value of the "unit for measured cumulative amounts of flowing water" property (which indicates the multiplying factor for measured cumulative amounts of running water) is 0x00, 0x01, 0x02, 0x03, 0x04, 0x05 or 0x06, the unit shall be 1 m³, 0,1 m³, 0,01 m³, 0,001 m³, 0,000 1 m³, 0,000 01 m³ or 0,000 001 m³ respectively. The property value range shall be from 0x00000000 to 3B9AC9FF (from 0 to 999 999 999). In the event of a measured cumulative flowing water amount overflow, the counting of the measured cumulative amount of flowing water shall be restarted from 0x00000000.

EXAMPLE If the value of the "measured cumulative amount of flowing water" property indicates that the measured cumulative amount of running water is 123 456 789 and the value of the "unit for measured cumulative amount of flowing water" property is 0x04, the actual measured cumulative amount would be:

$$123\,456\,789 \times 0,000\,1\,\text{m}^3 = 12\,345,678\,9\,\text{m}^3 \text{ (actual measured cumulative amount)}$$

9.37.6 Unit for measured cumulative amounts of flowing water property

This property indicates the unit for measured cumulative amounts of flowing water.

Property value and multiplying factor for measured cumulative amounts of flowing water:

0x00	1 m ³
0x01	0,1 m ³
0x02	0,01 m ³
0x03	0,001 m ³
0x04	0,000 1 m ³
0x05	0,000 01 m ³
0x06	0,000 001 m ³

9.37.7 Historical data of measured cumulative amounts of flowing water property

This property indicates the historical data of measured cumulative amounts of flowing water (unit = 0,001 m³), which consists of 48 pieces of half-hourly data for the preceding 24 h. The half-hourly cumulative flowing water amount measurements shall be measurements that have been taken, in increments of 0,001 m³, every hour and every half-hour by reference to the time indicated by the "current time setting" property (EPC = 0x97). The measurements shall be stored in the order they have been taken, with the oldest and newest measurements stored in the highest-order and lowest-order bytes, respectively. The property value range shall be from 0x00000000 to 0x3B9AC9FF (from 0 m³ to 999 999,999 m³). For non-measured time data in the historical data, 0xFFFFFFFF shall be set.

9.37.8 Detection of abnormal value in metering data property

This property indicates whether the meter has detected an abnormal value in the metering data. The property value shall be 0x41 when an abnormal value has been detected and 0x42 when no abnormal value has been detected.

9.37.9 Security data information property

This property provides security information about the abnormal states detected by the meter in the form of security data that identifies the abnormal states by means of bit assignments.

9.37.10 ID number setting property

This property indicates the ID number of the meter. The ID number shall be a 6-digit code comprised of 6 one-byte alphanumeric characters.

ID numbers are used when there are two or more meters.

9.37.11 Verification expiration information property

When the meter is one that has been verified by a verifying organization, this property indicates the month and year in which the verification of the meter will expire.

9.37.12 Historical data of measured cumulative amounts of flowing water 2 property

This property indicates the historical data of measured cumulative amounts of flowing water, which consists of 48 pieces of half-hourly data for the preceding 24 h. The half-hourly cumulative flowing water amount measurements shall be measurements that have been taken every hour and every half-hour by reference to the time indicated by the current time setting property (EPC = 0x97). The measurements shall be stored in the order they have been taken, with the oldest and newest measurements stored in the highest-order and lowest-order bytes, respectively. The unit for the values shall be indicated by the unit for measured cumulative amounts of flowing water property (EPC = 0xE1). The value range is from 0x00000000 to 0x3B9AC9FF (from 0 to 999 999 999). For non-measured time data in the historical data, 0xFFFFFFFF shall be set.

9.38 Power distribution board metering class specifications

9.38.1 General

The control commands of "distribution board metering" are shown in Table 56.

Class group code: 0x02

Class code: 0x87

Table 56 – List of power distribution board metering properties

[illegible]

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Historical data of measured cumulative amounts of electric energy (reverse direction)	0xC4	Indicates the day for which the historical data of measured cumulative amounts of electric energy shall be retrieved and the historical data of measured cumulative amounts of electric energy (8 digits), which consists of 48 pieces of half-hourly data for the preceding 24 h. 0x0000 to 0x0063: 0x00000000 to 0x05F5E0FF (0 to 99): (0 to 99 999 999)	unsigned short + unsigned long × 48	194 bytes	kWh	Get			
Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved	0xC5	Indicates the day for which the historical data of measured cumulative amounts of electric energy (which consists of 48 pieces of half-hourly data for the preceding 24 h) shall be retrieved. 0x00 to 0x63 (0–99) 0: current day 1 to 99: previous day to day that precedes the current day by 99 days	unsigned char	1 byte		Set/Get			
Measured instantaneous electric power	0xC6	Indicates the measured effective instantaneous electric power in watts. 0x80000001 to 0x7FFFFFFD (–2 147 483 647 to 2 147 483 645)	signed long	4 bytes	W	Get			
Measured instantaneous currents	0xC7	Indicates the measured effective instantaneous R and T phase currents in amperes. In the case of a single-phase, two-wire system, 0x7FFE shall be used for the T phase. 0x8001 to 0x7FFD (R phase) : 0x8001 to 0x7FFD (T phase) (–3 276,7 to 3 276,5): (–3 276,7 to 3 276,5)	signed short × 2	4 bytes	0,1 A	Get			

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Measured instantaneous voltages	0xC8	Indicates the measured effective instantaneous R-S(N) and S(N)-T voltages in volts. In the case of a single-phase, two-wire system, 0xFFFE shall be used for the S(N)-T voltage. 0x0000 to 0xFFFFD (between R and S(N)): 0x0000 to 0xFFFFD (between S(N) and T) (0 to 6 553,3): (0 to 6 553,3)	unsigned short × 2	4 bytes	0,1 V	Get			
Measurement channel 1	0xD0	Indicates the measurement data for Measurement channel 1 (cumulative amount of electric energy (kWh) and effective instantaneous R and T phase currents (amperes)). Data format for the electric energy: same as 0xC0 Unit: same as 0xC2 Data format for the currents: same as 0xC7	unsigned long + signed short × 2	8 bytes	kWh + 0,1 A × 2	Get			
Measurement channel 2	0xD1	Indicates the measurement data for Measurement channel 2 (cumulative amount of electric energy (kWh) and effective instantaneous R and T phase currents (amperes)). Data format for the electric energy: same as 0xC0 Unit: same as 0xC2 Data format for the currents: same as 0xC7	unsigned long + signed short × 2	8 bytes	kWh + 0,1 A × 2	Get			
Measurement channel 3	0xD2	Indicates the measurement data for Measurement channel 3 (cumulative amount of electric energy (kWh) and effective instantaneous R and T phase currents (amperes)). Data format for the electric energy: same as 0xC0 Unit: same as 0xC2 Data format for the currents: same as 0xC7	unsigned long + signed short × 2	8 bytes	kWh + 0,1 A × 2	Get			

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Measurement channel 4	0xD3	Indicates the measurement data for Measurement channel 4 (cumulative amount of electric energy (kWh) and effective instantaneous R and T phase currents (amperes)). Data format for the electric energy: same as 0xC0 Unit: same as 0xC2 Data format for the currents: same as 0xC7	unsigned long + signed short × 2	8 bytes	kWh + 0,1 A × 2	Get			
Measurement channel 5	0xD4	Indicates the measurement data for Measurement channel 5 (cumulative amount of electric energy (kWh) and effective instantaneous R and T phase currents (amperes)). Data format for the electric energy: same as 0xC0 Unit: same as 0xC2 Data format for the currents: same as 0xC7	unsigned long + signed short × 2	8 bytes	kWh + 0,1 A × 2	Get			
Measurement channel 6	0xD5	Indicates the measurement data for Measurement channel 6 (cumulative amount of electric energy (kWh) and effective instantaneous R and T phase currents (amperes)). Data format for the electric energy: same as 0xC0 Unit: same as 0xC2 Data format for the currents: same as 0xC7	unsigned long + signed short × 2	8 bytes	kWh + 0,1 A × 2	Get			

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Measurement channel 10	0xD9	Indicates the measurement data for Measurement channel 10 (cumulative amount of electric energy (kWh) and effective instantaneous R and T phase currents (amperes)). Data format for the electric energy: same as 0xC0 Unit: same as 0xC2 Data format for the currents: same as 0xC7	unsigned long + signed short × 2	8 bytes	kWh + 0,1 A × 2	Get			
Measurement channel 11	0xDA	Indicates the measurement data for Measurement channel 11 (cumulative amount of electric energy (kWh) and effective instantaneous R and T phase currents (amperes)). Data format for the electric energy: same as 0xC0 Unit: same as 0xC2 Data format for the currents: same as 0xC7	unsigned long + signed short × 2	8 bytes	kWh + 0,1 A × 2	Get			
Measurement channel 12	0xDB	Indicates the measurement data for Measurement channel 12 (cumulative amount of electric energy (kWh) and effective instantaneous R and T phase currents (amperes)). Data format for the electric energy: same as 0xC0 Unit: same as 0xC2 Data format for the currents: same as 0xC7	unsigned long + signed short × 2	8 bytes	kWh + 0,1 A × 2	Get			

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Measurement channel 22	0xE5	Indicates the measurement data for Measurement channel 22 (cumulative amount of electric energy (kWh) and effective instantaneous R and T phase currents (amperes)). Data format for the electric energy: same as 0xC0 Unit: same as 0xC2 Data format for the currents: same as 0xC7	unsigned long + signed short × 2	8 bytes	kWh + 0,1 A × 2	Get			
Measurement channel 23	0xE6	Indicates the measurement data for Measurement channel 23 (cumulative amount of electric energy (kWh) and effective instantaneous R and T phase currents (amperes)). Data format for the electric energy: same as 0xC0 Unit: same as 0xC2 Data format for the currents: same as 0xC7	unsigned long + signed short × 2	8 bytes	kWh + 0,1 A × 2	Get			
Measurement channel 24	0xE7	Indicates the measurement data for Measurement channel 24 (cumulative amount of electric energy (kWh) and effective instantaneous R and T phase currents (amperes)). Data format for the electric energy: same as 0xC0 Unit: same as 0xC2 Data format for the currents: same as 0xC7	unsigned long + signed short × 2	8 bytes	kWh + 0,1 A × 2	Get			

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Measurement channel 25	0xE8	Indicates the measurement data for Measurement channel 25 (cumulative amount of electric energy (kWh) and effective instantaneous R and T phase currents (amperes)). Data format for the electric energy: same as 0xC0 Unit: same as 0xC2 Data format for the currents: same as 0xC7	unsigned long + signed short × 2	8 bytes	kWh + 0,1 A × 2	Get			
Measurement channel 26	0xE9	Indicates the measurement data for Measurement channel 26 (cumulative amount of electric energy (kWh) and effective instantaneous R and T phase currents (amperes)). Data format for the electric energy: same as 0xC0 Unit: same as 0xC2 Data format for the currents: same as 0xC7	unsigned long + signed short × 2	8 bytes	kWh + 0,1 A × 2	Get			
Measurement channel 27	0xEA	Indicates the measurement data for Measurement channel 27 (cumulative amount of electric energy (kWh) and effective instantaneous R and T phase currents (amperes)). Data format for the electric energy: same as 0xC0 Unit: same as 0xC2 Data format for the currents: same as 0xC7	unsigned long + signed short × 2	8 bytes	kWh + 0,1 A × 2	Get			

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Measured instantaneous power consumption list (simplex)	0xB7	Indicates the measured instantaneous power consumptions of measurement channels specified by the property of "Channel range specification for instantaneous power consumption measurement (simplex)."	unsigned char + unsigned char + (signed long (Max) × 60)	(Max) 242 bytes	W	Get			
		1st byte: Acquisition start channel 0x01 to 0xFC (1 to 252) 2nd byte: Range from the acquisition start channel (0x01 to 0x3C: 1 to 60) 3rd byte and later: Measured instantaneous power consumption 0x80000001 to 0x7FFFFFFD (-2 147 483 647 to 2 147 483 645)							
Number of measurement channels (duplex)	0xB8	Indicates the number of duplex measurement channels.	unsigned char	1 byte	–	Get			
		0x01 to 0xFC (1 to 252) 0xFD: Unknown							
Channel range specification for cumulative amount of electric energy consumption measurement (duplex)	0xB9	This property is used to specify the range of acquisition by the measured cumulative amount of electric energy consumption list (duplex).	unsigned char × 2	2 bytes	–	Set/Get			
		1st byte: Acquisition start channel 0x01 to 0xFC (1 to 252) 2nd byte: Range from the acquisition start channel (0x01 to 0x1E: 1 to 30)							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Measured instantaneous power consumption list (duplex)	0xBE	Indicates the measured instantaneous power consumptions of measurement channels specified by the property of "Channel range specification for instantaneous power consumption measurement (duplex)."	unsigned char + unsigned char + signed long x (Max)60	(Max) 242 bytes	W	Get			
		1st byte: Acquisition start channel 0x01 to 0xFC (1 to 252) 2nd byte: Range from the acquisition start channel (0x01 to 0x3C: 1 to 60) 3rd byte and later: Measured instantaneous power consumption 0x80000001 to 0x7FFFFFFD (-2 147 483 647 to 2 147 483 645)							

Forward and reverse directions are defined with reference to Figure 81.

For master metering, forward current is defined as forward direction, and reverse current as reverse direction. Power consumption by air conditioning or lighting is defined as forward direction. Power generation by photovoltaic generator (PV), fuel cell (FC), or similar solar photovoltaic power generation system is defined as reverse direction. For storage battery (SB), electric vehicle (EV/EHV), or similar battery systems, charged energy is defined as forward direction, and discharged energy as reverse direction. The current direction is shown in Figure 81.

For the properties defined in this class to indicate measured instantaneous current and measured instantaneous power consumption, forward direction shall be handled as a positive value, and reverse direction as a negative value.

If electric power under measurement is identifiable, such as generated or discharged power, a measured value in the reverse direction may be handled as a positive value. For example, if PV measurement is implemented as an independent instance code of the power distribution board metering class, generated power may be defined as forward direction.

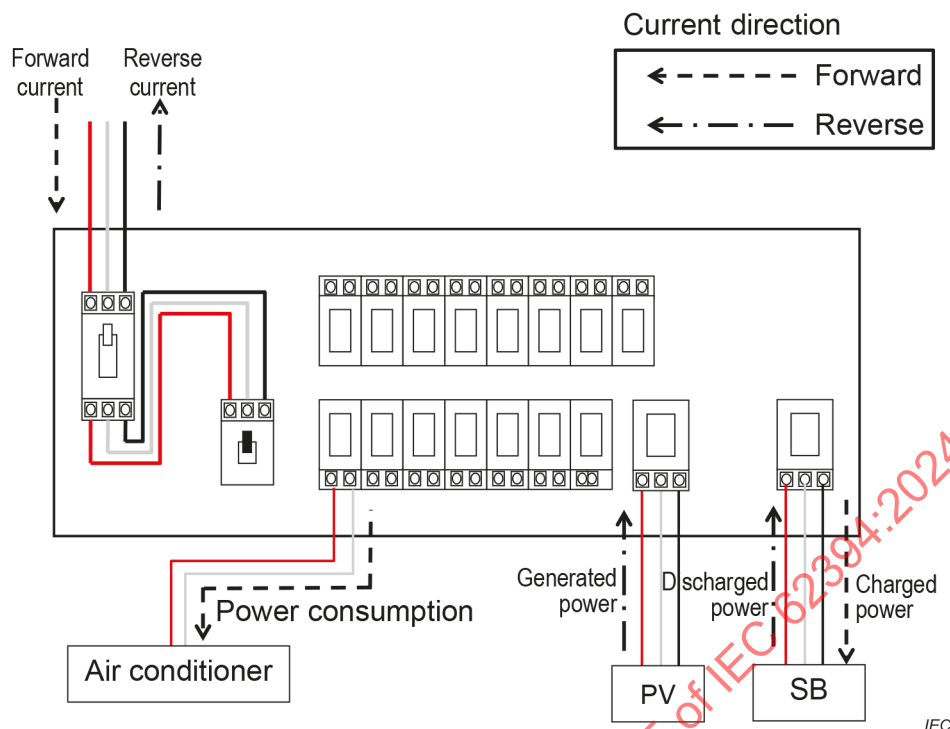


Figure 81 – Current direction in power distribution board

With reference to the definition of simplex and duplex, a property defined as duplex can be used for installation where both charged and discharged currents can be detected, for example, in a storage battery (SB). In addition, a property defined as simplex by separating charging and discharging may be used for implementation. The assignment of simplex and duplex properties to circuits shall depend on the implementation because it differs between the measuring points and sensors or systems installed.

9.38.2 Operation status property

This property indicates whether the functions specific to this class are operating (ON) or not (OFF). In the case of a node in which this class is implemented and the functions specific to this class start operating upon start-up of the node, this property may be implemented with the value fixed at 0x30 (operation status ON).

9.38.3 Measured cumulative amount of electric energy (normal and reverse directions) property

This property indicates the measured cumulative amount of electric energy using an 8-digit decimal notation number. The property value for the normal direction is the value for the power flow, and the property value for the reverse direction is the value for the reverse power flow. The unit is indicated by the "Unit for cumulative amounts of electric energy" property (EPC = 0xC2). When the value of the "Unit for cumulative amounts of electric energy" property (which indicates the multiplying factor for measured cumulative amounts of electric energy) is 0x00, 0x01, 0x02, 0x03, 0x04, 0x0A, 0x0B, 0x0C or 0x0D, the unit shall be 1 kWh, 0,1 kWh, 0,01 kWh, 0,001 kWh, 0,000 1 kWh, 10 kWh, 100 kWh, 1 000 kWh or 10 000 kWh, respectively. The property value range shall be from 0x00000000 to 0x05F5E0FF (from 0 to 99 999 999). In the event of a measured cumulative electric energy amount overflow, the counting of the measured cumulative amount of electric energy shall be restarted from 0x00000000.

EXAMPLE

If the value of the "Measured cumulative amount of electric energy" property indicates that the measured cumulative amount of electric energy is 12 345 678 and the value of the "Unit for measured cumulative amounts of electric energy" property is 0x03, the actual measured cumulative amount would be:

$$12\,345\,678 \times 0,001 \text{ kW} = 12\,345,678 \text{ kWh}$$

Overflow: Counting shall be restarted from 0x00000000.

No data: 0xFFFFFFFF

9.38.4 Unit for cumulative amounts of electric energy property

This property indicates the unit for measured cumulative amounts of electric energy (EPC = 0xC0, 0xC1).

Property value Unit (multiplying factor) for measured cumulative amounts of electric energy

0x00	1 kWh
0x01	0,1 kWh
0x02	0,01 kWh
0x03	0,001 kWh
0x04	0,000 1 kWh
0x0A	10 kWh
0x0B	100 kWh
0x0C	1 000 kWh
0x0D	10 000 kWh

9.38.5 Historical data of measured cumulative amounts of electric energy (normal and reverse directions) property

This property indicates the current setting of the "Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved" property (EPC = 0xC5; value range = 0x00 to 0x63 (0 to 99)) and the historical data of measured cumulative amounts of electric energy for the day specified by the "Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved" property, which consists of 48 pieces of half-hourly data for the preceding 24 h. The unit is indicated by the "unit for cumulative amounts of electric energy" property. When the value of the "Unit for cumulative amounts of electric energy" property is 0x00, 0x01, 0x02, 0x03, 0x04, 0x0A, 0x0B, 0x0C or 0x0D, the unit shall be 1 kWh, 0,1 kWh, 0,01 kWh, 0,001 kWh, 0,000 1 kWh, 10 kWh, 100 kWh, 1 000 kWh or 10 000 kWh, respectively. The half-hourly cumulative electric energy amount measurements shall be measurements that have been taken every hour and every half-hour by reference to the time specified by the "Current time setting" property (EPC = 0x97). The (8-digit) measurements (these are the measurements from the meter, not the cumulated amounts for the 30-min periods) shall be stored in the order they have been taken, with the oldest and newest measurements stored in the highest-order and lowest-order bytes, respectively. The value range shall be from 0x00000000 to 0x05F5E0FF (from 0 to 99 999 999). For the hours and half hours at which the amount of electric energy was not measured, 0xFFFFFFFF shall be used as the historical data value.

9.38.6 Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved (normal and reverse directions) property

Specifies the day for which the historical data of measured cumulative amounts of electric energy (EPC = 0xC3, C4) shall be retrieved. The value range shall be from 0x00 to 0x63 (from 0 to 99).

0x00 (0): historical data for the current day (up to the last hour)

0x63 (99): historical data for the day that precedes the current day by 99 days

When there is no data for the specified day, the "Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved" setting of the "Historical data of measured cumulative amounts of electric energy" property shall be set to 0xFF and all half-hourly value settings shall be set to 0xFFFFFFFF.

9.38.7 Measured instantaneous electric power property

This property indicates the measured effective instantaneous electric power in watts. The value range shall be from 0x80000001 to 0x7FFFFFFD (from –2 147 483 647 to 2 147 483 645).

Value range: from –2 147 483 647 W to 2 147 483 645 W (unit of measurement: watts)

Underflow : 0x80000000

Overflow : 0x7FFFFFFF

No data : 0x7FFFFFFE

9.38.8 Measured instantaneous currents property

This property indicates the measured effective instantaneous R and T phase currents in increments of 0,1 A. The value range shall be from 0x8001 to 0x7FFD (from –3 276,7 to 3 276,5).

In the case of a single-phase, two-wire system, the data shall be stored in the R phase field and 0x7FFE shall be set in the T phase field.

Range: from –3 276,7 A to 3 276,5 A (unit of measurement: 0,1 A)

Underflow: 0x8000

Overflow: 0x7FFF

No data: 0x7FFE

EXAMPLE

single-phase, three-wire system: 0x03E9, 0x03E7 = 100,1, 99,9 (A)

single-phase, two-wire system: 0xFC19, 0x7FFE = –99,9, not measured (A)

9.38.9 Measured instantaneous voltages property

This property indicates the measured effective instantaneous R-S(N) and S(N)-T voltages in volts. The value range shall be from 0x0000 to 0xFFFFD (from 0 to 6 553,3).

In the case of a single-phase, two-wire system, the data shall be stored in the R-S(N) field and 0xFFFE shall be set in the S(N)-T field.

Range: from 0,0 V to 6 553,3 V (unit of measurement: 0,1 V)

Overflow: 0xFFFF

No data: 0xFFFE

EXAMPLE

single-phase, three-wire system: 0x0451, 0x03E7 = 110,5, 99,9 (V)

single-phase, two-wire system: 0x03E7, 0xFFFE = 99,9, not measured (V)

9.38.10 Measurement channels 1 to 32 property

This property indicates the cumulative amount of electric energy (in kWh) and effective instantaneous currents (in increments of 0,1 A) for the respective measurement channel (each EPC code).

The data format for the cumulative amount of electric energy is the same as that for the "Measured cumulative amount of electric energy" property (0xC0). The format for the effective instantaneous currents is the same as that for the "Measured instantaneous currents" property (0xC7). The unit for the cumulative amount of electric energy is the same as that for the "Unit for cumulative amounts of electric energy" property (0xC2).

The voltage values shall be taken from 0xC8.

9.38.11 Master rated capacity property

This property indicates the rated capacity of the master circuit. The value range for this property shall be 0x00 to 0xFD (0 to 253) and the unit is A.

9.38.12 Number of measurement channels (simplex) property

This property indicates the number of channels for simplex current and power consumption measurement. The channels are for the measurement of instantaneous current consumption, cumulative amount of electric energy consumption, and instantaneous power consumption about load equipment (air conditioner, washing machine, etc.). They are also for the measurement of instantaneous generated current, amount of generated energy, and instantaneous power generation about power generation equipment (solar photovoltaic generation, etc.).

The value range for this property shall be 0x01 to 0xFC (1 to 252). 0xFD means that the number of measurement channels is unknown.

The number of channels defined by this property refers to the number of measurement channels indicated by EPC = 0xB2 to 0xB7.

9.38.13 Channel range specification for cumulative amount of electric energy consumption measurement (simplex) property

This property indicates the range of measurement channels to be acquired by the "measured cumulative amount of electric energy consumption list (simplex)" property (EPC: 0xB3).

First byte indicates the measurement channel at which to start acquisition. The value range for this property shall be 0x01 to 0xFC (1 to 252). Second byte indicates the range of acquisition from the acquisition start measurement channel. The value range shall be 0x01 to 0x3C (1 to 60).

The initial value of this property is 0xFD (no setting) for the acquisition start measurement channel and 0xFD (no setting) for the range from the acquisition start measurement channel.

When this property is installed, the "number of measurement channels (simplex)" property (EPC: 0xB1) and the "measured cumulative amount of electric energy consumption list (simplex)" property (EPC: 0xB3) are mandatory.

The value of this property is not updated when a property value write request is made by specifying a range beyond the number of measurement channels indicated by the "number of measurement channels (simplex)" property (EPC: 0xB1).

9.38.14 Measured cumulative amount of electric energy consumption list (simplex) property

This property indicates the measured cumulative amounts of electric energy consumptions of measurement channels in the range specified by the "channel range specification for cumulative amount of electric energy consumption measurement (simplex)" property (EPC: 0xB2).

The first byte indicates the measurement channel at which to start acquisition. The value range shall be 0x01 to 0xFC (1 to 252). The second byte indicates the range of acquisition from the acquisition start measurement channel. The value range shall be 0x01 to 0x3C (1 to 60). Starting from the acquisition start measurement channel, measured cumulative amount of electric energy consumption is stored sequentially in the third byte and later for the number of channels specified in the acquisition range. The format is the same as for the "measured cumulative amount of electric energy consumption (forward direction)" property (EPC: 0xC0) and the "measured cumulative amount of electric energy consumption (reverse direction)" property (EPC: 0xC1).

The initial value of this property is 0xFD (no setting) for the acquisition start measurement channel, 0xFD (no setting) for the range from the acquisition start measurement channel, and 0xFFFFFFFF (no data) for the measured cumulative amount of electric energy consumption (initial value: 0xFDFDFFFFFFFE).

When this property is installed, the "number of measurement channels (simplex)" property (EPC: 0xB1) and the "channel range specification for cumulative amount of electric energy consumption measurement (simplex)" property (EPC: 0xB2) are mandatory.

9.38.15 Channel range specification for instantaneous current measurement (simplex) property

This property indicates the range of measurement channels to be acquired by the "measured instantaneous current list (simplex)" property (EPC: 0xB5).

The first byte indicates the measurement channel at which to start acquisition. The value range shall be 0x01 to 0xFC (1 to 252). The second byte indicates the range of acquisition from the acquisition start measurement channel. The value range shall be 0x01 to 0x3C (1 to 60).

The initial value of this property is 0xFD (no setting) for the acquisition start channel and 0xFD (no setting) for the range from the acquisition start measurement channel.

When this property is installed, the "number of measurement channels (simplex)" property (EPC: 0xB1) and the "measured instantaneous current list (simplex)" property (EPC: 0xB5) are mandatory.

The value of this property is not updated when a property value write request is made by specifying a range beyond the number of measurement channels indicated by the "number of measurement channels (simplex)" property (EPC: 0xB1).

9.38.16 Measured instantaneous current list (simplex) property

This property indicates the measured instantaneous currents of measurement channels in the range specified by the "channel range specification for instantaneous current measurement (simplex)" property (EPC: 0xB4).

The first byte indicates the measurement channel at which to start acquisition. The value range shall be 0x01 to 0xFC (1 to 252). The second byte indicates the range of acquisition from the acquisition start measurement channel. The value range shall be 0x01 to 0x3C (1 to 60).

Starting from the acquisition start measurement channel, measured instantaneous current is stored sequentially in the third byte and later for the number of channels specified in the acquisition range. The format is the same as for the "measured instantaneous current" property (EPC: 0xC7).

The initial value of this property is 0xFD (no setting) for the acquisition start measurement channel, 0xFD (no setting) for the range from the acquisition start measurement channel, and 0x7FFE7FFE (no data) for the measured instantaneous current (R and T phases) (initial value: 0xFDFD7FFE7FFE).

When this property is installed, the "number of measurement channels (simplex)" property (EPC: 0xB1) and the "channel range specification for instantaneous current measurement (simplex)" property (EPC: 0xB4) are mandatory.

9.38.17 Channel range specification for instantaneous power consumption measurement (simplex) property

This property indicates the range of measurement channels to be acquired by the "measured instantaneous power consumption list (simplex)" property (EPC: 0xB7).

The first byte indicates the measurement channel at which to start acquisition. The value range shall be 0x01 to 0xFC (1 to 252). The second byte indicates the range of acquisition from the acquisition start measurement channel. The value range shall be 0x01 to 0x3C (1 to 60).

The initial value of this property is 0xFD (no setting) for the acquisition start measurement channel and 0xFD (no setting) for the range from the acquisition start measurement channel.

When this property is installed, the "number of measurement channels (simplex)" property (EPC: 0xB1) and the "measured instantaneous power consumption list (simplex)" property (EPC: 0xB7) are mandatory.

The value of this property is not updated when a property value write request is made by specifying a range beyond the number of measurement channels indicated by the "number of measurement channels (simplex)" property (EPC: 0xB1).

9.38.18 Measured instantaneous power consumption list (simplex) property

This property indicates the measured instantaneous power consumptions of measurement channels in the range specified by the "channel range specification for instantaneous power consumption measurement (simplex)" property (EPC: 0xB6).

The first byte indicates the measurement channel at which to start acquisition. The value range shall be 0x01 to 0xFC (1 to 252). The second byte indicates the range of acquisition from the acquisition start measurement channel. The value range shall be 0x01 to 0x3C (1 to 60).

Starting from the acquisition start measurement channel, measured instantaneous power consumption is stored sequentially in the third byte and later for the number of channels specified in the acquisition range. The format is the same as for the "measured instantaneous power consumption" property (EPC: 0xC6).

The initial value of this property is 0xFD (no setting) for the acquisition start measurement channel, 0xFD (no setting) for the range from the acquisition start measurement channel, and 0x7FFFFFFE (no data) for the measured instantaneous power consumption (initial value: 0xFDFD7FFFFFFE).

When this property is installed, the "number of measurement channels (simplex)" property (EPC: 0xB1) and the "channel range specification for instantaneous power consumption measurement (simplex)" property (EPC: 0xB6) are mandatory.

9.38.19 Number of measurement channels (duplex) property

This property indicates the number of channels for duplex current and power consumption measurement. The channels are for the measurement of cumulative amount of electric energy consumption (forward direction)/(reverse direction), instantaneous current, and instantaneous power consumption for charging and discharging equipment, such as storage battery, EV, and PHV. The value range for this property shall be 0x01 to 0xFC (1 to 252). 0xFD means that the number of measurement channels is unknown.

The number of channels defined by this property refers to the number of measurement channels indicated by EPC = 0xB9 to 0xBE.

9.38.20 Channel range specification for cumulative amount of electric energy consumption measurement (duplex) property

This property indicates the range of measurement channels to be acquired by the "measured cumulative amount of electric energy consumption list (duplex)" property (EPC: 0xBA).

The first byte indicates the measurement channel at which to start acquisition. The value range shall be 0x01 to 0xFC (1 to 252). The second byte indicates the range of acquisition from the acquisition start measurement channel. The value range shall be 0x01 to 0x1E (1 to 30).

The initial value of this property is 0xFD (no setting) for the acquisition start measurement channel and 0xFD (no setting) for the range from the acquisition start measurement channel.

When this property is installed, the "number of measurement channels (duplex)" property (EPC: 0xB8) and the "measured cumulative amount of electric energy consumption list (duplex)" property (EPC: 0xBA) are mandatory.

The value of this property is not updated when a property value write request is made by specifying a range beyond the number of measurement channels indicated by the "number of measurement channels (duplex)" property (EPC: 0xB8).

9.38.21 Measured cumulative amount of electric energy consumption list (duplex) property

This property indicates the measured cumulative amounts of electric energy consumptions of measurement channels in the range specified by the "channel range specification for cumulative amount of electric energy consumption measurement (duplex)" property (EPC: 0xB9).

The first byte indicates the measurement channel at which to start acquisition. The value range shall be 0x01 to 0xFC (1 to 252). The second byte indicates the range of acquisition from the acquisition start measurement channel. The value range shall be 0x01 to 0x1E (1 to 30).

Starting from the acquisition start measurement channel, measured cumulative amount of electric energy consumption (forward direction) and measured cumulative amount of electric energy consumption (reverse direction) are stored sequentially in the third byte and later for the number of channels specified in the acquisition range. The format is the same as for the "measured cumulative amount of electric energy consumption (forward direction)" property (EPC: 0xC0) and the "measured cumulative amount of electric energy consumption (reverse direction)" property (EPC: 0xC1).

The initial value of this property is 0xFD (no setting) for the acquisition start measurement channel, 0xFD (no setting) for the range from the acquisition start measurement channel, and 0xFFFFFFFFFFFFFFFF (no data) for the measured cumulative amount of electric energy consumption (initial value: 0xFDFDFFFFFFFFFFFFFFFF).

When this property is installed, the "number of measurement channels (duplex)" property (EPC: 0xB8) and the "channel range specification for cumulative amount of electric energy consumption measurement (duplex)" property (EPC: 0xB9) are mandatory.

9.38.22 Channel range specification for instantaneous current measurement (duplex) property

This property indicates the range of measurement channels to be acquired by the "measured instantaneous current list (duplex)" property (EPC: 0xBC).

The first byte indicates the measurement channel at which to start acquisition. The value range shall be 0x01 to 0xFC (1 to 252). The second byte indicates the range of acquisition from the acquisition start measurement channel. The value range shall be 0x01 to 0x3C (1 to 60).

The initial value of this property is 0xFD (no setting) for the acquisition start measurement channel and 0xFD (no setting) for the range from the acquisition start measurement channel.

When this property is installed, the "number of measurement channels (duplex)" property (EPC: 0xB8) and the "measured instantaneous current list (duplex)" property (EPC: 0xBC) are mandatory.

The value of this property is not updated when a property value write request is made by specifying a range beyond the number of measurement channels indicated by the "number of measurement channels (duplex)" property (EPC: 0xB8).

9.38.23 Measured instantaneous current list (duplex) property

This property indicates the measured instantaneous currents of measurement channels in the range specified by the "channel range specification for instantaneous current measurement (duplex)" property (EPC: 0xBB).

The first byte indicates the measurement channel at which to start acquisition. The value range for this property shall be 0x01 to 0xFC (1 to 252). The second byte indicates the range of acquisition from the acquisition start measurement channel. The value range shall be 0x01 to 0x3C (1 to 60).

Starting from the acquisition start measurement channel, measured instantaneous currents are stored sequentially in the third byte and the later for the number of channels specified in the acquisition range. The format is the same as for the "measured instantaneous current" property (EPC: 0xC7).

The initial value of this property is 0xFD (no setting) for the acquisition start measurement channel, 0xFD (no setting) for the range from the acquisition start measurement channel, and 0x7FFE7FFE (no data) for the measured instantaneous current (R and T phases) (initial value: 0xFDFD7FFE7FFE).

When this property is installed, the "number of measurement channels (duplex)" property (EPC: 0xB8) and the "channel range specification for instantaneous current measurement (duplex)" property (EPC: 0xBB) are mandatory.

9.38.24 Channel range specification for instantaneous power consumption measurement (duplex) property

This property indicates the range of measurement channels to be acquired by the "measured instantaneous power consumption list (duplex)" property (EPC: 0xBE).

The first byte specifies the acquisition start measurement channel and the second byte specifies the range from the acquisition start measurement channel. The specification range shall be from 0x01 to 0x3C (1 to 60).

The initial value of this property is 0xFD (no setting) for the acquisition start measurement channel and 0xFD (no setting) for the range from the acquisition start measurement channel.

When this property is installed, the "number of measurement channels (duplex)" property (EPC: 0xB8) and the "measured instantaneous power consumption list (duplex)" property (EPC: 0xBE) are mandatory.

The value of this property is not updated when a property value write request is made by specifying a range beyond the number of measurement channels indicated by the "number of measurement channels (duplex)" property (EPC: 0xB8).

9.38.25 Measured instantaneous power consumption list (duplex) property

This property indicates the measured instantaneous power consumptions of measurement channels in the range specified by the "channel range specification for instantaneous power consumption measurement (duplex)" property (EPC: 0xBD).

The first byte indicates the measurement channel at which to start acquisition. The value range for this property shall be 0x01 to 0xFC (1 to 252). The second byte indicates the range of acquisition from the acquisition start measurement channel. The value range for this property shall be 0x01 to 0x3C (1 to 60).

Starting from the acquisition start measurement channel, measured instantaneous power consumptions are stored sequentially in the third byte and the later for the number of channels specified in the acquisition range. The format is the same as for the "measured instantaneous power consumption" property (EPC: 0xC6).

The initial value of this property is 0xFD (no setting) for the acquisition start measurement channel, 0xFD (no setting) for the range from the acquisition start measurement channel, and 0xFFFFFFFF (no data) for the measured instantaneous power consumption (initial value: 0xFDFD7FFFFFFE).

When this property is installed, the "number of measurement channels (duplex)" property (EPC: 0xB8) and the "channel range specification for instantaneous power consumption measurement (duplex)" property (EPC: 0xBD) are mandatory.

9.39 Low-voltage smart electric meter class specifications

9.39.1 General

The control commands of "low-voltage smart electric meter" are shown in Table 57.

Class group code : 0x02

Class code : 0x88

Table 57 – List of low-voltage smart electric meter properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	–	Set		○	
		ON = 0x30, OFF = 0x31				Get	○		
Coefficient	0xD3	Indicates the coefficient for converting measured cumulative amount of electric energy and historical data to actual usage amount using a 6-digit decimal notation.	unsigned long	4 bytes	–	Get			
		0x00000000 to 0x000F423F (000 000 to 999 999)							
Number of effective digits for cumulative amounts of electric energy	0xD7	Indicates the number of effective digits for measured cumulative amounts of electric energy.	unsigned char	1 byte	digit	Get	○		
		0x01 to 0x08 (1 to 8)							
Measured cumulative amount of electric energy (normal direction)	0xE0	Indicates the measured cumulative amount of electric energy using an 8-digit decimal notation number.	unsigned long	4 bytes	kWh	Get	○		
		0x00000000 to 0x05F5E0FF (0 to 99 999 999)							
Unit for cumulative amounts of electric energy (normal and reverse directions)	0xE1	Indicates the unit (multiplying factor) used for the measured cumulative amount of electric energy and the historical data of measured cumulative amounts of electric energy.	unsigned char	1 byte	–	Get	○		
		0x00: 1 kWh 0x01: 0,1 kWh 0x02: 0,01 kWh 0x03: 0,001 kWh 0x04: 0,000 1 kWh 0x0A: 10 kWh 0x0B: 100 kWh 0x0C: 1 000 kWh 0x0D: 10 000 kWh							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Historical data of measured cumulative amounts of electric energy 1 (normal direction)	0xE2	Indicates the day for which the historical data of measured cumulative amounts of electric energy shall be retrieved 1 and the historical data of measured cumulative amounts of electric energy (normal direction), which consists of 48 items of half-hourly data for the preceding 24 h (00:00 to 23:30) of the day by time series from the highest-order byte. 1st to 2nd bytes: day for which the historical data of measured cumulative amounts of electric energy shall be retrieved 0x0000 to 0x0063 (0 to 99) 3rd and succeeding bytes: measured cumulative amounts of electric energy 0x00000000 to 0x05F5E0FF (0 to 99 999 999)	unsigned short + unsigned long × 48	194 bytes	kWh	Get	○		
Measured cumulative amounts of electric energy (reverse direction)	0xE3	Indicates the measured cumulative amounts of electric energy using an 8-digit decimal notation number. 0x00000000 to 0x05F5E0FF (0 to 99 999 999)	unsigned long	4 bytes	kWh	Get	○		a
Historical data of measured cumulative amounts of electric energy 1 (reverse direction)	0xE4	Indicates the day for which the historical data of measured cumulative amounts of electric energy shall be retrieved 1 and the historical data of measured cumulative amounts of electric energy (reverse direction), which consists of 48 items of half-hourly data for the preceding 24 h (00:00 to 23:30) of the day by time series from the highest-order byte. 1st to 2nd bytes: day for which the historical data of measured cumulative amounts of electric energy shall be retrieved 0x0000 to 0x0063 (0 to 99) 3rd and succeeding bytes: measured cumulative amounts of electric energy 0x00000000 to 0x05F5E0FF (0 to 99 999 999)	unsigned short + unsigned long × 48	194 bytes	kWh	Get	○		a

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Cumulative amounts of electric energy measured at fixed time (normal direction)	0xEA	Indicates the most recent cumulative amount of electric energy (normal direction) measured at 30-minute intervals held by the meter in the format of 4 bytes for date of measurement, 3 bytes for time of measurement, and 4 bytes for cumulative electric energy (normal direction). date of measurement YYYY:MM:DD time of measurement hh:mm:ss cumulative electric energy: an 8-digit decimal notation number 1st to 4th bytes: date of measurement YYYY: 0x0001 to 0x270F (1 to 9999) MM: 0x01 to 0x0C (1 to 12) DD: 0x01 to 0x1F (1 to 31) 5th to 7th bytes: time of measurement hh: 0x00 to 0x17 (0 to 23) mm: 0x00 to 0x3B (0 to 59) ss: 0x00 to 0x3B (0 to 59) 8th to 11th bytes: cumulative amounts of electric energy measured 0x00000000 to 0x05F5E0FF (0 to 99 999 999)	unsigned short + unsigned char × 2 + unsigned char × 3 + unsigned long	11 bytes	year + month + day + hour + minute + second + kWh	Get	○		

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Cumulative amounts of electric energy measured at fixed time (reverse direction)	0xEB	Indicates the most recent cumulative amount of electric energy (reverse direction) measured at 30-min intervals held by the meter in the format of 4 bytes for date of measurement, 3 bytes for time of measurement, and 4 bytes for cumulative electric energy (reverse direction). date of measurement YYYY:MM:DD time of measurement hh:mm:ss cumulative electric energy: an 8-digit decimal notation number 1st to 4th bytes: date of measurement YYYY: 0x0001 to 0x270F (1 to 9999) MM: 0x01 to 0x0C (1 to 12) DD: 0x01 to 0x1F (1 to 31) 5th to 7th bytes: time of measurement hh: 0x00 to 0x17 (0 to 23) mm: 0x00 to 0x3B (0 to 59) ss: 0x00 to 0x3B (0 to 59) 8th to 11th bytes: cumulative amounts of electric energy measured 0x00000000 to 0x05F5E0FF (0 to 99 999 999)	unsigned short + unsigned char × 2 + unsigned char × 3 + unsigned long	11 bytes	year + month + day + hour + minute + second + kWh	Get	○		a

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved 2	0xED	Indicates the date and time of historical data of measurements (every 30 min) and the number of segments where measurement of historical data is collected every 30 min.	unsigned short + unsigned char × 4 +	7 bytes		Set/Get			
		1st to 6th bytes: date and time for which the historical data shall be retrieved YYYY: 0x0001 to 0x270F (1 to 9999) MM: 0x01 to 0x0C (1 to 12) DD: 0x01 to 0x1F (1 to 31) hh: 0x00 to 0x17 (0 to 23) mm: 0x00/0x1E (0/30) 7th byte: number of collection segments 0x01 to 0x0C (1 to 12)	unsigned char						
a It is mandatory if there is a reverse direction measurement function.									

This class is used in the case of smart electric energy meters installed for customers supplied with power of 400 V or less.

In the case of smart electric energy meters installed for customers supplied with power of 6,6 kV, the high-voltage smart electric energy meter class (Class group code: 0x02, Class code: 0x8A) shall be used.

9.39.2 Operation status property

This property indicates whether the functions specific to this class are operating (ON) or not (OFF). In the case of a node in which this class is implemented and the functions specific to this class start operating upon start-up of the node, this property may be implemented with the value fixed at 0x30 (operation status ON).

9.39.3 Coefficient property

This property indicates the coefficient for converting measured cumulative amounts of electric energy and historical data of measured cumulative amounts of electric energy to actual usage amounts using a 6-digit decimal notation. If this property is not implemented, the coefficient shall be treated as 1.

9.39.4 Number of effective digits for cumulative amounts of electric energy property

This property indicates the number of effective digits from the low-order side of the measured cumulative amounts of electric energy (data size: 4 bytes, number of digits: 8).

EXAMPLE

Number of effective digits for cumulative amounts of electric energy 0x06 (six digits from the low-order side).

The cumulative electric energy value overflows at 0x000F423F (999 999) and increments again from 0x00000000(0).

9.39.5 Measured cumulative amount of electric energy (normal direction) property

This property indicates the measured cumulative amount of electric energy in the normal direction (power flow) using an 8-digit decimal notation number. The unit is indicated by the "Unit for cumulative amounts of electric energy" property (EPC = 0xE1). The property value range shall be from 0x00000000 to 0x05F5E0FF (from 0 to 99 999 999). If the cumulative electric energy value exceeds the value specified by the "Number of effective digits for cumulative amounts of electric energy" property (EPC = 0xD7), the value shall increment again from 0x00000000(0). When "Coefficient" property (EPC = 0xD3) is specified, the value multiplied by the coefficient is the actual usage amount.

EXAMPLE

If the value of the "Measured cumulative amount of electric energy (normal direction)" property is 0x00BC614E (12 345 678), the value of the "Coefficient (EPC = 0xD3)" property is 0x0000000A (10 times) and the value of the "Unit for cumulative amounts of electric energy (EPC = 0xE1)" property is 0x03 (0,001 kWh), the actual measured cumulative amount would be:

$12\,345\,678 \times 10 \times 0,001 \text{ kW} = 123\,456,78 \text{ kWh}$ (actual usage amount)

Overflow : Counting shall be restarted from 0x00000000

No measured data : 0xFFFFFFFF

9.39.6 Unit for measured cumulative amounts of electric energy (normal and reverse directions) property

This property indicates the unit for the measured cumulative amount of electric energy (normal and reverse directions) and the historical data of measured cumulative amounts of electric energy.

Property value	Unit (multiplying factor) for measured cumulative amounts of electric energy
0x00	1 kWh
0x01	0,1 kWh
0x02	0,01 kWh
0x03	0,001 kWh
0x04	0,000 1 kWh
0x0A	10 kWh
0x0B	100 kWh
0x0C	1 000 kWh
0x0D	10 000 kWh

9.39.7 Historical data of measured cumulative amounts of electric energy 1 (normal direction) property

This property includes two elements. One is the "day for which the historical data of measured cumulative amounts of electric energy shall be retrieved" 0x0000 to 0x0063 (0 to 99) specified by "Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved 1" (EPC = 0xE5) (day for which the historical data of measured cumulative amounts of electric energy shall be retrieved 1 (EPC = 0xE5) indicated in 2 bytes). The other is the historical data of measured cumulative amounts of electric energy in the normal direction (meter reading and not 30-min cumulative value) every 30 min at 00 and 30 min every hour for 24 h (00:00 to 23:30) on the day, 48 times in total, by time series from the highest-order byte.

This property indicates the cumulative amounts of electric energy using an 8-digit decimal notation number. The unit is indicated by the "Unit for cumulative amounts of electric energy" property (EPC = 0xE1). When "Coefficient" property (EPC = 0xD3) is specified, the value multiplied by the coefficient is the actual usage amount. The property value range shall be from 0x00000000 to 0x05F5E0FF (0 to 99 999 999). If the cumulative amounts of electric energy exceeds the number of effective digits specified by "number of effective digits for cumulative amounts of electric energy" (EPC = 0xD7), the value shall be increased again from 0x00000000(0). The property value shall be set to 0xFFFFFFFF (no measured data) in the case of no cumulative amounts of electric energy (normal direction) of the corresponding time. In the case of default values when "Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved 1" (EPC = 0xE5) has not been set, the day for which the historical data of measured cumulative amounts of electric energy shall be retrieved shall be set to 0x00FF and all half-hourly measurements of cumulative amount of electric energy shall be set to 0xFFFFFFFF.

9.39.8 Measured cumulative amounts of electric energy (reverse direction) property

This property indicates the measured cumulative amount of electric energy in the reverse direction (reverse power flow) using an 8-digit decimal notation number. The unit is indicated by the "Unit for cumulative amounts of electric energy" property (EPC = 0xE1). The property value range shall be from 0x00000000 to 0x05F5E0FF (from 0 to 99 999 999). If the cumulative electric energy value exceeds the value specified by the "Number of effective digits for cumulative amounts of electric energy" property (EPC = 0xD7), the value shall increment again from 0x00000000(0). When "Coefficient" property (EPC = 0xD3) is specified, the value multiplied by the coefficient is the actual usage amount.

Overflow : Counting shall be restarted from 0x00000000.

No measured data : 0xFFFFFFFF

9.39.9 Historical data of measured cumulative amounts of electric energy 1 (reverse direction) property

This property includes two elements. One is the "day for which the historical data of measured cumulative amounts of electric energy shall be retrieved" 0x0000 to 0x0063 (0 to 99) specified by "Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved 1" (EPC = 0xE5) (day for which the historical data of measured cumulative amounts of electric energy shall be retrieved 1 (EPC = 0xE5) indicated in 2 bytes). The other is the historical data of measured cumulative amounts of electric energy in the reverse direction (meter reading and not 30-min cumulative value) every 30 min at 00 min and 30 min past the hour for every hour for 24 h (00:00 to 23:30) on the day, 48 times in total, by time series from the highest-order byte.

This property indicates the cumulative amounts of electric energy using an 8-digit decimal notation number. The unit is indicated by the "Unit for cumulative amounts of electric energy" property (EPC = 0xE1). When "Coefficient" property (EPC = 0xD3) is specified, the value multiplied by the coefficient is the actual usage amount. The property value range shall be from 0x00000000 to 0x05F5E0FF (0 to 99 999 999). If the cumulative amounts of electric energy exceed the number of effective digits specified by "number of effective digits for cumulative amounts of electric energy" (EPC = 0xD7), the value shall be increased again from 0x00000000(0). The property value shall be set to 0xFFFFFFFF (no measured data) in the case of no cumulative amounts of electric energy (reverse direction) of the corresponding time. In the case of default values when "Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved 1" (EPC = 0xE5) has not been set, the day for which the historical data of measured cumulative amounts of electric energy shall be retrieved shall be set to 0x00FF and all half-hourly measurements of cumulative amount of electric energy shall be set to 0xFFFFFFFF.

9.39.10 Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved 1 property

This property specifies the day for which the historical data of measured cumulative amounts of electric energy 1 (EPC = 0xE2, 0xE4) shall be retrieved. The value range shall be from 0x00 to 0x63 (from 0 to 99).

- 0x00 (0): measured historical data for the current day (up to the last hour)
- 0x63 (99): measured historical data for the day that precedes the current day by 99 days

The default values of this property shall be 0xFF.

9.39.11 Measured instantaneous electric power property

This property indicates the measured effective instantaneous electric power in watts. The value range shall be from 0x80000001 to 0x7FFFFFFD (from –2 147 483 647 to 2 147 483 645).

Range: from –2 147 483 647 W to 2 147 483 645 W (unit of measurement: watts)

Underflow : 0x80000000

Overflow : 0x7FFFFFFF

No measured data : 0x7FFFFFFE

9.39.12 Measured instantaneous currents property

This property indicates the measured effective instantaneous R and T phase currents in amperes. The value range shall be from 0x8001 to 0x7FFD (from –3 276,7 to 3 276,5).

In the case of a single-phase, two-wire system, measured data shall be stored in the R phase field and 0x7FFE (no measured data) shall be set in the T phase field.

Range: from –3 276,7 A to 3 276,5 A (unit of measurement: 0,1 A)

Underflow: 0x8000

Overflow: 0x7FFF

No measured data: 0x7FFE

EXAMPLE

single-phase, three-wire system: 0x03E9, 0x03E7 = 100,1, 99,9 (A)

single-phase, two-wire system: 0xFC19, 0x7FFE = –99,9, not measured (A)

9.39.13 Cumulative amounts of electric energy measured at fixed time (normal direction) property

This property indicates the cumulative amounts of electric energy (normal direction) measured at 30-min intervals (every half hour) (meter reading and not 30-min cumulative value) held by the meter in the format of 4 bytes for date of measurement, 3 bytes for time of measurement, and 4 bytes for cumulative electric energy (normal direction). The date of measurement shall be indicated in the format of two bytes for year, one byte for month, and one byte for day. The time of measurement shall be indicated in the format of one byte for hour, one byte for minute, and one byte for second. If the meter has no second information, 0x00 shall be set for second. The measured cumulative amounts of electric energy shall be indicated using an 8-digit decimal notation number. The unit shall be indicated by the "Unit of cumulative amounts of electric energy" property (EPC = 0xE1). When "Coefficient" property (EPC = 0xD3) is specified, the value multiplied by the coefficient is the actual usage amount. The value range of the property shall be from 0x00000000 to 0x05F5E0FF (0 to 99 999 999). If the cumulative electric energy value exceeds the value specified by the "Number of effective digits for cumulative amounts of electric energy" property (EPC = 0xD7), the value shall increment again from 0x00000000(0).

If the meter does not support cumulative electric energy (normal direction), 0xFFFFFFFF shall be set for no measured data.

Overflow : Counting shall be restarted from 0x00000000

No measured data : 0xFFFFFFFF

EXAMPLE

Cumulative amounts of electric energy measured at fixed time (normal direction)

YYYY = 0x07DC (year: 2012), MM = 0x03 (month: 3), DD = 0x0F (day: 15)

hh = 0x07 (hour: 7), mm = 0x00 (minute: 0), ss = 0x00 (second: 0)

Cumulative electric energy (normal direction) = 0x0001E240 (00 123 456)

Number of effective digits for cumulative electric energy (EPC = 0xD7): 0x06 (low-order six digits)

Coefficient (EPC = 0xD3): No implementing of property (=1)

Unit for cumulative amounts of electric energy (EPC = 0xE1): 0x02 (0,01 kWh)

Date of measurement: March 15, 2012

Time of measurement: 07:00:00

Cumulative electric energy (normal direction)

$(123\,456 \times 0,01) \text{ kWh} = 1\,234,56 \text{ kWh}$ (actual usage amount)

9.39.14 Cumulative amounts of electric energy measured at fixed time (reverse direction) property

This property indicates the cumulative amounts of electric energy (reverse direction) measured at 30-min intervals (every half hour) (meter reading and not 30-min cumulative value) held by the meter in the format of 4 bytes for date of measurement, 3 bytes for time of measurement, and 4 bytes for cumulative electric energy (reverse direction). The date of measurement shall be indicated in the format of two bytes for year, one byte for month, and one byte for day. The time of measurement shall be indicated in the format of one byte for hour, one byte for minute, and one byte for second. If the meter has no second information, 0x00 shall be set for second. The measured cumulative amounts of electric energy shall be indicated using an 8-digit decimal notation number. The unit shall be indicated by the "Unit for cumulative amounts of electric energy" property (EPC = 0xE1). When "Coefficient" property (EPC = 0xD3) is specified, the value multiplied by the coefficient is the actual usage amount. The value range of the property shall be from 0x00000000 to 0x05F5E0FF (0 to 99 999 999). If the cumulative electric energy value exceeds the value specified by the "Number of effective digits for cumulative amounts of electric energy" property (EPC = 0xD7), the value shall increment again from 0x00000000 (0). If the meter does not support cumulative electric energy (reverse direction), 0xFFFFFFFF shall be set for no data.

Overflow : Counting shall be restarted from 0x00000000

No measured data : 0xFFFFFFFF

EXAMPLE

Cumulative amount of electric energy measured at fixed time (reverse direction)

YYYY = 0x07DC (year: 2012), MM = 0x03 (month: 3), DD = 0x0F (day: 15)

hh = 0x07 (hour: 7), mm = 0x00 (minute: 0), ss = 0x00 (second: 0)

Cumulative electric energy (reverse direction) = 0x0001E240 (00 123 456)

Number of effective digits for cumulative amounts of electric energy (EPC = 0xD7): 0x06 (low-order six digits)

Coefficient (EPC = 0xD3): No implementing of property (= 1)

Unit for cumulative amounts of electric energy (EPC = 0xE1): 0x02 (0,01 kWh)

Date of measurement: March 15, 2012

Time of measurement: 07:00:00

Cumulative electric energy (reverse direction)

(123 456 × 0,01) kWh = 1 234,56 kWh (actual usage amount)

9.39.15 Historical data of measured cumulative amounts of electric energy 2 (normal and reverse directions) property

This property includes two elements. One is the date and time for which the historical data of measured cumulative amounts of electric energy shall be retrieved in the format of YYYY:MM:DD:hh:mm, and the number of collection segments specified by "day for which the historical data of measured cumulative amounts of electric energy shall be retrieved 2" (EPC = 0xED) respectively. The other is the historical data of measured cumulative amount of electric energy every 30 min in the normal and reverse directions within the past 6 h on the day.

The date and time indicates date by four bytes and time by two bytes in this order. The property value for minutes every hour is 0x00 (0 min) or 0x1E (30 min).

The number of collection segments indicates the count of collecting data about cumulative amount of electric energy every 30 min by one byte. The value range shall be from 0x01 to 0x0C (1 to 12).

Measured cumulative amount of electric energy (meter reading and not 30-min cumulative value) is a decimal notation of up to 8 digits. The property of "Unit for measured cumulative amounts of electric energy" (EPC = 0xE1) indicates the unit. When "Coefficient" (EPC = 0xD3) is specified, the value multiplied by the coefficient is the actual usage amount. The property value range shall be from 0x00000000 to 0x05F5E0FF (0 to 99 999 999). With the measured cumulative amount of electric energy (normal and reverse directions) measured at the time set by "date and time for which the historical data shall be retrieved" as the higher-order byte, the property value indicates the number of segments specified by "day for which the historical data of measured cumulative amounts of electric energy shall be retrieved 2" (EPC = 0xED) in reverse time series. If the cumulative amount of electric energy exceeds the number of effective digits specified by "Number of effective digits for cumulative amounts of electric energy" (EPC = 0xD7), the value shall be increased again from 0x00000000 (0). When cumulative amount of electric energy is not measured or the data is outside the history retention period, the property value shall be set to 0xFFFFFFFF for no measured data.

When "Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved 2" (EPC = 0xED) is not set, the initial value shall be set to 0xFFFFFFFF for date and time for which the historical data of measured cumulative amounts of electric energy shall be retrieved, 0x01 for the number of segments, and 0xFFFFFFFF for the 30-min value of each segment in the normal and reverse directions respectively.

9.39.16 Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved 2 property

This property includes two elements. One is the date and time for which the historical data of measured cumulative amounts of electric energy shall be retrieved of a target specified by the "Historical data of measured cumulative amounts of electric energy 2 (normal and reverse directions)" (EPC = 0xEC). The other is the number of collection segments where 30-min measurement historical data is one segment.

The date and time shall be the latest ones of data collection. The format is two bytes for year, one byte for month, one byte for day, one byte for hour, and one byte for minute. Since "Historical data of measured cumulative amounts of electric energy 2 (normal and reverse directions)" is data collected every 30 min, the minutes value shall be 0x00 (0 min) or 0x1E (30 min).

The initial value of this property shall be set to 0xFFFFFFFF for date and time for which the historical data shall be retrieved and 0x01 for the number of collection segments.

9.40.1 General

Class group code : 0x02

Class code : 0x89

Table 58 – List of smart gas meter properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	This property indicates the ON/OFF status.	unsigned char	1 byte	—	Set		○	
		ON = 0x30, OFF = 0x31				Get	○		
Gas classification setting	0xE0	Indicates the gas meter type.	unsigned char	1 byte	—	Set/Get			
		0x30: City gas 0x31: LP gas 0x32: Natural gas 0x33: Other							
Owner classification setting	0xE1	Indicates the type of owner of the meter.	unsigned char	1 byte	—	Set/Get			
		0x30: Not specified 0x31: City gas 0x32: LP gas 0x33: Private-sector company 0x34: Individual							
Measured cumulative gas consumption	0xE2	Indicates the measured cumulative gas consumption in m ³ .	unsigned long	4 bytes	0,001 m ³	Get	○		a
		0 to 0x3B9AC9FF (0 m ³ to 999 999 999 m ³)							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remarks
		Value range (decimal notation)							
Security data information	0xE7	Provides security information about the abnormal states detected by the meter in the form of security data that identifies the abnormal states by means of bit assignment.	unsigned char × 10	10 bytes	–	Get			
		For details, see 9.40.10.							
Valve closure by the Centre	0xE8	Indicates whether the Centre has closed the gas shutoff valve of the meter.	unsigned char	1 byte	–	Get			
		Center has closed the valve: 0x41 Center has not closed the valve: 0x42							
Permission from the Centre to reopen the valve closed by the Centre	0xE9	Indicates whether permission has been given by the Centre to reopen the gas shutoff valve of the meter closed by the Centre.	unsigned char	1 byte	–	Get			
		Permission has been given by the Centre to reopen the gas shutoff valve closed by the Centre: 0x41 Permission to reopen the gas shutoff valve closed by the Centre has not been given by the Centre: 0x42							
Emergency closure of shutoff valve	0xEA	Indicates whether the gas shutoff valve of the meter has been closed in response to an emergency.	unsigned char	1 byte	–	Get			
		Emergency closure of the shutoff valve has occurred: 0x41 No emergency closure of the shutoff valve has occurred: 0x42							
Shutoff valve status	0xEB	Indicates whether the shutoff valve is open or closed.	unsigned char	1 byte	–	Get			
		Shutoff valve open: 0x41 Shutoff valve closed: 0x42							
Historical data of shutoff reasons	0xEC	Indicates the reasons for the 3 past shutoff valve-based gas shutoffs by means of bit assignment with one byte used for each of the 3 shutoff reasons. Historical data3: Historical data2: Historical data 1	unsigned char × 3	3 bytes	–	Get			
		0xFF: 0xFF: 0xFF							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
ID number setting	0xED	Indicates the ID number of the meter.	unsigned char	6 bytes		Set/Get			
		000000 to FFFFFF (Initial value: "000000")							
Verification expiration setting	0xEE	Indicates the month and year in which the verification of the meter will expire.	unsigned char	6 bytes		Set/Get			
		YYYYMM YYYY (year), MM (month)							
Measured cumulative gas consumption information with date and time	0xD0	Indicates the cumulative gas consumption and the date and time of measurement. – Date of measurement: YYYY:MM:DD – Time of measurement: HH:MM:SS – Cumulative gas consumption: 9 digits 1st to 4th bytes: 0 to 0x270F: 1 to 0x0C: 1 to 0x1F (= 0 to 9999): (= 1 to 12): (1 to 31) 5th to 7th bytes: 0 to 0x17: 0 to 0x3B: 0 to 0x3B (= 0 to 23): (= 0 to 59): (= 0 to 59) 8th to 11th bytes: 0x00000000 to 0x3B9AC9FF (0 to 999 999 999)	unsigned char × 4 + unsigned char × 3 + unsigned long	11 bytes	Date + time + 0,001 m ³	Get	○		a

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Historical information of cumulative gas consumption	0xD1	Indicates the historical information of gas consumption measured at every hour, the date and time of history start, cumulative gas consumption at history start and cumulative time interval. – Date: YYYY:MM:DD – Time: HH:MM:SS – Historical information of gas consumption – Cumulative gas consumption at history start – Cumulative time interval: 5 digits, every minute	unsigned char × 4 + unsigned char × 3 + unsigned long × 24 + unsigned long + unsigned short	109 bytes	Date + time + 0,001 m ³ + 0,001 m ³ + minute	Get			
		1st to 4th bytes: 0 to 0x270F:1 to 0x0C:1 to 0x1F (=0 to 9999):(=1 to 12): (1 to 31) 5th to 7th bytes: 0 to 0x17:0 to 0x3B:0 to 0x3B (= 0 to 23):(= 0 to 59): (= 0 to 59) 8th to 103rd bytes: 0x00000000 to 0x0001869F × 24 (0 m ³ to 99,999 m ³) × 24 104th to 107th bytes: 0x00000000 to 0x3B9AC9FF (0 to 999 999 999) 108th to 109th bytes: 0x0001 to 0xFFFF (1 to 65 535)							
^a Measured cumulative gas consumption (EPC = 0xE2) or measured cumulative gas consumption information with date and time (EPC = 0xD0) is mandatory.									

9.40.2 Operation status property

This property indicates whether the functions specific to this class are operating (ON) or not (OFF). In the case of a node in which this class is implemented and the functions specific to this class start operating upon start-up of the node, this property may be implemented with the value fixed at 0x30 (operation status ON).

9.40.3 Gas meter classification setting property

This property indicates the type of the gas being metered by the meter in the form of meter classification.

9.40.4 Owner classification setting property

This property indicates the owner of the meter in the form of owner classification.

9.40.5 Measured cumulative gas consumption property

This property indicates the measured cumulative gas consumption using a 9-digit decimal notation number. The unit is indicated by the "Unit for measured cumulative gas consumption" property (EPC = 0xE3). If the "Unit for measured cumulative gas consumption" property (EPC = 0xE3) is not installed, however, the unit shall be 0,001 m³. If the "Unit for measured cumulative gas consumption" property (EPC = 0xE3) is installed, the unit shall depend on the property value as specified below. When the value of the "Unit for measured cumulative gas consumption" property (which indicates the multiplying factor for measured cumulative gas consumption) is 0x00, 0x01, 0x02, 0x03, 0x04, 0x05 or 0x06, the unit shall be 1 m³, 0,1 m³, 0,01 m³, 0,001 m³, 0,000 1 m³, 0,000 01 m³ or 0,000 001 m³, respectively. The property value range shall be from 0x00000000 to 3B9AC9FF (from 0 to 999 999,999). In the event of a measured cumulative gas consumption overflow, the counting of the measured cumulative gas consumption shall be restarted from 0x00000000.

EXAMPLE

If the value of the "Measured cumulative gas consumption" property indicates that the measured cumulative gas consumption is 123 456 789 and the value of the "Unit for measured cumulative gas consumption" property is 0x03, the actual measured cumulative gas consumption would be:

$123\,456\,789 \times 0,001\, \text{m}^3 = 123\,456,789\, \text{m}^3$

Overflow : Counting shall be restarted from 0x00000000

No data : 0xFFFFFFFFE

EPC shall be 0xE2 (measured cumulative gas consumption) or 0xD0 (measured cumulative gas consumption information with date and time).

9.40.6 Unit for measured cumulative gas consumption property

This property indicates the unit for measured cumulative gas consumption.

Property value: Cumulative gas consumption (multiplying factor)

0x00	1 m ³
0x01	0,1 m ³
0x02	0,01 m ³
0x03	0,001 m ³
0x04	0,000 1 m ³
0x05	0,000 01 m ³
0x06	0,000 001 m ³

When this property is not implemented, the unit of measured cumulative gas consumption shall be 0,001 m³.

9.40.7 Historical data of measured cumulative gas consumption property

This property indicates the current setting of the "Day setting for which the historical data of measured cumulative gas consumption shall be retrieved" property (EPC = 0xE5; value range = 0x0000 to 0x0063 (0 to 99)) (Day setting for which the historical data of measured cumulative gas consumption shall be retrieved 1 (EPC = 0xE5) indicated in 2 bytes) and the historical data of measured cumulative gas consumption (unit = 0,001 m³) for the day specified by the "Day setting for which the historical data of measured cumulative gas consumption shall be retrieved" property, which consists of 48 pieces of half-hourly data for the preceding 24 h. The half-hourly cumulative gas consumption measurements shall be measurements that have been taken every hour and every half-hour by reference to the time specified by the "Current time setting" property (EPC = 0x97). The measurements (unit = 0,001 m³) shall be stored in the order they have been taken, with the oldest and newest measurements stored in the highest-order and lowest-order bytes, respectively. The value range shall be from 0x00000000 to 0x3B9AC9FF (from 0 m³ to 999 999,999 m³).

9.40.8 Day setting for which the historical data of measured cumulative gas consumption shall be retrieved property

Specifies the day for which the historical data of measured cumulative gas consumption is to be retrieved. The value range shall be from 0x00 to 0x63 (from 0 to 99).

- 0x00 (0): historical data for the current day (up to the last hour)
- 0x63 (99): historical data for the day that precedes the current day by 99 days

When there is no data for the specified day, the "Day setting for which the historical data of measured cumulative gas consumption shall be retrieved" setting of the "Historical data of measured cumulative gas consumption" property (EPC = 0xE4) shall be set to 0xFF and all half-hourly value settings shall be set to 0xFFFFFFFF.

9.40.9 Detection of abnormal value in metering data property

This property indicates whether the meter has detected an abnormal value in the metering data. The property value shall be 0x41 when an abnormal value has been detected and 0x42 when no abnormal value has been detected.

9.40.10 Security data information property

This property provides security information about the abnormal states detected by the meter in the form of security data that identifies the abnormal states by means of bit assignments as shown in Table 59.

Table 59 – Security data information property

	Char1	Char2	Char3	Char4	Char5	...	Char10
Bit1	Arr01	Arr09	Arr17	Arr25	Arr33		Arr73
Bit2	Arr02	Arr10	Arr18	Arr26	Arr34		Arr74
Bit3	Arr03	Arr11	Arr19	Arr27	Arr35		Arr75
Bit4	Arr04	Arr12	Arr20	Arr28	Arr36		Arr76
Bit5	Arr05	Arr13	Arr21	Arr29	Arr37		Arr78
Bit6	Arr06	Arr14	Arr22	Arr30	Arr38		Arr77
Bit7	Arr07	Arr15	Arr23	Arr31	Arr39		Arr79
Bit8	Arr08	Arr16	Arr24	Arr32	Arr40		Arr80

Arr: Alarm information.

9.40.11 Valve closure by the Centre property

This property indicates whether the Centre has closed the gas shutoff valve of the meter. When the value of this property is "0x41" (= Centre has closed the valve), no request to reopen the valve is accepted until the value for the "Permission has been given by the Centre to reopen the gas shutoff valve closed by the Centre" state (0x41) is received from the "Permission from the Centre to reopen the valve closed by the Centre" property.

9.40.12 Permission from the Centre to reopen the valve closed by the Centre property

This property indicates whether permission has been given by the Centre to reopen the gas shutoff valve of the meter closed by the Centre. The value "0x41" indicates that permission has been given by the Centre to reopen the gas shutoff valve closed by the Centre, and the value "0x42" indicates that permission to reopen the gas shutoff valve closed by the Centre has not been given by the Centre.

9.40.13 Emergency closure of shutoff valve property

This property indicates whether the gas shutoff valve of the meter has been closed in response to an emergency. The value "0x41" indicates that emergency closure of the shutoff valve has occurred and the value "0x42" indicates that no emergency closure of the shutoff valve has occurred.

9.40.14 Shutoff valve status property

This property indicates whether the shutoff valve is open or closed. The value "0x41" indicates that the shutoff valve is open and the value "0x42" indicates that the shutoff valve is closed.

9.40.15 Historical data of shutoff reasons property

This property indicates the reasons for the 3 past shutoff valve-based gas shutoffs by means of bit assignment with one byte used for each of the 3 shutoff reasons. The higher-order, intermediate-order and lower-order bytes shall contain Historical data 3 (the reason for the shutoff before the shutoff before the last shutoff), Historical data 2 (the reason for the shutoff before the last shutoff) and Historical data 1 (the reason for the last shutoff), respectively.

9.40.16 ID number setting property

This property indicates the ID number of the meter. The ID number shall be a 6-digit code comprised of 6 one-byte alphanumeric characters.

ID numbers are used when there are two or more meters.

9.40.17 Verification expiration setting property

When the meter is one that has been verified by a verifying organization, this property indicates the year and month in which the verification of the meter will expire.

9.40.18 Measured cumulative gas consumption information with date and time property

This property indicates the cumulative gas consumption and the date and time of measurement in the format of 4 bytes for date of measurement, 3 bytes for time of measurement, and 4 bytes for cumulative gas consumption. The date of measurement shall be indicated in the format of two bytes for year, one byte for month, and one byte for day. The time of measurement shall be indicated in the format of one byte for hour, one byte for minute, and one byte for second. If the meter has no second information, 0x00 shall be set for second.

For the definition of cumulative gas consumption, see 9.40.5.

9.40.19 Historical information of cumulative gas consumption property

This property indicates the historical information of gas consumption measured at every hour in the format of 4 bytes for the date of history start, 3 bytes for the time of history start, 4 bytes × 24 for historical data of measured cumulative gas consumption, 4 bytes for cumulative gas consumption at history start, and 2 bytes for cumulative time interval.

The date of history start shall be indicated in the format of two bytes for year, one byte for month, and one byte for day. The time of history start shall be indicated in the format of one byte for hour, one byte for minute, and one byte for second. If the meter has no second information, 0x00 shall be set for second.

Historical data of measured cumulative gas consumption indicates the gas consumption (unit: 0,001 m³) at every cumulative interval using a 5-digit decimal notation number. The value range of the property shall be from 0x00000 to 0xF423F (0 to 99,999 m³).

Cumulative gas consumption at history start shall follow the definition in 9.40.5.

The value range of cumulative time interval shall be 0x0001 to 0xFFFF (1 min to 65 535 min).

EXAMPLE

Sending 24 cumulative values (reading increment at every hour) from 00:00:00 on March 1, 2012 (reading: 123 456,789 m³) after 00:00:00 on March 2

Date of history start (YYYY:MM:DD) = 0x07DC0301(2012:03:01)

Time of history start (hh:mm:ss) = 0x000000(00:00:00)

Historical data of measured cumulative gas consumption = See the Table 60
(24 from Vol.01 to Vol.24)

Cumulative gas consumption at history start = 0x075BCD15 (123 456,789 m³)

Cumulative time interval = 0x3C (60 min)

**Table 60 – Historical data of measured cumulative gas consumption (example)
corresponding to the transition of cumulative gas consumption**

No.	Date	Time	Reading	Gas consumption log Vol.01 to 24
	20120301	000000	123456789	
01	20120301	010000	123456799	00010 (= 123456799 to 123456789)
02	20120301	020000	123456819	00020 (= 123456819 to 123456799)
03	20120301	030000	123456849	00030 (= 123456849 to 123456819)
04	20120301	040000	123456889	00040 (= 123456889 to 123456849)
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.
21	20120301	210000	123461234	01000 (= 123461234 to 123460234)
22	20120301	220000	123461756	00522 (= 123461756 to 123461234)
23	20120301	230000	123461756	00000 (= 123461756 to 123461756)
24	20120302	000000	123461756	00000 (= 123461756 to 123461756)

9.41 High-voltage smart electric energy meter class specifications

9.41.1 General

The control commands of "high-voltage smart electric energy meter" are shown in Table 61.

Class group code : 0x02

Class code : 0x8A

Table 61 – List of high-voltage smart electric energy meter properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	—	Set		○	
		ON = 0x30, OFF = 0x31				Get	○		
Coefficient	0xD3	Indicates the coefficient for converting meter readings to actual kWh, kVarh and kW usage in 6-digit decimal notation.	unsigned long	4 bytes	—	Get	○		
		0x00000000 to 0x000F423F (000 000 to 999 999)							
Multiplying factor for coefficient	0xD4	Indicates the multiplying factor for coefficient.	unsigned char	1 byte		Get	○		
		0x00: × 1 0x01: × 0,1 0x02: × 0,01 0x03: × 0,001							
Fixed date	0xE0	Indicates the fixed date for monthly usage, etc.	unsigned char	1 byte		Get	○		
		0x01 to 0x1F (1 to 31)							
Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved	0xE1	Indicates the day for which the historical data of measured cumulative amounts of electric energy shall be retrieved (consisting of 48 items of half-hourly data for the preceding 24 h) shall be retrieved.	unsigned char	1 byte		Set/Get	○		
		0x00 to 0x63 (0 to 99) 0: current day 1 to 99: days ago							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Measured cumulative amount of active electric energy	0xE2	Indicates the unit used for the measured cumulative amount of active electric energy at the most recent measurement time using a maximum of 8 digits in decimal notation. Indicates the measurement date in 4 bytes, measurement time in 3 bytes, and cumulative amount of active electric energy in 4 bytes. – Measurement date YYYY:MM:DD – Measurement time hh:mm:ss – Cumulative amount of active electric energy Max. 8 digits in decimal notation 1st to 4th bytes: measurement date YYYY: 0x0001 to 0x270F (1 to 9999) MM: 0x01 to 0x0C (1 to 12) DD: 0x01 to 0x1F (1 to 31) 5th to 7th bytes: measurement time hh: 0x00 to 0x17 (0 to 23) mm: 0x00 to 0x3B (0 to 59) ss: 0x00 to 0x3B (0 to 59) 8th to 11th bytes: Cumulative amount of active electric energy 0x00000000 to 0x05F5E0FF (0 to 99 999 999)	unsigned short + unsigned char × 2 + unsigned char × 3 + unsigned long	11 bytes	year, month, day, hour, minute, second, and kWh	Get	○		

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Cumulative amounts of active electric energy at fixed time	0xE3	Indicates the most recent cumulative amount of active electric energy measured at 30-min intervals held by the meter with the measurement date in 4 bytes, measurement time in 3 bytes, and cumulative amount of active electric energy in 4 bytes. Measurement date YYYY:MM:DD Measurement time hh:mm:ss cumulative electric energy: an 8-digit decimal notation number 1st to 4th bytes: measurement date YYYY: 0x0001 to 0x270F (1 to 9999) MM: 0x01 to 0x0C (1 to 12) DD: 0x01 to 0x1F (1 to 31) 5th to 7th bytes: measurement time hh: 0x00 to 0x17 (0 to 23) mm: 0x00 to 0x3B (0 to 59) ss: 0x00 to 0x3B (0 to 59) 8th to 11th bytes: Cumulative amount of active electric energy 0x00000000 to 0x05F5E0FF (0 to 99 999 999)	unsigned short + unsigned char × 2 + unsigned char × 3 + unsigned long	11 bytes	year, month, day, hour, minute, second, and kWh	Get	○		

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Measurement data of cumulative amount of active electric energy for power factor measurement	0xE4	Indicates the measurement data of cumulative amount of active electric energy for power factor measurement at the most recent measurement time, with the measurement date in 4 bytes, measurement time in 3 bytes, and cumulative amount of active electric energy in 4 bytes. – Measurement date YYYY: MM: DD – Measurement time hh: mm: ss – Cumulative amount of active electric energy Max. 8 digits in decimal notation 1st to 4th bytes: measurement date YYYY: 0x0001 to 0x270F (1 to 9999) MM: 0x01 to 0x0C (1 to 12) DD: 0x01 to 0x1F (1 to 31) 5th to 7th bytes: measurement time hh: 0x00 to 0x17 (0 to 23) mm: 0x00 to 0x3B (0 to 59) ss: 0x00 to 0x3B (0 to 59) 8th to 11th bytes: Cumulative amount of active electric energy 0x00000000 to 0x05F5E0FF (0 to 99 999 999)	unsigned short + unsigned char × 2 + unsigned char × 3 + unsigned long	11 bytes	year, month, day, hour, minute, second, and kWh	Get			
Number of effective digits for cumulative amount of active electric energy	0xE5	Indicates the number of effective digits for cumulative amounts of active electric energy. 0x01 to 0x08 (1 to 8)	unsigned char	1 byte	digit	Get	○		

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Cumulative maximum electric power demand	0xC2	Indicates the cumulative value of meter readings for maximum electric power demand contractually fixed by the electric power company.	unsigned long	4 bytes	kW	Get			
		0x00000000 to 0x05F5E0FF (0 to 99 999 999)							
Electric power demand at fixed time (30-min average electric power)	0xC3	Indicates the meter reading for electric power demand (30-min average electric power) in the most recent half-hourly measurement time, with the measurement date in 4 bytes, measurement time in 3 bytes, and electric power demand (30-min average electric power) in 4 bytes. – Measurement date YYYY:MM:DD – Measurement time hh:mm:ss – Electric power demand Max. 8 digits in decimal notation 1 st to 4 th bytes: Measurement date YYYY: 0x0001 to 0x270F (1 to 9999) MM: 0x01 to 0x0C (1 to 12) DD: 0x01 to 0x1F (1 to 31) 5 th to 7 th bytes: Measurement time hh: 0x00 to 0x17 (0 to 23) mm: 0x00 to 0x3B (0 to 59) ss: 0x00 to 0x3B (0 to 59) 8 th to 11 th bytes: Electric power demand 0x00000000 to 0x05F5E0FF (0 to 99 999 999)	unsigned short + unsigned char × 2 + unsigned char × 3 + unsigned long	11 bytes	year, month, day, hour, minute, second, and kW	Get	○		
Number of effective digits of electric power demand	0xC4	Indicates the number of effective digits of electric power demand. 0x01 to 0x08 (1 to 8)	unsigned char	1 byte	digit	Get	○		

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Unit of cumulative maximum electric power demand	0xC7	Indicates the unit of cumulative maximum electric power demand.	unsigned char	1 byte		Get			
		0x00 : 1 kW 0x01 : 0,1 kW 0x02 : 0,01 kW 0x03 : 0,001 kW 0x04 : 0,000 1 kW 0x0A : 10 kW 0x0B : 100 kW 0x0C : 1 000 kW 0x0D : 10 000 kW							
Measurement data of reactive electric energy consumption (lag) for power factor measurement	0xCA	Indicates the measurement data of reactive electric energy consumption (lag) for power factor measurement at the most recent measurement time, with the measurement date in 4 bytes, measurement time in 3 bytes, and cumulative amount of reactive electric energy consumption in 4 bytes. – Measurement date YYYY:MM:DD – Measurement time hh:mm:ss – Cumulative amount of reactive electric energy consumption (lag) Max. 8 digits in decimal notation	unsigned short + unsigned char × 2 + unsigned char × 3 + unsigned long	11 bytes	year, month, day, hour, minute, second, and kWh	Get			
		1 st to 4 th bytes: Measurement date YYYY: 0x0001 to 0x270F (1 to 9999) MM: 0x01 to 0x0C (1 to 12) DD: 0x01 to 0x1F (1 to 31) 5 th to 7 th bytes: Measurement time hh: 0x00 to 0x17 (0 to 23) mm: 0x00 to 0x3B (0 to 59) ss: 0x00 to 0x3B (0 to 59) 8 th to 11 th bytes: Cumulative amount of reactive electric energy consumption (lag) 0x00000000 to 0x05F5E0FF (0 to 99 999 999)							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Measurement data of cumulative amount of reactive electric energy consumption (lag) at fixed time for power factor measurement	0xCB	Indicates the measurement data of cumulative amount of reactive electric energy for power factor measurement at the most recent half-hourly measurement time, with the measurement date in 4 bytes, measurement time in 3 bytes, and cumulative amount of reactive electric energy consumption in 4 bytes. – Measurement date YYYY:MM:DD – Measurement time hh:mm:ss – Cumulative amount of reactive electric energy consumption (lag) Max.8 digits in decimal notation 1st to 4th bytes: Measurement date YYYY: 0x0001 to 0x270F (1 to 9999) MM: 0x01 to 0x0C (1 to 12) DD: 0x01 to 0x1F (1 to 31) 5th to 7th bytes: Measurement time hh: 0x00 to 0x17 (0 to 23) mm: 0x00 to 0x3B (0 to 59) ss: 0x00 to 0x3B (0 to 59) 8th to 11th bytes: Cumulative amount of reactive electric energy consumption (lag) 0x00000000 to 0x05F5E0FF (0 to 99 999 999)	unsigned short + unsigned char × 2 + unsigned char × 3 + unsigned long	11 bytes	year, month, day, hour, minute, second, and kWh	Get			
Number of effective digits for measurement data of cumulative amount of reactive electric energy consumption (lag) for power factor measurement	0xCC	Indicates the number of effective digits of measured data of cumulative amount of reactive electric energy consumption (lag) for power factor measurement. 0x01 to 0x08 (1 to 8)	unsigned char	1 byte	digit	Get			

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Unit of measurement data of cumulative amount of reactive electric energy consumption (lag)	0xCD	Indicates the unit (multiplying factor) for measurement data of cumulative amount of reactive electric energy consumption (lag) and historical data.	unsigned char	1 byte		Get			
		0x00: 1 kVarh 0x01: 0,1 kVarh 0x02: 0,01 kVarh 0x03: 0,001 kVarh 0x04: 0,000 1 kVarh 0x0A: 10 kVarh 0x0B: 100 kVarh 0x0C: 1 000 kVarh 0x0D: 10 000 kVarh							
Historical data of measurement data of cumulative amount of reactive electric energy consumption (lag) for power factor measurement	0xCE	Indicates historical data for cumulative amount of reactive electric energy consumption (lag) measurements at fixed time on the day specified under "Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved", equalling 48 pieces of half-hourly data for 24 h (00:00 to 23:30) of the day by time series from the highest-order byte.	unsigned short + unsigned long × 48	194 bytes	kVarh	Get			
		1 st to 2 nd bytes: Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved 0x0000 to 0x0063 (0 to 99) 3 rd and succeeding bytes: measurement data of cumulative amount of reactive electric energy consumption (lag) 0x00000000 to 0x05F5E0FF (0 to 99 999 999)							

This class is used in the case of smart electric energy meters installed for users supplied with power of 6,6 kV.

In the case of smart electric energy meters installed for users supplied with 400 V or less, the low-voltage smart electric energy meter class (Class group code: 0x02, Class code: 0x88) shall be used.

9.41.2 Operation status property

This property indicates whether the functions specific to this class are operating (ON) or not (OFF). In the case of a node in which this class is implemented and the functions specific to this class start operating upon start-up of the node, this property may be implemented with the value fixed at 0x30 (operation status ON).

9.41.3 Coefficient property

This property indicates the coefficient in 6-digit decimal notation. The coefficient multiplied by the multiplying factor for the coefficient shall be used as the value for converting meter readings to actually used kWh, kVarh or kW.

9.41.4 Multiplying factor for coefficient property

This property indicates the multiplying factor for the coefficient. Meter readings can be converted to actually used kWh, kVarh or kW by multiplying by the coefficient and the multiplying factor for the coefficient.

With a 6,6 kV supply, meters cannot be connected directly to power supply circuits. In such cases, electric energy and others are measured by means of a voltage transformer (VT) and current transformer (CT). Meter readings taken using a voltage transformer and current transformer are converted to primary side measured values representing actual usage, etc., by multiplying by the coefficient and the multiplying factor for the coefficient.

EXAMPLE

Coefficient = 0x00000001 (1)

Multiplying factor for coefficient = 0x01 (1)

Measured cumulative amount of active electric energy (EPC=0xE2): 0x00BC614E (12 345 678)

Unit for cumulative amounts of active electric energy (EPC=0xE6): 0x01 (0,1 kWh)

In this case, the primary side measured value (actual usage) will be:

Measured cumulative amount of active electric energy × coefficient × multiplying factor for coefficient × Unit for cumulative amounts of active electric energy
 $= 12\,345\,678 \times 1 \times 1 \times 0,1 \text{ kWh} = 1\,234\,567,8 \text{ kWh}$

9.41.5 Fixed date property

This property indicates the fixed date of monthly usage, etc., as 0x01 to 0x1F (1 to 31). If the fixed date is the 10th, the value will be 0x0A (10).

9.41.6 Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved property

This property specifies the Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved (EPC = 0xE7, 0xC6, 0xCE). The value range shall be from 0x00 to 0x63 (from 0 to 99).

- 0x00 (0): measured historical data for the current day (up to the last hour)
- 0x63 (99): measured historical data for the day that precedes the current day by 99 days

The default values of this property shall be 0xFF.

9.41.7 Measured cumulative amount of active electric energy property

This property indicates the measured cumulative amount of active electric energy in the order of measurement date in 4 bytes, measurement time in 3 bytes, and cumulative amount of active electric energy in 4 bytes. The measurement date is indicated using 2 bytes for the year, 1 byte for the month, and 1 byte for the day. The measurement time is indicated using 1 byte for hours, 1 byte for minutes, and 1 byte for seconds. If the meter does not have information on seconds as a unit of measured time, 0x00 is set for seconds. The cumulative amount of active electric energy is indicated using a maximum of 8 digits in decimal notation, with units indicated by property values of the unit for cumulative amounts of active electric energy (EPC = 0xE6). Measurements are multiplied by the coefficient (EPC = 0xD3) and multiplying factor for coefficient (EPC = 0xD4) to produce the actual usage.

The property value range shall be 0x00000000 to 0x05F5E0FF (0 to 99 999 999). If the cumulative amount of active electric energy exceeds the number of effective digits specified under "Number of effective digits for cumulative amount of active electric energy" (EPC = 0xE5), the number shall be incremented again from 0x00000000 (0). The value shall be set to 0xFFFFFFFF (no measured data) in the case of no cumulative amount of active electric energy.

EXAMPLE

Measured cumulative amount of active electric energy = 0x00BC614E (12 345 678)

Coefficient (EPC = 0xD3): 0x00000001 (1)

Multiplying factor for coefficient (EPC = 0xD4): 0x01 (1)

Unit for cumulative amounts of active electric energy (EPC = 0xE6): 0x01 (0,1 kWh)

In this case, the primary side measured value (actual usage) will be:

Measured cumulative amount of active electric energy × coefficient × multiplying factor for multiple × unit for cumulative amounts of active electric energy
 = 12 345 678 × 1 × 1 × 0,1 kWh = 1 234 567,8 kWh

9.41.8 Cumulative amounts of active electric energy at fixed time property

This property indicates cumulative amounts of active electric energy measured at 30-min intervals (every hour on the hour and on the half hour). This property indicates the cumulative amount of active electric energy at the most recent scheduled measurement time retained by the meter, in the order of measurement date in 4 bytes, measurement time in 3 bytes, and cumulative amount of active electric energy in 4 bytes. The measurement date is indicated using 2 bytes for the year, 1 byte for the month, and 1 byte for the day. The measurement time is indicated using 1 byte for hours, 1 byte for minutes, and 1 byte for seconds. If the meter does not have information on seconds as a unit of measured time, 0x00 is set for seconds. The cumulative amount of active electric energy is indicated using a maximum of 8 digits in decimal notation, with units indicated by property values of the unit for cumulative amounts of active electric energy (EPC = 0xE6). Measurements are multiplied by the coefficient (EPC = 0xD3) and multiplying factor for coefficient (EPC = 0xD4) to produce the actual usage.

The property value range shall be 0x00000000 to 0x05F5E0FF (0 to 99 999 999). If the cumulative amount of active electric energy exceeds the number of effective digits specified under "Number of effective digits for cumulative amount of active electric energy" (EPC = 0xE5), the number shall be incremented again from 0x00000000 (0). The value shall be set to 0xFFFFFFFF (no measured data) in the case of no cumulative amount of active electric energy.

EXAMPLE

Cumulative amounts of active electric energy at fixed time

YYYY = 0x07DE (2014), MM = 0x04 (April), DD = 0x01 (1st)

hh = 0x0A (hour:10), mm = 0x1E (minute:30), ss = 0x00 (second:00)

Cumulative amount of active electric energy = 0x00BC614E (12 345 678)

Coefficient (EPC = 0xD3): 0x00000001 (1)

Multiplying factor for coefficient (EPC = 0xD4): 0x01 (1)

Unit for cumulative amounts of active electric energy (EPC = 0xE6): 0x01 (0,1 kWh)

In this case,

Measurement date: April 1, 2014

Measurement time: 10:30:00

Cumulative amount of active electric energy (primary side measured value (actual usage)):

Cumulative amounts of active electric energy at fixed time × coefficient × multiplying factor for coefficient × unit for cumulative amounts of active electric energy
 = 12 345 678 × 1 × 1 × 0,1 kWh = 1 234 567,8 kWh.

9.41.9 Measurement data of cumulative amount of active electric energy for power factor measurement

This property indicates the measurement data of cumulative amounts of active electric energy for power factor measurement, in the order of measurement date in 4 bytes, measurement time in 3 bytes, and cumulative amount of active electric energy in 4 bytes. The measurement date is indicated using 2 bytes for the year, 1 byte for the month, and 1 byte for the day. The measurement time is indicated using 1 byte for hours, 1 byte for minutes, and 1 byte for seconds. If the meter does not have information on seconds as a unit of measured time, 0x00 is set for seconds. The cumulative amount of active electric energy is indicated using a maximum of 8 digits in decimal notation, with units indicated by property values of the unit for cumulative amounts of active electric energy (EPC = 0xE6). Measurements are multiplied by the coefficient (EPC = 0xD3) and multiplying factor for coefficient (EPC = 0xD4) to produce the actual usage. "Measurement data of cumulative amount of active electric energy for power factor measurement" is the cumulative amount of active electric energy in daytime (e.g., 8:00 to 22:00 in a day).

The property value range shall be 0x00000000 to 0x05F5E0FF (0 to 99 999 999). If the cumulative amount of active electric energy exceeds the number of effective digits specified under "Number of effective digits for cumulative amount of active electric energy" (EPC = 0xE5), the number shall be incremented again from 0x00000000 (0). The value shall be set to 0xFFFFFFFF (no measured data) in the case of no cumulative amount of active electric energy.

EXAMPLE

Measurement data of cumulative amount of active electric energy for power factor measurement= 0x00BC614E (12 345 678)

Coefficient (EPC = 0xD3): 0x00000001 (1)

Multiplying factor for coefficient (EPC = 0xD4): 0x01 (1)

Unit for cumulative amounts of active electric energy (EPC = 0xE6): 0x01 (0,1 kWh)

In this case, the primary side measured value (actual usage) will be:

Measurement data of cumulative amount of active electric energy for power factor measurement × coefficient × multiplying factor for coefficient × unit for cumulative amounts of active electric energy
 = 12 345 678 × 1 × 1 × 0,1 kWh = 1 234 567,8 kWh.

9.41.10 Number of effective digits for cumulative amount of active electric energy property

This property indicates the number of effective digits (effective digit count) for the data size of measured cumulative amounts of active electric energy (4 bytes: as a digit count, 8 digits), from the lower order side within these.

EXAMPLE

Number of effective digits for cumulative amount of active electric energy is 0x06 (6 digits from the lower order side).

Cumulative amount of active electric energy overflows at 0x000F423F (999 999), and increments again from 0x00000000 (0).

9.41.11 Unit for cumulative amounts of active electric energy property

This property indicates units of measured cumulative amounts of active electric energy and historical data.

Property values	Unit for cumulative amounts of active electric energy (multiplying factor)
0x00	1 kWh
0x01	0,1 kWh
0x02	0,01 kWh
0x03	0,001 kWh
0x04	0,000 1 kWh
0x0A	10 kWh
0x0B	100 kWh
0x0C	1 000 kWh
0x0D	10 000 kWh

9.41.12 Historical data of measured cumulative amount of active electric energy property

This property indicates the historical data of measured cumulative amounts of active electric energy on the retrieval day specified under "Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved" (Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved 1 (EPC = 0xE1) indicated in 2 bytes), equalling 48 pieces of half-hourly data for 24 h (00:00 to 23:30) of the day by time series from the highest-order byte. The cumulative amount of active electric energy is indicated in a maximum of 8 digits in decimal notation, with units indicated by property values of the unit for cumulative amounts of active electric energy (EPC = 0xE6). Measurements are multiplied by the coefficient (EPC = 0xD3) and multiplying factor for coefficient (EPC = 0xD4) to produce the actual usage.

The property value range shall be 0x00000000 to 0x05F5E0FF (0 to 99 999 999). If the cumulative amount of active electric energy exceeds the number of effective digits specified under "Number of effective digits for cumulative amount of active electric energy" (EPC = 0xE5), the number shall be incremented again from 0x00000000 (0). The value shall be set to 0xFFFFFFFF (no measured data) in the case of no cumulative amount of active electric energy at the time in question.

In the case of default values with no "Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved" (EPC = 0xE1) set, the day for which the historical data of measured cumulative amounts of electric energy is to be retrieved shall be set to 0x00FF and all half-hourly measurements of cumulative amounts of active electric energy shall be set to 0xFFFFFFFF.

9.41.13 Monthly maximum electric power demand property

This property indicates the maximum value of meter readings for electric power demand recorded every hour on the hour and on the half hour between the date of the last fixed reading and the most recent measurement time.

Monthly maximum electric power demand is indicated using a maximum of 8 digits in decimal notation, with units indicated by property values of the unit of electric power demand (EPC = 0xC5). Measurements are multiplied by the coefficient (EPC = 0xD3) and multiplying factor for coefficient (EPC = 0xD4) to produce the actual usage. The property value range shall be 0x00000000 to 0x05F5E0FF (0 to 99 999 999). The value shall be set to 0xFFFFFFFF (no measured data) in the case of no monthly maximum electric power demand.

EXAMPLE

Monthly maximum electric power demand = 0x00BC614E (12 345 678)

Coefficient (EPC = 0xD3): 0x00000001 (1)

Multiplying factor for coefficient (EPC = 0xD4): 0x01 (1)

Unit of electric power demand (EPC = 0xC5): 0x01 (0,1 kW)

In this case, the primary side measured value (actual usage) will be:

Monthly maximum electric power demand × coefficient × multiplying factor for coefficient × unit of electric power demand = $12\,345\,678 \times 1 \times 1 \times 0,1 \text{ kW} = 1\,234\,567,8 \text{ kW}$

9.41.14 Cumulative maximum electric power demand property

This property indicates the cumulative value of meter readings for maximum electric power demand contractually fixed by the electric power company.

Cumulative maximum electric power demand is indicated using a maximum of 8 digits in decimal notation, with units indicated by property values of the unit of electric power demand (EPC = 0xC5). Measurements are multiplied by the coefficient (EPC = 0xD3) and multiplying factor for coefficient (EPC = 0xD4) to produce the actual usage. The property value range shall be 0x00000000 to 0x05F5E0FF (0 to 99 999 999). If the cumulative maximum electric power demand exceeds the number of effective digits specified under "Number of effective digits of electric power demand" (EPC = 0xC4), the number shall be incremented again from 0x00000000 (0). The value shall be set to 0xFFFFFFFF (no measured data) in the case of no cumulative maximum electric power demand.

EXAMPLE

Cumulative maximum electric power demand = 0x00BC614E (12 345 678)

Coefficient (EPC = 0xD3): 0x00000001 (1)

Multiplying factor for coefficient (EPC = 0xD4): 0x01 (1)

Unit of electric power demand (EPC = 0xC5): 0x01 (0,1 kW)

In this case, measurements of the primary side (actual usage) will be:

Cumulative maximum electric power demand × coefficient × multiplying factor for coefficient multiple × unit of electric power demand = $12\,345\,678 \times 1 \times 1 \times 0,1 \text{ kW} = 1\,234\,567,8 \text{ kW}$.

9.41.15 Electric power demand at fixed time (30-min average electric power) property

Of meter readings for electric power demand (30-min average electric power) every 30 min at 00 min and 30 min past the hour, this property indicates electric power demand at the most recent scheduled measurement time retained by the meter, in the order of measurement date in 4 bytes, measurement time in 3 bytes, and electric power demand 4 bytes. The measurement date is indicated using 2 bytes for the year, 1 byte for the month, and 1 byte for the day. The measurement time is indicated using 1 byte for hours, 1 byte for minutes, and 1 byte for seconds. If the meter does not have information on seconds as a unit of measured time, 0x00 is set for seconds. Electric power demand is indicated using a maximum of 8 digits in decimal notation, with units indicated by property values of the unit of electric power demand (EPC = 0xC5). Measurements are multiplied by the coefficient (EPC = 0xD3) and multiplying factor for coefficient (EPC = 0xD4) to produce the actual usage. The property value range shall be 0x00000000 to 0x05F5E0FF (0 to 99 999 999). The value shall be set to 0xFFFFFFFF (no measured data) in the case of no electric power demand.

EXAMPLE

Electric power demand at fixed time (30-min average electric power)

YYYY = 0x07DE (2014), MM = 0x04 (April), DD = 0x01 (1st)

hh = 0x0A (hour:10), mm = 0x1E (minute:30), ss = 0x00 (second:00)

Electric power demand = 0x00BC614E (12 345 678)

Coefficient (EPC = 0xD3): 0x00000001 (1)

Multiplying factor for coefficient (EPC = 0xD4): 0x01 (1)

Unit of electric power demand (EPC = 0xC5): 0x01 (0,1 kW)

In this case,

Measurement date April 1, 2014

Measurement time 10:30:00

Electric power demand (30-min average electric power) (primary side measured value (actual usage)):

Electric power demand at fixed time (30-min average electric power) × coefficient × multiplying factor for coefficient × unit of electric power demand = $12\,345\,678 \times 1 \times 1 \times 0,1 \text{ kW} = 1\,234\,567,8 \text{ kW}$

9.41.16 Number of effective digits of electric power demand property

This property indicates the number of effective digits (effective digit count) for the data size of monthly maximum electric power demand, cumulative maximum electric power demand, and electric power demand (30-min average electric power) (4 bytes: as a digit count, 8 digits), from the lower order side within these.

EXAMPLE

Number of effective digits for electric power demand 0x06 (6 digits from the lower order side)

Cumulative maximum electric power demand overflows at 0x000F423F (999 999) and increments again from 0x00000000 (0).

9.41.17 Unit of electric power demand property

This property indicates units of monthly maximum electric power demand, cumulative maximum electric power demand, and electric power demand at fixed time (30-min average electric power).

Property values	Unit of measured electric power demand (multiple)
0x00	1 kW
0x01	0,1 kW
0x02	0,01 kW

0x03	0,001 kW
0x04	0,000 1 kW
0x0A	10 kW
0x0B	100 kW
0x0C	1 000 kW
0x0D	10 000 kW

9.41.18 Historical data of measured electric power demand property

This property indicates the day of historical data retrieval 0x0000 to 0x0063 (0 to 99) specified under "Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved" (EPC = 0xE1) (Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved 1 (EPC = 0xE1) indicated in 2 bytes), and meter readings for scheduled electric power demand (30-min average electric power) every 30 min at 00 min and 30 min past every hour for 24 h (00:00 to 23:30) of the day, equalling 48 pieces of historical data, representing property values by time series from the highest-order byte.

Electric power demand is indicated using a maximum 8-digit decimal notation number, with units indicated by property values of the unit of electric power demand (EPC = 0xC5). Measurements are multiplied by the coefficient (EPC = 0xD3) and multiplying factor for coefficient (EPC = 0xD4) to produce the actual usage.

The property value range shall be 0x00000000 to 0x05F5E0FF (0 to 99 999 999). The value shall be set to 0xFFFFFFFF (no measured data) in the case of no electric power demand at the time in question.

In the case of default values with no "Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved" (EPC = 0xE1) set, the day for which the historical data of measured cumulative amounts of electric energy is to be retrieved shall be set to 0x00FF and electric power demand every 30 min at fixed time (30-min average electric power) shall be set to 0xFFFFFFFF.

9.41.19 Unit of cumulative maximum electric power demand property

This property indicates units of cumulative maximum electric power demand.

Property value	Unit of measured electric power demand (multiple)
0x00	1 kW
0x01	0,1 kW
0x02	0,01 kW
0x03	0,001 kW
0x04	0,000 1 kW
0x0A	10 kW
0x0B	100 kW
0x0C	1 000 kW
0x0D	10 000 kW

9.41.20 Measurement data of reactive electric energy consumption (lag) for power factor measurement property

This property indicates measurement data of reactive electric energy consumption (lag) for power factor measurement, in the order of measurement date in 4 bytes, measurement time in 3 bytes, and cumulative amount of reactive electric energy consumption in 4 bytes. The measurement date is indicated using 2 bytes for the year, 1 byte for the month, and 1 byte for the day. The measurement time is indicated using 1 byte for hours, 1 byte for minutes, and 1 byte for seconds. If the meter does not have information on seconds as a unit of measured time, 0x00 is set for seconds. Reactive electric energy consumption is indicated using a maximum 8-digit decimal notation number, with units indicated by the property values of unit of measurement data for cumulative amount of reactive electric energy consumption (lag) (EPC = 0xCD). Measurements are multiplied by the coefficient (EPC = 0xD3) and multiplying factor for coefficient (EPC = 0xD4) to produce the actual usage. "Measurement data of reactive electric energy consumption (lag) for power factor measurement" is the cumulative amount of reactive electric energy in daytime (e.g., 8:00 to 22:00 in a day).

The property value range shall be 0x00000000 to 0x05F5E0FF (0 to 99 999 999). If the cumulative amount of reactive electric energy consumption exceeds the number of effective digits specified under "Number of effective digits for measurement data of cumulative amount of reactive electric energy consumption (lag) for power factor measurement" (EPC = 0xCC), the number shall be incremented again from 0x00000000 (0). The value shall be set to 0xFFFFFFFF (no measured data) in the case of no measurement data of cumulative amount of reactive electric energy consumption (lag) for power factor measurement.

EXAMPLE

Measurement data of cumulative amount of reactive electric energy consumption (lag) for power factor measurement = 0x00BC614E (12 345 678)

Coefficient (EPC = 0xD3): 0x00000001 (1)

Multiplying factor for coefficient (EPC = 0xD4): 0x01 (1)

Unit of measurement data for cumulative amount of reactive electric energy consumption (lag) (EPC = 0xCD): 0x01 (0,1 kVarh)

In this case, the primary side measured value (actual usage) will be:

measurement data of cumulative amount of reactive electric energy consumption (lag) for power factor measurement × coefficient × multiplying factor for coefficient × unit of measurement data for cumulative amount of reactive electric energy consumption (lag) = $12\,345\,678 \times 1 \times 1 \times 0,1 \text{ kVarh} = 1\,234\,567,8 \text{ kVarh}$

9.41.21 Measurement data of cumulative amount of reactive electric energy consumption (lag) at fixed time for power factor measurement property

Measurement data of cumulative amount of reactive electric energy consumption (lag) at fixed time for power factor measurement every 30 min at 00 min and 30 min past the hour, this property indicates measurement data of cumulative amount of reactive electric energy consumption (lag) for power factor measurement at the most recent scheduled measurement time retained by the meter, in the order of measurement date in 4 bytes, measurement time in 3 bytes, and cumulative amount of reactive electric energy consumption in 4 bytes. The measurement date is indicated using 2 bytes for the year, 1 byte for the month, and 1 byte for the day. The measurement time is indicated using 1 byte for hours, 1 byte for minutes, and 1 byte for seconds. If the meter does not have information on seconds as a unit of measured time, 0x00 is set for seconds. The cumulative amount of reactive electric energy consumption is indicated using a maximum 8-digit number in decimal notation, with units indicated by the property values of unit of measurement data of cumulative amount of reactive electric energy consumption (lag) for power factor measurement (EPC = 0xCD). Measurements are multiplied by the coefficient (EPC = 0xD3) and multiplying factor for coefficient (EPC = 0xD4) to produce the actual usage.

The property value range shall be 0x00000000 to 0x05F5E0FF (0 to 99 999 999). If the cumulative amount of reactive electric energy consumption exceeds the number of effective digits specified under "Number of effective digits for measurement data of cumulative amount of reactive electric energy consumption (lag) for power factor measurement" (EPC = 0xCC), the number shall be incremented again from 0x00000000 (0). The value shall be set to 0xFFFFFFFF (no measured data) in the case of no cumulative amount of reactive electric energy consumption (lag) for power factor measurement.

EXAMPLE

Measurement data of reactive electric energy consumption (lag) at fixed time

YYYY = 0x07DE (2014), MM = 0x04 (April), DD = 0x01 (1st)

hh = 0x0A (hour:10), mm = 0x1E (minute:30), ss = 0x00 (second:00)

Cumulative amount of reactive electric energy consumption (lag) = 0x00BC614E (12 345 678)

Coefficient (EPC = 0xD3): 0x00000001 (1)

Multiplying factor for coefficient (EPC = 0xD4): 0x01 (1)

Unit of measurement data of cumulative amount of reactive electric energy consumption (lag) for power factor measurement (EPC = 0xCD): 0x01 (0,1 kWh)

In this case,

Measurement date April 1, 2014

Measurement time 10:30:00

Cumulative amount of reactive electric energy consumption (lag) (primary side measured value (actual usage):

Measurement data of reactive electric energy consumption (lag) at fixed time × coefficient × multiplying factor for coefficient × unit of measurement data of cumulative amount of reactive electric energy consumption (lag) for power factor measurement = 12 345 678 × 1 × 1 × 0,1 kVarh = 1 234 567,8 kVarh

9.41.22 Number of effective digits for measurement data of cumulative amount of reactive electric energy consumption (lag) for power factor measurement property

This property indicates the number of effective digits (effective digit count) for the data size of measurement data of cumulative amount of reactive electric energy consumption (lag) (4 bytes: as a digit count, 8 digits), from the lower order side within these.

EXAMPLE

Number of effective digits for cumulative amount of reactive electric energy consumption (lag) for power factor measurement 0x06 (6 digits from the lower order side).

Cumulative amount of reactive electric energy consumption (lag) for power factor measurement overflows at 0x000F423F (999 999) and increments again from 0x00000000 (0).

9.41.23 Unit of measurement data of cumulative amount of reactive electric energy consumption (lag) property

This property indicates units of measurement data of cumulative amount of reactive electric energy consumption (lag).

Property values Unit of measurement data of cumulative amount of reactive electric energy consumption (lag) for power factor measurement (multiple)

0x01	0,1 kVarh
0x02	0,01 kVarh
0x03	0,001 kVarh
0x04	0,000 1 kVarh
0x0A	10 kVarh

0x0B	100 kVarh
0x0C	1 000 kVarh
0x0D	10 000 kVarh

9.41.24 Historical data of measurement data of cumulative amount of reactive electric energy consumption (lag) for power factor measurement property

This property indicates the day for which the historical data of measured 0x0000 to 0x0063 (0 to 99) specified under "Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved" (EPC = 0xE1) (Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved 1 (EPC = 0xE1) indicated in 2 bytes) and measured data for cumulative amount of reactive electric energy consumption (lag) every 30 min at 00 min and 30 min past every hour, for 24 h (00:00 to 23:30) of the day, equalling 48 pieces of historical data, representing property values by time series from the highest-order byte.

The cumulative amount of reactive electric energy consumption (lag) is indicated using a maximum 8-digit number in decimal notation. Units are indicated by the property values of the unit of measurement data of cumulative amount of reactive electric energy consumption (lag) (EPC = 0xCD). Measurements are multiplied by the coefficient (EPC = 0xD3) and multiplying factor for coefficient (EPC = 0xD4) to produce the actual usage.

The property value range shall be 0x00000000 to 0x05F5E0FF (0 to 99 999 999). If the cumulative amount of reactive electric energy consumption exceeds the number of effective digits specified under "Number of effective digits for measurement data of cumulative amount of reactive electric energy consumption (lag) for power factor measurement" (EPC = 0xCC), the number shall be incremented again from 0x00000000 (0). The value shall be set to 0xFFFFFFFF (no measured data) in the case of no cumulative amount of reactive electric energy consumption (lag) at the time in question.

In the case of default values with no "Day for which the historical data of measured cumulative amounts of electric energy shall be retrieved" (EPC = 0xE1) set, the day for which the historical data of measured cumulative amounts of electric energy is to be retrieved shall be set to 0x00FF and cumulative amount of reactive electric energy consumption (lag) every 30 min shall be set to 0xFFFFFFFF.

9.42 Kerosene meter class specifications

9.42.1 General

The control commands of "kerosene meter" are shown in Table 62.

Class group code	: 0x02
Class code	: 0x8B

Table 62 – List of kerosene meter properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	–	Set		○	
		ON = 0x30, OFF = 0x31				Get	○		
Measured cumulative amount of kerosene consumption	0xE0	Indicates the cumulative amount of kerosene consumption in 0,1 litres.	unsigned long	4 bytes	0,1 litre	Get	○		
		0x00000000 to 0x3B9AC9FF (0 litres to 99 999 999,9 litres)							
History of measured cumulative amounts of kerosene consumption	0xE2	Indicates the history of measured results of cumulative amounts of kerosene consumption for the past 24 h in 30-min sections.	unsigned long × 48	192 bytes	0,1 litre	Get			
		0x00000000 to 0x3B9AC9FF (0 litres to 99 999 999,9 litres)							

9.42.2 Operation status property

This property indicates whether the functions specific to this class are operating (ON) or not (OFF). In the case of a node in which this class is implemented and the functions specific to this class start operating upon start-up of the node, this property may be implemented with the value fixed at 0x30 (operation status ON).

9.42.3 Measured cumulative amount of kerosene consumption property

This property indicates the cumulative amount of kerosene consumption in increments of 0,1 litres. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 litres to 99 999 999,9 litres). When the cumulative amount of kerosene consumption overflows, the property value shall be incremented again from 0x00000000.

9.42.4 History of measured cumulative amounts of kerosene consumption property

This property indicates the history of measured results of cumulative amounts of kerosene consumption (0,1 litres) for the past 24 h in 30-min sections. For the measured cumulative amounts of kerosene consumption for every 30 min, the measured value in 0,1 litres at each 00 min and 30 min past the hour based on the time set in the property name "Current time setting" (EPC = 0x97) shall be indicated in the range from 0x00000000 to 0x3B9AC9FF (0 to 99 999 999,9 litres). The property value shall begin with the high-order byte in time series. 0xFFFFFFFF shall be used in relation to time data in the history of measured values when measurements were not made.

9.43 Smart kerosene meter class specifications

9.43.1 General

The control commands of "smart kerosene meter" are shown in Table 63.

Class group code : 0x02

Class code : 0x8C

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Security data information	0xE7	Provides safety information detected by the meter in the form of security data defined by bit assignment.	unsigned char × 10	10 bytes	–	Get			
		For details, see 9.43.9							
Residual volume control warning level	0xE8	Indicates a warning where residual volume is very small. Residual volume control warning level 1 0x31 Residual volume control warning level 2 0x32 Residual volume control warning level 3 0x33 No residual volume control warning 0x42	unsigned char	1 byte	–	Get		○	
Residual volume control warning level 1	0xEA	Sets "Residual volume control warning level 1". 0 to 0xFFFFFFFF (0 to 16 777 215)	unsigned char × 3	3 bytes	l	Set/Get			
Residual volume control warning level 2	0xEB	Sets "Residual volume control warning level 2". 0 to 0xFFFFFFFF (0 to 16 777 215)	unsigned char × 3	3 bytes	l	Set/Get			
Residual volume control warning level 3	0xEC	Sets "Residual volume control warning level 3". 0 to 0xFFFFFFFF (0 to 16 777 215)	unsigned char × 3	3 bytes	l	Set/Get			
Slight leak timer value (kerosene flow rate continuation)	0xED	Indicates the number of days on which kerosene flow rate is continued. 0 to 0xFD (0 days to 253 days)	unsigned char	1 byte	Day	Get			
ID number setting	0xEE	Indicates the ID number of the meter. 000000 to FFFFFFFF (Initial value: "000000")	unsigned char	6 bytes		Set/Get			
Verification expiration setting	0xEF	Indicates the month and year in which the verification of the meter will expire. YYYYMM YYYY (Year), MM (Month)	unsigned char	6 bytes		Set/Get			

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Measured cumulative kerosene consumption information with date and time	0xD0	Indicates the cumulative kerosene consumption and the date and time of measurement. • Date of measurement: YYYY:MM:DD • Time of measurement: HH:MM:SS • Cumulative kerosene consumption: 9 digits 1st to 4th bytes: 0 to 0x270F: 1 to 0x0C: 1 to 0x1F (= 0 to 9999): (= 1 to 12): (= 1 to 31) 5th to 7th bytes: 0 to 0x17: 0 to 0x3B: 0 to 0x3B (= 0 to 23): (= 0 to 59): (= 0 to 59) 8th to 11th bytes: 0x00000000 to 0x3B9AC9FF (0 to 999 999 999)	unsigned char × 4 + unsigned char × 3 + unsigned long	11 bytes	Date + Time + 0,001 l	Get	○ ^a		

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Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Historical information of cumulative kerosene consumption	0xD1	Indicates the historical information of kerosene consumption, the date and time of history start, index value at history start and cumulative time interval • Date: YYYY:MM:DD • Time: HH:MM:SS • Historical data of kerosene consumption • Cumulative kerosene consumption at history start • Cumulative time interval (5 digits, every minute)	unsigned char × 4 + unsigned char × 3 + unsigned long × 24 + unsigned long + unsigned short	109 bytes	Date + Time + 0,001 l + 0,001 l + Minute	Get			
		1 st to 4 th bytes: 0 to 0x270F: 1 to 0x0C: 1 to 0x1F (= 0 to 9999): (= 1 to 12): (= 1 to 31) 5 th to 7 th bytes: 0 to 0x17: 0 to 0x3B: 0 to 0x3B (= 0 to 23): (= 0 to 59): (= 0 to 59) 8 th to 103 rd bytes: 0x00000000 to 0x0001869F × 24) (0 l to 99,999 l) × 24 104 th to 107 th bytes: 0x00000000 to 0x3B9AC9FF (0 to 999 999 999) 108 to 109 th bytes: 0x0001 to 0xFFFF (1 to 65 535)							
^a EPC of 0xE2 (measured cumulative kerosene consumption) or 0xD0 (measured cumulative kerosene consumption information with date and time) is required.									

9.43.2 Operation status property

This property indicates whether the function native to this class is operating or not (ON/OFF). In the node mounting this class, if the function of this class is started concurrently with the start of node operation, this property may be implemented at a fixed value of 0x30 (Operation status ON).

9.43.3 Owner category setting property

This property sets the owner of the device as an owner category.

9.43.4 Measured cumulative kerosene consumption property

This property indicates the cumulative amount of kerosene consumption in a 9-digit decimal notation. Units are indicated based on the property value for Units for measured cumulative kerosene consumption (EPC = 0xE3).

When the Units for measured cumulative kerosene consumption (multiplying factor in relation to the measured cumulative kerosene consumption) is 0x00, the unit is 1 l; when it is 0x01, the unit is 0,1 l; when it is 0x02, the unit is 0,01 l; when it is 0x03, the unit is 0,001 l; when it is 0x04, the unit is 0,000 1 l; when it is 0x05, the unit is 0,000 01 l; and when it is 0x06, the unit is 0,000 001 l.

The property value range shall be 0x00000000 to 3B9AC9FF (0 to 999 999 999), and when the cumulative amount of kerosene consumption overflows, the property value shall be incremented again from 0x00000000.

EXAMPLE

When the measured cumulative kerosene consumption is 123 456 789, and the units for measured cumulative kerosene consumption is (0x03):

$$123\,456\,789 \times 0,001\,l = 123\,456,789\,l \text{ (actual measured value)}$$

Overflow: Incremented again from 0x00000000

No data: 0xFFFFFFFF

9.43.5 Units for measured cumulative kerosene consumption property

This property indicates the units for the measured cumulative kerosene consumption.

Property value	Cumulative kerosene consumption (multiplying factor)
0x00	1 l
0x01	0,1 l
0x02	0,01 l
0x03	0,001 l
0x04	0,000 1 l
0x05	0,000 01 l
0x06	0,000 001 l

9.43.6 Historical information of cumulative kerosene consumption property

The data 0x00 to 0x63 (0 to 99) set for Collection date setting for history of cumulative kerosene consumption (EPC = 0x05), and the cumulative kerosene consumption (0,001 l) on the set collection date of history of cumulative kerosene consumption are expressed in the form of data over the past 24 h in 30-min sections. The measured cumulative amount of kerosene consumption for every 30 min is the measured value in 0,001 l at each 00 min and 30 min past the hour based on the time set in the property name "Current time setting" (EPC = 0x97) and is indicated in the range from 0x00000000 to 0x3B9AC9FF (0 l to 999 999,999 l). The property value shall begin with the high-order byte in time series.

9.43.7 Collection date setting for history of cumulative kerosene consumption property

The date on which historical information of cumulative kerosene consumption is summoned is set within a range from 0x00 to 0x63 (0 to 99).

- 0x00 (0) represents data for the current day (up to previous time limit value)
- 0x63 (99) represents data from 99 days ago

If there is no corresponding data, set 0xFF for the cumulative history collection date in Historical information of cumulative kerosene consumption (EPC = 0xE4), and set 0xFFFFFFFF for all the 30-min values.

9.43.8 Meter reading data abnormality detection status property

This property indicates a status where an abnormality was detected in the meter reading data. 0x41 is used when an abnormality is detected, and 0x42 is used when no abnormality is detected.

9.43.9 Security data information property

This property provides security information about the abnormal states detected by the meter in the form of security data that identifies the abnormal states by means of bit assignment as shown in Table 64.

Table 64 – bit assignment for security data

	Char1	Char2	Char3	Char4	Char5	• • •	Char10
Bit1	Arr01	Arr09	Arr17	Arr25	Arr33		Arr73
Bit2	Arr02	Arr10	Arr18	Arr26	Arr34		Arr74
Bit3	Arr03	Arr11	Arr19	Arr27	Arr35		Arr75
Bit4	Arr04	Arr12	Arr20	Arr28	Arr36		Arr76
Bit5	Arr05	Arr13	Arr21	Arr29	Arr37		Arr77
Bit6	Arr06	Arr14	Arr22	Arr30	Arr38		Arr78
Bit7	Arr07	Arr15	Arr23	Arr31	Arr39		Arr79
Bit8	Arr08	Arr16	Arr24	Arr32	Arr40		Arr80

9.43.10 Residual volume control warning level property

Issues a warning to indicate that the residual volume is very small. The value 0x31 indicates residual volume control warning level 1. The value 0x32 indicates residual volume control warning level 2. The value 0x33 indicates residual volume control warning level 3. The value 0x42 indicates that no residual volume control warning is issued. When the residual volume decreases below a residual volume control warning level setting (the property value for the set value of residual volume control warning level 1, set value of residual volume control warning level 2, or set value of residual volume control warning level 3), the associated property value shall be taken as stated above. The residual volumes indicated by the three warning levels shall be, in decreasing order, the set value of residual volume control warning level 1, set value of residual volume control warning level 2, and set value of residual volume control warning level 3.

9.43.11 Residual volume control warning level 1 property

This property sets the residual kerosene volume that changes the value of the residual volume control warning level property (0xE8) to residual volume control warning level 1 (0x31). The property value range shall be 0 to 0xFFFFFFFF (0 l to 16 777 215 l).

9.43.12 Residual volume control warning level 2 property

This property sets the residual kerosene volume that changes the value of the residual volume control warning level property (0xE8) to residual volume control warning level 2 (0x32). The property value range shall be 0 to 0xFFFFFFFF (0 l to 16 777 215 l).

9.43.13 Residual volume control warning level 3 property

This property sets the residual kerosene volume that changes the value of the residual volume control warning level property (0xE8) to residual volume control warning level 3 (0x33). The property value range shall be 0 to 0xFFFFFFFF (0 l to 16 777 215 l).

9.43.14 Slight leak timer value (kerosene flow rate continuation) property

This property indicates the number of days for which gas has flowed continuously. The property value range shall be 0 to 0xFD (0 days to 253 days).

9.43.15 ID number setting property

This property indicates the ID number of the meter. The setting scope shall be a 6-digit code comprised of 6 one-byte alphanumeric characters.

ID numbers are used when there are two or more meters.

9.43.16 Verification expiration setting property

When the meter is one that has been verified by a verifying organization, this property indicates the month and year in which the verification of the meter will expire.

9.43.17 Measured cumulative kerosene consumption information with date and time property

This property indicates the cumulative kerosene consumption and the date and time of measurement in the format of 4 bytes for date of measurement, 3 bytes for time of measurement, and 4 bytes for cumulative kerosene consumption.

The date of measurement shall be indicated in the format of two bytes for year, one byte for month, and one byte for day. The time of measurement shall be indicated in the format of one byte for hour, one byte for minute, and one byte for second. If the meter has no second information, 0x00 shall be set for second.

Cumulative kerosene consumption shall follow the definition in 9.43.4, "Measured cumulative kerosene consumption."

9.43.18 Historical information of cumulative kerosene consumption property

This property indicates the historical information of kerosene consumption measured at every hour in the format of 4 bytes for the date of history start, 3 bytes for the time of history start, 4 bytes × 24 for historical data of measured cumulative kerosene consumption, 4 bytes for cumulative kerosene consumption at history start, and 2 bytes for cumulative time interval.

The date of history start shall be indicated in the format of two bytes for year, one byte for month, and one byte for day. The time of history start shall be indicated in the format of one byte for hour, one byte for minute, and one byte for second. If the meter has no second information, 0x00 shall be set for second.

Historical data of measured cumulative kerosene consumption indicates the kerosene consumption (unit: 0,001 l) at every cumulative interval using a 5-digit decimal notation number. The value range of the property shall be from 0x00000 to 0xF423F (0 l to 99,999 l).

Cumulative kerosene consumption at history start shall follow the definition in 9.43.4, "Measured cumulative kerosene consumption."

The value range of cumulative time interval shall be 0x0001 to 0xFFFF (1 min to 65 535 min).

EXAMPLE

Sending 24 cumulative values (reading increment at every hour) from 00:00:00 on March 1, 2012 (reading: 123 456,789L) after 00:00:00 on March 2

Date of history start (YYYY:MM:DD) = 0x07DC0301 (2012:03:01)

Time of history start (hh:mm:ss) = 0x000000 (00:00:00)

Historical data of measured cumulative kerosene consumption = See Table 65 (24 from Vol.01 to Vol.24)

Cumulative kerosene consumption at history start = 0x075BCD15 (123 456,789 l)

Cumulative time interval = 0x3C (60 min)

An example of historical data of measured cumulative kerosene consumption corresponding to the transition of cumulative kerosene consumption is shown in Table 65.

Table 65 – Historical data example of measured cumulative kerosene consumption corresponding to the transition of cumulative kerosene consumption

No.	Date	Time	Reading	Historical data of measured cumulative kerosene consumption Vol.01 to 24
	20120301	000000	123 456 789	
01	20120301	010000	123 456 799	00010 (= 123 456 799 to 123 456 789)
02	20120301	020000	123 456 819	00020 (= 123 456 819 to 123 456 799)
03	20120301	030000	123 456 849	00030 (= 123 456 849 to 123 456 819)
04	20120301	040000	123 456 889	00040 (= 123 456 889 to 123 456 849)
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.
21	20120301	210000	123 461 234	01000 (= 123 461 234 to 123 460 234)
22	20120301	220000	123 461 756	00522 (= 123 461 756 to 123 461 234)
23	20120301	230000	123 461 756	00000 (= 123 461 756 to 123 461 756)
24	20120302	000000	123 461 756	00000 (= 123 461 756 to 123 461 756)

9.44 Smart electric energy meter for sub-metering class specifications

9.44.1 General

The control commands of "smart electric energy meter for sub-metering" are shown in Table 66.

Class group code : 0x02

Class code : 0x8D

Property name	EPC	Contents of property Value range (decimal notation)	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
Number of effective digits for cumulative amount of electric energy	0xD7	Indicates the number of effective digits for measured cumulative amount of electric energy, historical data of measured cumulative amount of electric energy, and cumulative amount of electric energy measured at a fixed time. 0x01 to 0x08 (1 to 8)	unsigned char	1 byte	digit	Get	○		
Electric current coefficient	0xD8	Indicates the coefficient for converting measured instantaneous current to actual electric current using a 3-digit decimal notation. 0x0001 to 0x03E7 (1 to 999)	unsigned short	2 bytes		Get			
Voltage coefficient	0xD9	Indicates the coefficient for converting measured instantaneous currents to actual electric voltage using a 3-digit decimal notation. 0x0001 to 0x03E7 (1 to 999)	unsigned short	2 bytes		Get			
Day on which the historical data of measured cumulative amount of electric energy is to be retrieved	0xE0	Indicates the day on which the historical data of measured cumulative amount of electric energy (which consists of 48 pieces of half-hourly data for the preceding 24 h) is to be retrieved. 0x00 to 0x63, 0xFF (0 to 99) 0: today, 1 to 99: yesterday to the day 99 days ago, 0xFF: not set (default value).	unsigned char	1 byte		Set/Get	○		
Measured cumulative amount of electric energy (normal direction)	0xE1	Indicates the cumulative amount of electric energy using a number of effective digits for cumulative amount of electric energy (max. eight digits). 0x00000000 to 0x05F5E0FF (0 to 99 999 999) 0xFFFFFFFFE: No measured data	unsigned long	4 bytes	kWh a	Get	○		

Property name	EPC	Contents of property Value range (decimal notation)	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
Historical data of measured cumulative amount of electric energy (normal direction)	0xE2	Indicates the day on which the historical data of measured cumulative amount of electric energy is to be retrieved and the historical data of measured cumulative amount of electric energy (normal direction), which consists of 48 items of half-hourly data for the preceding 24 h (00:00 to 23:30) of the day by time series from the highest-order byte. The 1st and 2nd bytes: the day on which the historical data of measured cumulative amount of electric energy is to be retrieved 0x0000 to 0x0063, 0x00FF (0 to 99) 0: today, 1 to 99: yesterday to the day 99 days ago, 0x00FF: not set. The 3rd and succeeding bytes: measured cumulative amount of electric energy 0x00000000 to 0x05F5E0FF (0 to 99 999 999) 0xFFFFFFFF: no measured data	unsigned short + unsigned long × 48	194 bytes	kWh a	Get	○		

Property name	EPC	Contents of property Value range (decimal notation)	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
Measured cumulative amount of electric energy (reverse direction)	0xE3	Indicates the cumulative amount of electric energy using a number of effective digits for cumulative amount of electric energy (max. eight digits). 0x00000000 to 0x05F5E0FF (0 to 99 999 999) 0xFFFFFFFFE: No measured data	unsigned long	4 bytes	kWh a	Get	○		
Historical data of measured cumulative amount of electric energy (reverse direction)	0xE4	Indicates the day on which the historical data of measured cumulative amount of electric energy is to be retrieved and the historical data of measured cumulative amount of electric energy (reverse direction), which consists of 48 items of half-hourly data for the preceding 24 h (00:00 to 23:30) of the day by time series from the highest-order byte. The 1st and 2nd bytes: the day on which the historical data of measured cumulative amount of electric energy is to be retrieved 0x0000 to 0x0063, 0x00FF (0 to 99) 0: today, 1 to 99: yesterday to the day 99 days ago, 0x00FF: not set. The 3rd and succeeding bytes: measured cumulative amount of electric energy 0x00000000 to 0x05F5E0FF (0 to 99 999 999) 0xFFFFFFFFE: no measured data	unsigned short + unsigned long × 48	194 bytes	kWh a	Get	○		

Property name	EPC	Contents of property Value range (decimal notation)	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
Measured instantaneous electric power	0xE7	Indicates the measured effective instantaneous electric power in units of 1 W. If the device has voltage transformer (VT) and current transformer (CT), the electric power at the secondary side shall be taken. 0x80000001 to 0x7FFFFFFD, (-2 147 483 647 to +2 147 483 645) 0x7FFFFFFE: No measured data	signed long	4 bytes	W b	Get	○		
Measured instantaneous currents	0xE8	Indicates the measured effective instantaneous R and T phase currents in unit of 0,1 A side-by-side. In the case of a single-phase, two-wire system, 0x7FFE shall be used for the T phase. If the device has current transformer (CT), the electric current at the secondary side shall be taken. 0x8001 to 0x7FFD (R phase): 0x8001 to 0x7FFD (T phase) (-3 276,7 to +3 276,5): (-3 276,7 to +3 276,5) 0x7FFE: No measured data	signed short × 2	4 bytes	0,1 A b	Get	○		
Measured instantaneous voltages	0xE9	Indicates the measured effective instantaneous R - S(N) and S(N) - T voltages in unit of 0,1 V side-by-side. In the case of a single-phase, two-wire system, 0xFFFFE shall be used for the S(N) - T voltage. If the device has a voltage transformer (VT), the measured electric voltage at the secondary side shall be taken.	unsigned short × 2	4 bytes	0,1 V b	Get			

Property name	EPC	Contents of property Value range (decimal notation)	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		0x0000 to 0xFFFFD (between R and S(N)): 0x0000 to 0xFFFFD (between S(N) and T) (0 to 6 553,3): (0 to 6 553,3) 0xFFFFE: No measured data							
Cumulative amount of electric energy measured at a fixed time (normal direction)	0xEA	Indicates the most recent cumulative amount of electric energy (normal direction) measured at 30-min intervals held by the meter in the format of 4 bytes for the date of measurement, 3 bytes for the time of measurement, and 4 bytes for the cumulative electric energy (normal direction). Date of measurement: YYYY:MM:DD Time of measurement: hh:mm:ss Cumulative amount of electric energy: max. 8 digits in decimal notation (number of effective digits for cumulative amount of electric energy) The 1st to 4th bytes: Date of measurement YYYY: 0x0001 to 0x270F (1 to 9 999) MM: 0x01 to 0x0C (1 to 12) DD: 0x01 to 0x1F (1 to 31) The 5th to 7th bytes: Time of measurement hh: 0x00 to 0x17 (0 to 23) mm: 0x00 to 0x3B (0 to 59) ss: 0x00 to 0x3B (0 to 59) The 8th to 11th bytes: cumulative amount of electric energy measured 0x00000000 to 0x05F5E0FF (0 to 99 999 999) 0xFFFFFEE: No measured data	unsigned short + unsigned char×2 + unsigned char×3 + unsigned long	11 bytes	Year, month, day, time, hour, second, kWh a	Get	○		

Property name	EPC	Contents of property Value range (decimal notation)	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
Cumulative amount of electric energy measured at a fixed time (reverse direction)	0xEB	Indicates the most recent cumulative amount of electric energy (reverse direction) measured at 30-min intervals held by the meter in the format of 4 bytes for the date of measurement, 3 bytes for the time of measurement, and 4 bytes for the cumulative electric energy (reverse direction). Date of measurement: YYYY:MM:DD Time of measurement: hh:mm:ss Cumulative amount of electric energy: Max. 8 digits in decimal notation (number of effective digits for cumulative amount of electric energy) The 1st to 4th bytes: Date of measurement YYYY: 0x0001 to 0x270F (1 to 9 999) MM: 0x01 to 0x0C (1 to 12) DD: 0x01 to 0x1F (1 to 31) The 5th to 7th bytes: Time of measurement: hh:mm:ss hh: 0x00 to 0x17 (0 to 23) mm: 0x00 to 0x3B (0 to 59) ss: 0x00 to 0x3B (0 to 59) The 8th to 11th bytes: cumulative amount of electric energy measured 0x00000000 to 0x05F5E0FF (0 to 99 999 999) 0xFFFFFFFF: No measured data	unsigned short + unsigned char × 2 + unsigned char × 3 + unsigned long	11 bytes	Year, month, day, time, hour, second, kWh ^a	Get	○		

^a The unit for the cumulative amount of electric energy measurement value (kWh) shall be represented by the property of unit for cumulative amount of electric energy (normal and reverse directions).

^b Measured instantaneous electric energy, measured instantaneous currents, and measured instantaneous currents indicate measured values at the secondary side when measured with instruments with a voltage transformer and/or current transformer.

9.44.2 Operation status property

This property indicates whether the function native to this class is operating or not (ON/OFF). In the node mounting this class, if the function of this class is started concurrently with the start of node operation, this property may be implemented at a fixed value of 0x30 (Operation status ON).

9.44.3 Current time setting property

This property indicates the current local time using a value between 0x00 and 0x17 (0 to 23) for the hour and a value between 0x00 and 0x3B (0 to 59) for the minute. The first byte of the property value indicates the hour and the second byte indicates the minute. When this property is Set, "00" seconds is set to the electric meters that control time in seconds. The electric meters having Get only (or not having this property) are instruments that internally control time.

9.44.4 Current date setting property

This property indicates the current date using a value between 0x0001 and 0x270F (1 to 9 999) for the year, a value between 0x01 and 0x0C (1 to 12) for the month and a value between 0x01 and 0x1F (1 to 31) for the day. The first and second bytes are treated as one piece of unsigned short data which indicates the year (2 bytes). The third byte indicates the month (1 byte) and the fourth byte indicates the day (1 byte). The electric meters having Get only (or not having this property) are instruments that internally control date.

9.44.5 Electric power coefficient property

This property indicates the coefficient for converting the measured cumulative amount of electric energy and the historical data of measured cumulative amount of electric energy, measured instantaneous electric power, cumulative amount of electric energy measured at a fixed time to actual usage amounts using a 6-digit decimal notation. The actual usage amount shall be a value multiplied by an electric power coefficient. If this property is not implemented, the coefficient shall be treated as 1.

9.44.6 Unit for measured cumulative amount of electric energy (normal and reverse directions) property

This property indicates the unit used for the measured cumulative amount of electric energy, the historical data of the measured cumulative amount of electric energy, and cumulative amount of electric energy measured at a fixed time.

9.44.7 Number of effective digits for cumulative amount of electric energy property

This property indicates the number of effective digits from the low-order side of the measured cumulative amount of electric energy, historical data of measured cumulative amount of electric energy, and cumulative amount of electric energy measured at a fixed time (data size: 4 bytes, number of digits: 8).

EXAMPLE 1 Number of effective digits for the cumulative amount of electric energy = 0x06 (six digits).
The cumulative amount of electric energy value overflows at 0x000F423F (999 999) and increments again from 0x00000000(0).

EXAMPLE 2 Number of effective digits for the cumulative amount of electric energy = 0x07 (seven digits).
The cumulative amount of electric energy value overflows at 0x0098967F (9 999 999) and increments again from 0x00000000(0).

9.44.8 Electric current coefficient property

This property indicates the coefficient for converting measured instantaneous current to actual electric current using a 3-digit decimal notation. The actual electric current value shall be a value multiplied by an electric current coefficient. If this property is not implemented, the coefficient shall be treated as 1. For direct connection type meters not having a transformer, it is normally 1.

9.44.9 Voltage coefficient property

This property indicates the coefficient for converting measured instantaneous voltage to actual voltage using a 3-digit decimal notation. The actual voltage value shall be a value multiplied by a voltage coefficient. Instruments having no measured instantaneous voltages (EPC=0xE9) output functions do not have this property. If this property is not implemented but measured instantaneous voltages (EPC=0xE9) is implemented, the coefficient shall be treated as 1. For direct connection type meters not having a transformer and instruments having a low-voltage current transformer, it is normally 1.

9.44.10 Day on which the historical data of measured cumulative amount of electric energy is to be retrieved property

This property specifies the day on which the historical data of measured cumulative amount of electric energy (EPC=0xE2, 0xE4) is to be set with the value range is from 0x00 to 0x63 (from 0 to 99) for day on which the historical data of measured cumulative amount of electric energy.

- 0x00 (0): measured historical data for the current day (up to the latest hour)
- 0x63 (99): measured historical data for the day that precedes the current day by 99 days

The default values of this property shall be 0xFF.

9.44.11 Measured cumulative amount of electric energy (normal direction) property

This property indicates the measured cumulative amount of electric energy in the normal direction (normal power flow) using an up to 8-digit decimal notation number. The property value range is from 0x00000000 to 0x05F5E0FF (0 to 99 999 999). When the cumulative amount of electric energy exceeds the number of effective digits specified by "number of effective digits for the cumulative amount of electric energy" (EPC=0xD7), the value shall be increased again from 0x00000000(0).

If the "electric energy coefficient" (EPC=0xD3) is specified, the value multiplied by the coefficient is the actual usage amount. The unit shall be indicated by the "Unit of cumulative amount of electric energy" property (EPC=0xD4).

- Overflow: Counting shall be restarted from 0x00000000.
- No measured data: 0xFFFFFFFF

EXAMPLE:

Number of effective digits for cumulative amount of electric energy (EPC=0xD7): 0x07 (seven digits)

Electric energy coefficient (EPC=0xD3): 0x000012C0 (4 800)

Unit for cumulative amount of electric energy (EPC=0xD4): 0x03 (0,001 kWh)

With the above three conditions,

Measured cumulative amount of electric energy (normal direction) = 0x0012D687 (1 234 567) is used in the actual energy calculation as:

$$1\,234\,567 \times 4\,800 \times 0,001 \text{ kWh} = 5\,925\,921,6 \text{ kWh (actual usage amount)}$$

9.44.12 Historical data of measured cumulative amount of electric energy (normal direction) property

This property includes two elements; one is the value specified by "Day on which the historical data of measured cumulative amount of electric energy is to be retrieved" (EPC=0xE0) in 2 bytes (0x0000 to 0x0063 (0 to 99)). The other is the historical data of measured cumulative amount of electric energy in the normal direction (meter reading; it means not 30-min cumulative values) every 30 min (at 00 and 30 min every hour) for 24 h (00:00 to 23:30) on that day, 48 times in total, by time series from the highest-order byte.

The cumulative amount of electric energy is indicated up to 8 digits in decimal notation. The property value range is from 0x00000000 to 0x05F5E0FF (0 to 99 999 999). When the cumulative amount of electric energy exceeds the number of effective digits specified by "number of effective digits for the cumulative amount of electric energy" (EPC=0xD7), the value shall be increased again from 0x00000000(0). If the "electric energy coefficient" (EPC=0xD3) is specified, the value multiplied by the coefficient is the actual usage amount. The unit shall be indicated by the "Unit for cumulative amount of electric energy" property (EPC=0xD4). If there is no measured data for the corresponding time, the value of cumulative amount of electric energy shall be set to 0xFFFFFFFF (no measured data).

In the case that "Day on which the historical data of measured cumulative amount of electric energy is to be retrieved" (EPC=0xE0) is not set (i.e. the default value), the day on which the historical data of measured cumulative amount of electric energy is to be retrieved shall be set to 0x00FF and all half-hourly measurements of cumulative amount of electric energy shall be set to 0xFFFFFFFF.

- Overflow: counting shall be restarted from 0x00000000.
- No measured data: 0xFFFFFFFF

9.44.13 Measured cumulative amount of electric energy (reverse direction) property

This property indicates the measured cumulative amount of electric energy in the reverse direction (reverse power flow) using an up to 8-digit decimal notation number. The value range is from 0x00000000 to 0x05F5E0FF (0 to 99 999 999). When the cumulative amount of electric energy exceeds the number of effective digits specified by "number of effective digits for the cumulative amount of electric energy" (EPC=0xD7), the value shall be increased again from 0x00000000(0). If the "electric energy coefficient" (EPC=0xD3) is specified, the value multiplied by the coefficient is the actual usage amount. The unit shall be indicated by the "Unit for cumulative amount of electric energy" property (EPC=0xD4).

Overflow: counting shall be restarted from 0x00000000.

No measured data: 0xFFFFFFFF

9.44.14 Historical data of measured cumulative amount of electric energy (reverse direction) property

This property includes two elements; one is the value specified by "Day on which the historical data of measured cumulative amount of electric energy is to be retrieved" (EPC=0xE0) in 2 bytes (0x0000 to 0x0063 (0 to 99)). The other is the historical data of measured cumulative amount of electric energy in the normal direction (meter reading; it means not 30-min cumulative values) every 30 min (at 00 and 30 min every hour) for 24 h (00:00 to 23:30) on that day, 48 times in total, by time series from the highest-order byte.

The cumulative amount of electric energy is indicated up to 8-digits in decimal notation. The property value range is from 0x00000000 to 0x05F5E0FF (0 to 99 999 999). When the cumulative amount of electric energy exceeds the number of effective digits specified by "number of effective digits for the cumulative amount of electric energy" (EPC=0xD7), the value shall be increased again from 0x00000000(0). If the "electric energy coefficient" (EPC=0xD3) is specified, the value multiplied by the coefficient is the actual usage amount. The unit shall be indicated by the "Unit for cumulative amount of electric energy" property (EPC=0xD4). If there is no measured data for the corresponding time, the value of cumulative amount of electric energy shall be set to 0xFFFFFFFF (no measured data).

In the case that "Day on which the historical data of measured cumulative amount of electric energy is to be retrieved" (EPC=0xE0) is not set (i.e. the default value), the day on which the historical data of measured cumulative amount of electric energy is to be retrieved shall be set to 0x00FF and all half-hourly measurements of cumulative amount of electric energy shall be set to 0xFFFFFFFF.

- Overflow: Counting shall be restarted from 0x00000000.
- No measured data: 0xFFFFFFFF

9.44.15 Measured instantaneous electric power property

This property indicates the measured effective instantaneous electric power in units of 1 W. The value range is from 0x80000001 to 0x7FFFFFFD (from –2 147 483 647 to +2 147 483 645).

On instruments measuring electric power via a voltage transformer (VT) and/or current transformer (CT), the actual electric power is calculated by multiplying the "electric power coefficient" (EPC=0xD3).

Range: –2 147 483 647 to +2 147 483 645 W (unit 1 W)

Underflow: 0x80000000

Overflow: 0x7FFFFFFF

No measured data: 0x7FFFFFFE

There are some meters that can only output absolute values (positive numbers), even in cases where the measured instantaneous electric power should be negative numbers. If a positive/negative (+/–) sign is required for this property value, it is necessary to check whether the meter is capable of outputting the sign, in advance.

9.44.16 Measured instantaneous currents property

This property indicates the measured effective instantaneous R and T phase currents side-by-side in increments of 0,1 A unit. The value range is from 0x8001 to 0x7FFD (from –3 276,7 to +3 276,5). In the case of a single-phase, two-wire system, measured data shall be stored in the R phase field and 0x7FFE (no measured data) shall be set in the T phase field.

On instruments measuring current via a current transformer (CT), the actual currents is calculated by multiplying the "electric current coefficient" (EPC=0xD8).

Range: from –3 276,7 to +3 276,5 A (unit: 0,1 A)

- Underflow: 0x8000
- Overflow: 0x7FFF
- No measured data: 0x7FFE

Example: Single-phase, three-wire system: 0x03E9, 0x03E7 = 100,1 A, 99,9 A

Single-phase, two-wire system: 0xFC19, 0x7FFE = –99,9 A, not measured

There are some meters that can only output absolute values (positive numbers), even in cases where the measured instantaneous electric current should be negative numbers. If a positive/negative (+/–) sign is required for this property value, it is necessary to check whether the meter is capable of outputting the sign, in advance.

9.44.17 Measured instantaneous voltages property

This property indicates the measured effective instantaneous R-S(N) and S(N)-T voltages side-by-side in increments of 0,1 V unit. The value range is from 0x0000 to 0xFFFFD (from 0 to 6 553,3). In the case of a single-phase, two-wire system, the measured data shall be stored in the R-S(N) field and 0xFFFFE (no measured data) shall be set in the S(N)-T field.

On instruments measuring voltage via a voltage transformer (VT), actual voltage is calculated by multiplying the "voltage coefficient" (EPC=0xD9).

- Range: from 0,0 to 6 553,3 V (unit: 0,1 V)
- Overflow: 0xFFFF

- No measured data: 0xFFFFE

Example: Single-phase, three-wire system: 0x0451, 0x03E7 = 110,5 V, 99,9 V

Single-phase, two-wire system: 0x03E7, 0xFFFFE = 99,9 V, not measured

9.44.18 Cumulative amount of electric energy measured at a fixed time (normal direction) property

This property indicates the cumulative amount of electric energy (normal direction) measured at 30-min intervals (every half hour) (meter reading; it means not 30-min cumulative value) held by the meter in the format of 4 bytes for the date of measurement, 3 bytes for the time of measurement, and 4 bytes for the cumulative amount of electric energy (normal direction). The date of measurement shall be indicated in the format of two bytes for the year, one byte for the month, and one byte for the day. The time of measurement shall be indicated in the format of one byte for the hour, one byte for the minute, and one byte for the second. If the meter does not have information on seconds as a unit of measured time, 0x00 is set for seconds. The measured cumulative amount of electric energy is indicated using up to 8-digit decimal notation number. The value range is from 0x00000000 to 0x05F5E0FF (0 to 99 999 999). When the cumulative amount of electric energy exceeds the number of effective digits specified by "number of effective digits for the cumulative amount of electric energy" (EPC=0xD7), the value shall be increased again from 0x00000000(0). If the "electric energy coefficient" (EPC=0xD3) is specified, the value multiplied by the coefficient is the actual usage amount. The unit shall be indicated by the "Unit for cumulative amount of electric energy" property (EPC=0xD4). The property value shall be set to 0xFFFFFFFFE (no measured data) if there is no measured cumulative amount of electric energy (normal direction).

- Overflow: counting shall be restarted from 0x00000000.
- No measured data: 0xFFFFFFFFE

EXAMPLE Cumulative amount of electric energy measured at a fixed time (normal direction)

- YYYY=0x07E5 (year: 2021), MM=0x0C (month: 12), DD=0x1F (day: 31)
- hh=0x00 (hour:0), mm=0x3B (minute:59), ss=0x00 (second:0)
- Cumulative amount of electric energy (normal direction)=0x0012D687 (01 234 567)

Conditions:

- Number of effective digits for cumulative amount of electric energy (EPC=0xD7): 0x07 (seven digits)
- Electric energy coefficient (EPC=0xD3): 0x00000001 (1)
- Unit for cumulative amount of electric energy (EPC=0xD4): 0x03 (0.001kWh)

With the above three conditions:

- Measurement date: December 31, 2021
- Measurement time: 00:59:00
- Cumulative amount of electric energy measured (normal direction)
- $1\,234\,567 \times 0,001\text{ kWh} = 1\,234,567\text{ kWh}$ (actual usage amount)

9.44.19 Cumulative amount of electric energy measured at a fixed time (reverse direction) property

This property indicates the cumulative amount of electric energy (reverse direction) measured at 30-min intervals (every half hour) (meter reading; it means not 30-min cumulative value) held by the meter in the format of 4 bytes for the date of measurement, 3 bytes for the time of measurement, and 4 bytes for the cumulative amount of electric energy (reverse direction).

The date of measurement shall be indicated in the format of two bytes for the year, one byte for the month, and one byte for the day. The time of measurement shall be indicated in the format of one byte for the hour, one byte for the minute, and one byte for the second. If the meter does not have information on seconds as a unit of measured time, 0x00 is set for seconds.

The measured cumulative amount of electric energy is indicated using up to an 8-digit decimal notation number. The value range is from 0x00000000 to 0x05F5E0FF (0 to 99 999 999). When the cumulative amount of electric energy exceeds the number of effective digits specified by "number of effective digits for the cumulative amount of electric energy" (EPC=0xD7), the value shall be increased again from 0x00000000(0).

If the "electric energy coefficient" (EPC=0xD3) is specified, the value multiplied by the coefficient is the actual usage amount. The unit shall be indicated by the "Unit for cumulative amount of electric energy" property (EPC=0xD4)

The property value shall be set to 0xFFFFFFFFE (no measured data) if there is no cumulative amount of electric energy (reverse direction).

- Overflow: Counting shall be restarted from 0x00000000.
- No measured data: 0xFFFFFFFFE

EXAMPLE Cumulative amount of electric energy measured at a fixed time (reverse direction)

- YYYY=0x07E4 (year: 2020), MM=0x04 (month: 4), DD=0x0A (day: 10)
- hh=0x0F (hour:15), mm=0x1E (minute:30), ss=0x37 (second:55)
- Cumulative amount of electric energy (reverse direction) =0x0001E240 (00 123 456)

Conditions:

- Number of effective digits for cumulative amount of electric energy (EPC=0xD7): 0x06 (six digits)
- Electric energy coefficient (EPC=0xD3): 0x00000001 (1)
- Unit for cumulative amount of electric energy (EPC=0xD4): 0x02 (0,01 kWh)

With the above three conditions:

- Measurement date: April 10, 2020
- Time of measurement: 15:30:55
- Cumulative amount of electric energy measured (reverse direction)
- $123\,456 \times 0,01 \text{ kWh} = 1\,234,56 \text{ kWh}$ (actual usage amount)

9.45 Distributed generator's electric energy meter class specifications

9.45.1 General

The control commands of "distributed generator's electric energy meter" are shown in Table 67.

Class group code : 0x02

Class code : 0x8E

Table 67 – List of distributed generator's electric energy meter properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	–	Set		○	
		ON = 0x30, OFF = 0x31				Get	○		
Current date setting	0x98	Current date (YYYY: MM: DD format)	unsigned short + unsigned char × 2	4 bytes		Set			
		0x0001 to 0x270F: 0x01 to 0x0C: 0x01 to 0x1F (1 to 9 999):(1 to 12):(1 to 31)				Get	○ a		

[illegible]

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Unit for cumulative amount of electric energy	0xD4	Unit for cumulative amount of electric energy (AC output, AC input and output during a power outage)	unsigned char	1 byte		Get	○		
		0x00: 1 kWh 0x01: 0,1 kWh 0x02: 0,01 kWh 0x03: 0,001 kWh 0x04: 0,000 1 kWh 0x0A: 10 kWh 0x0B: 100 kWh 0x0C: 1 000 kWh 0x0D: 10 000 kWh							
Day on which the historical data of measured cumulative amount of electric energy is to be retrieved	0xD5	Indicates the day on which the historical data of measured cumulative amount of electric energy (which consists of 48 pieces of half-hourly data for the preceding 24 h) is to be retrieved.	unsigned short	2 bytes		Set/Get	○ a		
		0x0000 to 0x0063 (0 to 99) 0x0000: on the day 0x0001 to 0x0063: 1 to 99 days earlier 0xFFFF: initial value (not set)							
Identification number of device to be metered	0xD6	Identification number of device to be metered	unsigned char	9 or		Get			

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
		The first byte: lower-layer communication ID field 0x01 to 0xFD: this is a communication protocol used in the lower-layer communication and is set arbitrarily according to the protocol class in the case where unique number is assigned (not used in ECHONET Lite). 0x11 to 0x1F: Power line Communication Protocol a and d systems 0x31 to 0x3F: Low-Power Radio Communication Protocol 0x41 to 0x4F: Extended HBS 0x51 to 0x5F: IrDA 0x61 to 0x6F: LonTalk 0x71 to 0x7F: Bluetooth 0x81 to 0x8F: Ethernet 0x91 to 0x9F: IEEE802.11/11b 0xA1: Power line Communication Protocol c systems 0xB1: IPv6/Ethernet 0xB2: IPv6/6LoWPAN 0xFE: The 2nd to 17th bytes are defined by the manufacturer, and are set according to the type. Defined by the type (refer to the identification number for device object super class requirements) 0xFF: if the protocol used in the lower layer generates the 2nd thru 9th bytes randomly, the 1st byte is set 0xFF. 0x00: identification number is not set. The second and succeeding bytes: unique number field		17 bytes					

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
		electric energy 0x00000000 to 0x3B9AC9FF (0 to 999 999 999) No measured data: 0xFFFFFFFF ^g							
Measured cumulative amount of electric energy (AC output) ^f	0xE2	Indicates the measured cumulative amount of electric energy using a 9-digit decimal notation number. 0x00000000 to 0x3B9AC9FF (0 to 999 999 999)	unsigned long	4 bytes	b	Get	○ c		
Historical data of measured cumulative amount of electric energy (AC output) ^e	0xE3	Indicates the day on which the historical data of measured cumulative amount of electric energy is to be retrieved and the historical data of cumulative amount of electric energy measured at fixed time (AC output), which consists of 48 items of half-hourly data for the preceding 24 h (00:00 to 23:30) of the day by time series from the highest-order byte. The 1st and 2nd bytes: day on which the historical data of measured cumulative amount of electric energy is to be retrieved 0x0000 to 0x0063 (0 to 99) The 3rd and succeeding bytes: measured cumulative amount of electric energy 0x00000000 to 0x3B9AC9FF (0 to 999 999 999), No measured data: 0xFFFFFFFF ^g	unsigned short + unsigned long × 48	194 bytes	b	Get	○ e		
Measured cumulative amount of electric energy (independent output)	0xE4	Indicates the measured cumulative amount of electric energy using a 9-digit decimal notation number. 0x00000000 to 0x3B9AC9FF (0 to 999 999 999) No measured data: 0xFFFFFFFF ^g	unsigned long	4 bytes	b	Get			

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Historical data of measured cumulative amount of electric energy (independent output)	0xE5	Indicates the day on which the historical data of measured cumulative amount of electric energy is to be retrieved and the historical data of cumulative amount of electric energy measured at fixed time (output during a power outage), which consists of 48 items of half-hourly data for the preceding 24 h (00:00 to 23:30) of the day by time series from the highest-order byte.	unsigned short + unsigned long × 48	194 bytes	b	Get			
		The 1st and 2nd bytes: day on which the historical data of measured cumulative amount of electric energy is to be retrieved 0x0000 to 0x0063 (0 to 99) The 3rd and succeeding bytes: measured cumulative amount of electric energy 0x00000000 to 0x3B9AC9FF (0 to 999 999 999) No measured data: 0xFFFFFFFF⁹							
Cumulative amount of electric energy measured at fixed time (AC input)	0xE6	Indicates the most recent cumulative amount of electric energy (AC input) measured at 30-min intervals; measurement date in 4 bytes, measurement time in 3 bytes, and cumulative amount of active electric energy in 4 bytes. Date of measurement: YYYY:MM:DD Time of measurement: hh:mm:ss Cumulative amount of electric energy: 9-digit decimal notation number The 1st to 4th bytes: Measurement date YYYY: 0x0001 to 0x270F (1 to 9 999) MM: 0x01 to 0x0C	unsigned short + unsigned char × 2 + unsigned char × 3 + unsigned long	11 bytes	Year, month, day, hour, minute, second -	Get	○ d		

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
		(1 to 12) DD: 0x01 to 0x1F (1 to 31) The 5th to 7th bytes: Time of measurement hh: 0x00 to 0x17 (0 to 23) mm: 0x00 to 0x3B (0 to 59) ss: 0x00 to 0x3B (0 to 59) The 8th to 11th bytes: cumulative amount of electric energy measured 0x00000000 to 0x3B9AC9FF (0 to 999 999 999) No measured data: 0xFFFFFFFF ⁹							
Cumulative amount of electric energy measured at fixed time (AC output) ^e	0xE7	Indicates the most recent cumulative amount of electric energy (AC output) measured at 30-min intervals; measurement date in 4 bytes, measurement time in 3 bytes, and cumulative amount of active electric energy in 4 bytes. Date of measurement: YYYY:MM:DD Time of measurement: hh:mm:ss Cumulative amount of electric energy: 9-digit decimal notation number The 1st to 4th bytes: measurement date YYYY: 0x0001 to 0x270F (1 to 9 999) MM: 0x01 to 0x0C (1 to 12) DD: 0x01 to 0x1F (1 to 31) The 5th to 7th bytes: time of measurement hh: 0x00 to 0x17 (0 to 23) mm: 0x00 to 0x3B (0 to 59) ss: 0x00 to 0x3B (0 to 59) The 8th to 11th bytes: cumulative amount of electric energy	unsigned short + unsigned char ×2 + unsigned char ×3 + unsigned long	11 bytes	Year, month, day, hour, minute, second -	Get	Optional		

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
		measured 0x00000000 to 0x3B9AC9FF (0 to 999 999 999) No measured data: 0xFFFFFFFF ^g							
Cumulative amount of electric energy measured at fixed time (independent output)	0xE8	Indicates the most recent cumulative amount of electric energy (output during a power outage) measured at 30-min intervals; measurement date in 4 bytes, measurement time in 3 bytes, and cumulative amount of active electric energy in 4 bytes. Date of measurement: YYYY:MM:DD Time of measurement: hh:mm:ss Cumulative amount of electric energy: 9-digit decimal notation number The 1st to 4th bytes: Measurement date YYYY: 0x0001 to 0x270F (1 to 9 999) MM: 0x01 to 0x0C (1 to 12) DD: 0x01 to 0x1F (1 to 31) The 5th to 7th bytes: Time of measurement hh: 0x00 to 0x17 (0 to 23) mm: 0x00 to 0x3B (0 to 59) ss: 0x00 to 0x3B (0 to 59) The 8th to 11th bytes: cumulative amount of electric energy measured 0x00000000 to 0x3B9AC9FF (0 to 999 999 999) No measured data: 0xFFFFFFFF ^g	unsigned short + unsigned char ×2 + unsigned char ×3 + unsigned long	11 bytes	Year, month, day, hour, minute, second - b	Get			
Measured instantaneous electric power (AC input/output) ^f	0xE9	Indicates the effective instantaneous electric power (AC input/output) in units of 1 W. 0x80000001 to 0x7FFFFFFD	signed long	4 bytes	W	Get			

The values for electric energy and electric power of power generation equipment etc. shall be values in AC in this class. The measuring points are shown in Figure 83.

The amount of electrical energy is the cumulative value after the equipment installed, and the measured values of multiple power generation equipment etc. shall not be added together.

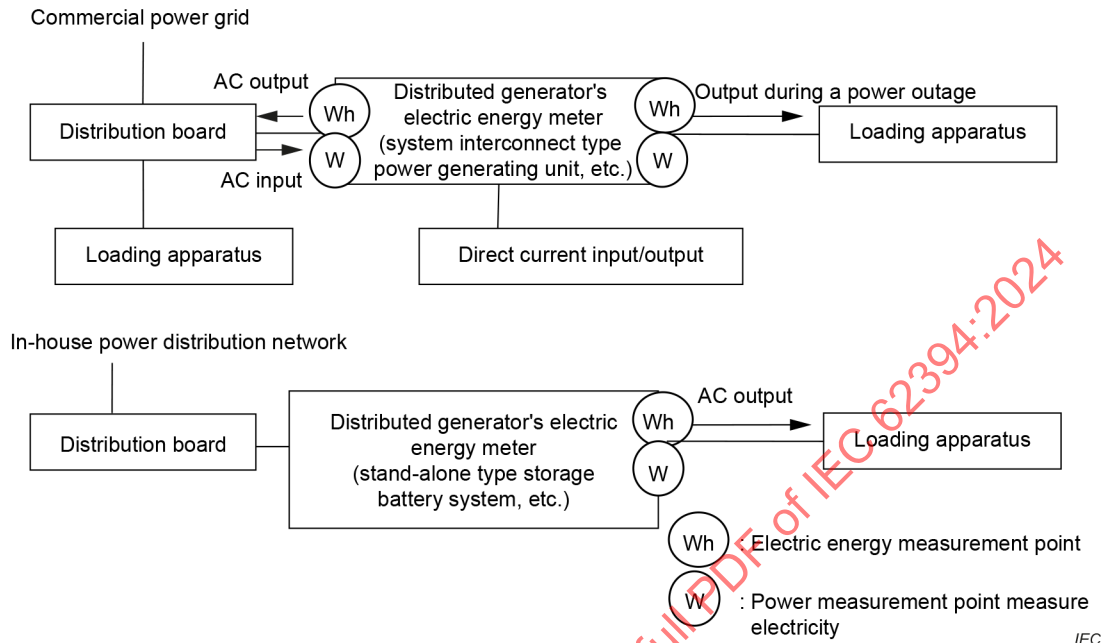
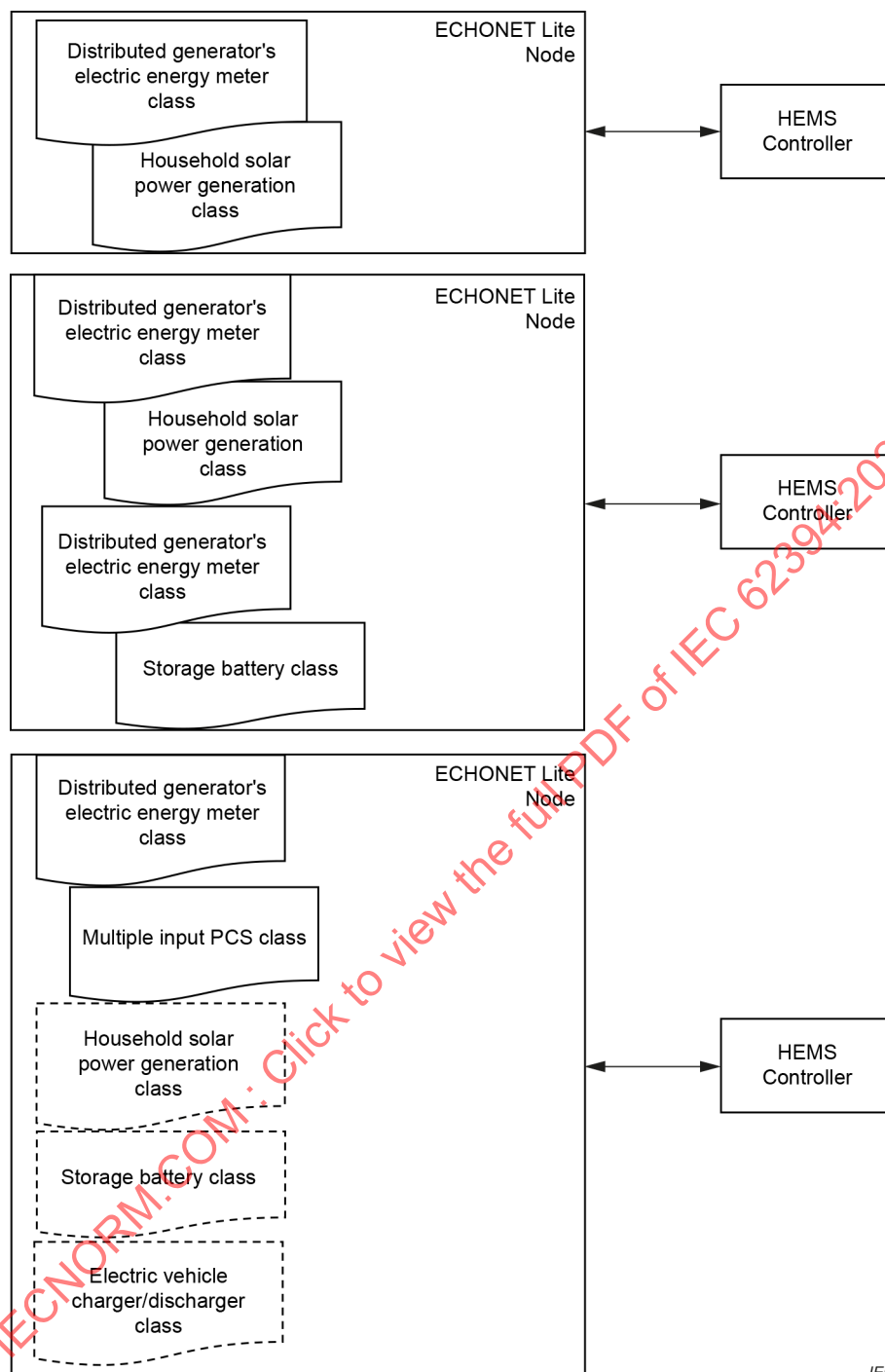


Figure 83 – Measuring points in the distributed generator's electric energy meter class

The device object of this class and the device object of the device to be metered are implemented on the same node. Figure 84 shows configuration examples that this class is implemented in ECHONET Lite nodes. There are cases that are equipped with both this class objects and the objects to be measured (power generating device, etc) and that are equipped with this class objects and the objects not to be measured.



Classes indicated with dotted lines are examples of classes not to be measured by this class.

Figure 84 – Node configuration examples

9.45.2 Operation status property

This property indicates whether measurement function is operating (ON) or not (OFF). ON shall mean that the measurement is ongoing even if there is no input nor output. If measurement is not in operation, it shall be OFF.

9.45.3 Current date setting property

This property indicates the current date using a value between 0x0001 and 0x270F (1 to 9 999) for the year, a value between 0x01 and 0x0C (1 to 12) for the month and a value between 0x01 and 0x1F (1 to 31) for the day. The first and second bytes are treated as one piece of unsigned short data which indicates the year (2 bytes). The third byte indicates the month (1 byte) and the fourth byte indicates the day (1 byte).

9.45.4 Device type property

Objects to be measured are represented with class group code (0x00 to 0xFF), class code (0x00 to 0xFF), and type of system interconnection (0x00: system interconnected type, and 0x01: stand-alone type). For example, in the case of an electric energy meter with a household solar power generation, the codes are: 0x02 (housing/facilities-related devices), 0x79 (household solar power generation) and 0x00 (system interconnected type).

9.45.5 Device ID property

A global unique ID shall be used to identify decentralized electric energy meters. MAC address (6 bytes) plus a branch number (1 byte); the branch number shall be in the range of 0x00 to 0xFF. Decentralized electric energy meters implemented on the ECHONET Lite node shall be identified by the branch number. The branch number shall be newly assigned when the decentralized electric energy meter is replaced.

9.45.6 Tolerance property

The measurement accuracy of the power resources, etc., is indicated as a tolerance class according to the scale of transactions. If other than n1 through n7 or unknown, "other" (0xFF) shall be used.

9.45.7 Number of days to retain historical data of measured cumulative amount of electric energy property

This property indicates the maximum number of days to retain historical data of measured cumulative amount of electric energy. Value range of the property shall be 0x0000 to 0x0063 (0 to 99), and 0xFFFF for distributed generator's electric energy meters with no historical data of measured cumulative amount of electric energy.

- 0x0000(0) has the history of the current day only
- 0x0001(1) has the history of the current day and the previous day
- 0x0063(99) has the history of the current day to 99 days earlier

9.45.8 Unit for cumulative amount of electric energy property

This property indicates units of measured cumulative amount of electric energy, historical data of measured cumulative amount of electric energy, cumulative amount of electric energy measured at fixed time for AC input, AC output, and output during a power outage output.

9.45.9 Day on which the historical data of measured cumulative amount of electric energy is to be retrieved property

This property specifies the day on which the historical data of measured cumulative amount of electric energy (EPC=0xE1, 0xE3, 0xE5) is to be retrieved. The value range is from 0x0000 to 0x0063 (0 to 99).

- 0x0000 (0): specifies the data on the current day (up to the last hour)
- 0x0063 (99) specifies the data on the day 99 days before

The default value of this property shall be 0xFFFF (no setting).

9.45.10 Identification number of device to be metered property

This property indicates the identification number (0x83) for the device to be metered (e.g. household solar power generation class, storage battery class, electric vehicle chargers/dischargers class, or multiple input PCS class)

9.45.11 Current hour, minute, and second setting property

This property indicates the current time using the "hour (0x00 to 0x17(0 to 23)): minute (0x00 to 0x3B (0 to 59)): second (0x00 to 0x3B (0 to 59))" format. The first byte of the property value indicates the hour, while the second byte indicates minute and the third byte indicates the second.

9.45.12 Time synchronization status property

This property indicates the time synchronization status of the ECHONET Lite node.

Devices that do not synchronize with an NTP server or the like, but instead synchronize with ECHONET Lite current date property and current time property shall be indicated as 0x00.

Devices that synchronize with an NTP server or the like and have successfully synchronized at least once in the past 24 h shall be indicated as 0x01.

Devices that synchronize with an NTP server or the like but have not successfully synchronized within 24 h shall be indicated as 0x02.

Devices unable to make time synchronization (neither the current date property nor the current time property are implemented, and there is no time synchronization function with an NTP or the like) shall be indicated as 0xFF.

9.45.13 Measured cumulative amount of electric energy (AC input) property

This property indicates a measured cumulative amount of electric energy loaded to a power generating device, etc. The unit for cumulative amount of electric energy property (EPC=0xD4) indicates the unit of this value.

The property value range is from 0x00000000 to 0x3B9AC9FF (0 to 999 999 999). When the cumulative amount of electric energy exceeds the maximum value of the value range, the value shall be increased again from 0x00000000 (0).

EXAMPLE Measured cumulative amount of electric energy (AC input) = 0x075BCD15 (123 456 789)

With the condition Unit for cumulative amount of electric energy (EPC=0xD4) = 0x03 (0,001 kWh),

$$123\,456\,789 \times 0,001 \text{ kWh} = 123\,456,789 \text{ kWh}$$

9.45.14 Historical data of measured cumulative amount of electric energy (AC input) property

This property includes two elements. One is the "day on which the historical data of measured cumulative amount of electric energy is to be retrieved" 0x0000 to 0x0063 (0 to 99) specified by "Day on which the historical data of measured cumulative amount of electric energy is to be retrieved 1" (EPC = 0xD5). The other is the historical data of measured cumulative amount of electric energy at every 30 min (at 00 and 30 min every hour) for 24 h (00:00 to 23:30) on the day, 48 times in total, by time series from the highest-order byte. Note they are not cumulative energies over 30 min. The unit is indicated by the unit for cumulative amount of electric energy property (EPC=0xD4). The value range shall be from 0x00000000 to 0x3B9AC9FF (0 to 999 999 999). When the value of cumulative amount of electric energy exceeds the maximum value of the value range, the value shall be increased again from 0x00000000 (0). If there is no measured data at the corresponding time, the value shall be 0xFFFFFFFF (no measured data). In the case that "day on which the historical data of measured cumulative amount of electric energy is to be retrieved" (EPC=0xD5) is not set (it shall be a default initial value), the day on which the historical data of measured cumulative amount of electric energy is to be retrieved shall be set to 0xFFFF and all half-hourly measurements of cumulative amount of electric energy shall be set to 0xFFFFFFFF.

9.45.15 Measured cumulative amount of electric energy (AC output) property

This property indicates a measured cumulative amount of electric energy output of the AC output of the power generation facility, etc., and the property value of the unit for cumulative amount of electric energy property (EPC = 0xD4) indicates the unit. The property value range shall be from 0x00000000 to 0x3B9AC9FF (0 to 999 999 999). When the cumulative amount of electric exceeds the maximum value of the value range, the value shall be increased again from 0x00000000 (0).

9.45.16 Historical data of measured cumulative amount of electric energy (AC output) property

This property includes two elements. One is the "day on which the historical data of measured cumulative amount of electric energy is to be retrieved" 0x0000 to 0x0063 (0 to 99) specified by "Day on which the historical data of measured cumulative amount of electric energy is to be retrieved 1" (EPC = 0xD5). The other is the historical data of measured cumulative amount of electric energy at every 30 min (at 00 and 30 min every hour) for 24 h (00:00 to 23:30) on the day, 48 times in total, by time series from the highest-order byte. Note they are not cumulative energies over 30 min. The unit is indicated by the unit for cumulative amount of electric energy property (EPC=0xD4). The property value range is from 0x00000000 to 0x3B9AC9FF (0 to 999 999 999). When the value of cumulative amount of electric energy exceeds the maximum value of the value range, the value shall be increased again from 0x00000000 (0). If there is no measured data at the corresponding time, the value shall be 0xFFFFFFFF (no measured data). In the case that "day on which the historical data of measured cumulative amount of electric energy is to be retrieved" (EPC=0xD5) is not set (it shall be a default initial value), the day on which the historical data of measured cumulative amount of electric energy is to be retrieved shall be set to 0xFFFF and all half-hourly measurements of cumulative amount of electric energy shall be set to 0xFFFFFFFF.

9.45.17 Measured cumulative amount of electric energy (independent output) property

This indicates a measured cumulative amount of electric energy outputted by power generating device etc. in output during a power outage mode, and property values of the unit for cumulative amount of electric energy property (EPC=0xD4) indicates the unit. The property value range is from 0x00000000 to 0x3B9AC9FF (0 to 999 999 999). When the cumulative amount of electric exceeds the maximum value of the value range, the value shall be increased again from 0x00000000 (0).

9.45.18 Historical data of measured cumulative amount of electric energy (independent output) property

This property includes two elements. One is the "day on which the historical data of measured cumulative amount of electric energy is to be retrieved" 0x0000 to 0x0063 (0 to 99) specified by "Day on which the historical data of measured cumulative amount of electric energy is to be retrieved 1" (EPC = 0xD5). The other is the historical data of measured cumulative amount of electric energy at every 30 min (at 00 and 30 min every hour) for 24 h (00:00 to 23:30) on the day, 48 times in total, by time series from the highest-order byte. Note they are not cumulative energies over 30 min. The unit is indicated by the unit for cumulative amount of electric energy property (EPC=0xD4). The property value range is from 0x00000000 to 0x3B9AC9FF (0 to 999 999 999). When the value of cumulative amount of electric energy exceeds the maximum value of the value range, the value shall be increased again from 0x00000000 (0). If there is no measured data at the corresponding time, the value shall be 0xFFFFFFFF (no measured data). In the case that "day on which the historical data of measured cumulative amount of electric energy is to be retrieved" (EPC=0xD5) is not set (it shall be a default initial value), the day on which the historical data of measured cumulative amount of electric energy is to be retrieved shall be set to 0xFFFF and all half-hourly measurements of cumulative amount of electric energy shall be set to 0xFFFFFFFF.

9.45.19 Cumulative amount of electric energy measured at fixed time (AC input) property

This property indicates the most recent cumulative amount of electric energy measured at fixed times (AC input) out of measured data at every 30 min (at 00 and 30 min every hour) (not a cumulative value over 30 min) held by the power generating device, etc., in 4 bytes for date of measurement, 3 bytes for time of measurement, and 4 bytes for cumulative electric energy (AC input). The date of measurement is indicated in the format of two bytes for year, one byte for month, and one byte for day. The time of measurement is indicated in the format of one byte for hour, one byte for minute, and one byte for second. If power generating units etc. do not have information on seconds as a unit of measured time, 0x00 shall be set for seconds. The unit is indicated by the unit for cumulative amount of electric energy property (EPC=0xD4). The value range is 0x00000000 to 0x3B9AC9FF (0 to 99 999 999), and when the value of cumulative amount of electric energy exceeds the maximum value of the value range, the value shall be increased again from 0x00000000 (0). If there is no measured data at the corresponding time, the value shall be 0xFFFFFFFF (no measured data).

EXAMPLE Cumulative amount of electric energy measured at fixed time (AC input)

YYYY=0x07E5(2021), MM=0x0C (12), DD=0x1F(31)

hh=0x17(23), mm=0x1E (30), ss=0x00(0)

Cumulative amount of electric energy (AC input) = 0x075BCD15 (123 456 789)

With condition: Unit for cumulative amount of electric energy (EPC=0xD4): 0x02 (0,01 kWh)

Measurement date: December 31, 2021

Time of measurement: 23:30:00

Measured cumulative amount of electric energy (AC input)

$123\,456\,789 \times 0,01 \text{ kWh} = 1\,234\,567,89 \text{ kWh}$

9.45.20 Cumulative amount of electric energy measured at fixed time (AC output) property

This property indicates the most recent cumulative amount of electric energy measured at fixed time (AC input) out of measured data at every 30 min (at 00 and 30 min every hour) (not a cumulative value over 30-minutes) held by the power generating device etc. in 4 bytes for date of measurement, 3 bytes for time of measurement, and 4 bytes for cumulative electric energy (AC output). The date of measurement is indicated in the format of two bytes for year, one byte for month, and one byte for day. The time of measurement is indicated in the format of one byte for hour, one byte for minute, and one byte for second. If power generating devices etc. do not have information on seconds as a unit of measured time, 0x00 shall be set for seconds. The unit is indicated by the unit for cumulative amount of electric energy property (EPC=0xD4). The value range is 0x00000000 to 0x3B9AC9FF (0 to 99 999 999), and when the value of cumulative amount of electric energy exceeds the maximum value of the value range, the value shall be increased again from 0x00000000 (0). If there is no measured data at the corresponding time, the value shall be 0xFFFFFFFF (no measured data).

9.45.21 Cumulative amount of electric energy measured at fixed time (independent output) property

This property indicates the most recent cumulative amount of electric energy measured at fixed time (AC input) out of measured data at every 30 min (at 00 and 30 min every hour) (not a cumulative value over 30 min) held by the power generating device etc. in 4 bytes for date of measurement, 3 bytes for time of measurement, and 4 bytes for cumulative electric energy (output during a power outage output). The date of measurement shall be indicated in the format of two bytes for year, one byte for month, and one byte for day. The time of measurement shall be indicated in the format of one byte for hour, one byte for minute, and one byte for second. If power generating units etc. do not have information on seconds as a unit of measured time, 0x00 is set for seconds. The unit is indicated by the unit for cumulative amount of electric energy property (EPC=0xD4). The property value range is 0x00000000 to 0x3B9AC9FF (0 to 99 999 999), and when the value of cumulative amount of electric energy exceeds the maximum value of the value range, the value shall be increased again from 0x00000000 (0). If there is no measured data at the corresponding time, the value shall be 0xFFFFFFFF (no measured data).

9.45.22 Measured instantaneous electric power (AC input/output) property

This property indicates the measured effective instantaneous electric power of AC input/output in W.

The value range is from 0x80000001 to 0x7FFFFFFD (from –2 147 483 647 to +2 147 483 645).

- Underflow: 0x80000000
- Overflow: 0x7FFFFFFF
- No measured data: 0x7FFFFFFE

9.45.23 Measured instantaneous electric power (independent output) property

This property indicates the measured effective instantaneous electric power of output during a power outage in W.

The value range is from 0x80000001 to 0x7FFFFFFD (from –2 147 483 647 to +2 147 483 645).

- Underflow: 0x80000000
- Overflow: 0x7FFFFFFF
- No measured data: 0x7FFFFFFE

9.46 General light class specifications

9.46.1 General

The control commands of "general light" are shown in Table 68.

Class group code : 0x02

Class code : 0x90

Table 68 – List of general light properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	–	Set	○	○	
		ON = 0x30, OFF = 0x31				Get	○		
Illuminance level	0xB0	Indicates illuminance level in %.	unsigned char	1 byte	%	Set/Get			
		0x00 to 0x64 (0 % to 100 %)							
Light colour setting	0xB1	Indicates the colour setting.	unsigned char	1 byte	–	Set/Get			
		Incandescent lamp colour = 0x41, white = 0x42, daylight white = 0x43, daylight colour = 0x44, other = 0x40, setting unknown = 0xFD							
Illuminance level step setting	0xB2	Used to specify the illuminance level in terms of steps and acquire the current setting.	unsigned char	1 byte	–	Set/Get			
		From 0x01 to the maximum specifiable illuminance level value (dark to bright)							
Light colour step setting	0xB3	Used to specify the light colour in terms of steps and acquire the current setting.	unsigned char	1 byte	–	Set/Get			
		From 0x01 to the maximum specifiable light colour value (incandescent lamp colour to white)							
Maximum specifiable values	0xB4	Used to acquire the maximum specifiable illuminance level value and the maximum specifiable light colour value of main lighting.	unsigned char × 2	2 bytes	–	Get			
		First byte: illuminance Second byte: light colour 0x01 to 0xFF (Step 1 to Step 255) 0x00 (when the function is not implemented)							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Light colour level step setting for main lighting	0xBC	Used to set the light colour level by the number of steps for main lighting and to acquire the current setting.	unsigned char	1 byte	–	Set/Get			
		0x01 to the maximum value of settable light colour level (incandescent lamp colour to white)							
Light colour setting for night lighting	0xBD	Used to set the light colour for night lighting.	unsigned char	1 byte	–	Set/Get			
		incandescent lamp colour = 0x41, white = 0x42, daylight white = 0x43, daylight colour = 0x44							
Light colour level step setting for night lighting	0xBE	Used to set the light colour level by the number of steps for night lighting and to acquire the current setting.	unsigned char	1 byte	–	Set/Get			
		0x01 to the maximum value of settable light colour level (incandescent lamp colour to white)							
Lighting mode status in automatic mode	0xBF	Used to acquire the current lighting mode in automatic mode.	unsigned char	1 byte	–	Get			
		main lighting = 0x42, night lighting = 0x43, off = 0x44, colour lighting = 0x45							
RGB setting for colour lighting	0xC0	Used to set the RGB value for colour lighting and to acquire the current setting.	unsigned char × 3	3 bytes	–	Set/Get			
		1st byte: R 2nd byte: G 3rd byte: B 0x00 to 0xFF (0 to 255) Minimum brightness = 0x00, maximum brightness = 0xFF							
ON timer reservation setting	0x90	Reservation ON/OFF	unsigned char	1 byte	–	Set/Get			
		Reservation ON = 0x41, Reservation OFF = 0x42							
ON timer setting	0x91	Timer value HH:MM	unsigned char × 2	2 bytes	–	Set/Get			
		0 to 0x17: 0 to 0x3B (= 0 to 23): (= 0 to 59)							
OFF timer reservation setting	0x94	Reservation ON/OFF	unsigned char	1 byte	–	Set/Get			
		Reservation ON = 0x41, Reservation OFF = 0x42							
OFF timer setting	0x95	Timer value HH:MM	unsigned char × 2	2 bytes	–	Set/Get			
		0 to 0x17: 0 to 0x3B (= 0 to 23): (= 0 to 59)							

9.46.2 Operation status property

Operation status ON:

When the illuminance level property (0xB0, 0xB2) does not exist: illuminated.

When the illuminance level property (0xB0, 0xB2) exists: the illuminance level is reflected in the lighting device's illuminance.

When the "Lighting mode setting" property (0xB6) has automatic mode (0x41), the lighting may be off in automatic mode.

Operation status OFF:

Extinguished.

9.46.3 Illuminance level property

This property indicates the illuminance level of lighting in % in the current lighting mode setting. This property is used to set the illuminance level and to acquire the current setting. If the illuminance level setting of the actual device is smaller or greater than the property value in %, the value of the actual device shall be assigned to this property.

When this property and the "Illuminance level step setting" property (0xB2) are implemented, their values shall be associated with each other.

The Illuminance level setting indicated by this property is that of the actual device when the "Lighting mode setting" property (0xB6) does not have the Automatic function (0x41) or when the function is implemented but the lighting mode setting is Main lighting (0x42) or Night lighting (0x43). When the lighting mode setting is Automatic (0x41), the illuminance level setting at the time of acquisition is recommended. Since the illuminance level setting indicated by this property is unknown in the Automatic status, the property value shall be 0xFD (setting unknown).

Even when the "Operation status" property (0x80) is OFF (0x31), the effectiveness of this property shall be guaranteed.

9.46.4 Light colour setting property

This property is used to set a light colour (incandescent lamp colour/white/daylight white/daylight colour/other) of lighting in the current "Lighting mode setting" and to acquire the current setting. "Other" means a light colour not belonging to any specified colour. Only property values for functions supported by a device of this class may be implemented. For a device of this class not supporting the daylight white function, there is no need to implement 0x43 for daylight white. When this property and the "Light colour step setting" property (EPC = 0xB3) are implemented, their values shall be associated with each other.

The light colour setting indicated by this property is that of the actual device when the "Lighting mode setting" property (0xB6) does not have the Automatic function (0x41) or when the function is implemented but the lighting mode setting is Main lighting (0x42) or Night lighting (0x43). When the lighting mode setting is Automatic (0x41), the lighting mode setting at the time of acquisition is recommended. Since the light colour setting indicated by this property is unknown in the Automatic status, the property value shall be 0xFD (setting unknown).

Even when the "Operation status" property (0x80) is OFF (0x31), the effectiveness of this property shall be guaranteed.

9.46.5 Illuminance level step setting property

This property indicates the illuminance level of lighting in the current "Lighting mode setting" by the number of steps. This property is also used to set the illuminance level and to acquire the current setting. The maximum value of settable illuminance level is acquired by the "Maximum specifiable values" property (EPC = 0xB4) and the "Maximum value of settable level for night lighting" property (EPC = 0xB5). No actual value is specified for illuminance level. However, the illuminance decreases as the level setting becomes smaller and increases as it becomes greater. Only property values for functions supported by a device of this class may be implemented. When this property and the "Illuminance level" property (EPC = 0xB0) are implemented, their values shall be associated with each other. With this property, the "Maximum specifiable values" property (0xB4) shall be implemented. When the "Night lighting" function (0x43) of the "Lighting mode setting" property (0xB6) is implemented, the "Maximum value of settable level for night lighting" property (0xB5) shall also be implemented.

The illuminance level step setting indicated by this property is that of the actual device when the "Lighting mode setting" property (0xB6) does not have the Automatic function (0x41) or when the function is implemented but the lighting mode setting is Main lighting (0x42) or Night lighting (0x43). When the lighting mode setting is Automatic (0x41), the illuminance level step setting at the time of acquisition is recommended. Since the illuminance level step setting indicated by this property is unknown in the Automatic status, the property value shall be 0x00 (setting unknown).

Even when the "Operation status" property (0x80) is OFF (0x31), the effectiveness of this property shall be guaranteed.

9.46.6 Light colour step setting property

This property indicates the light colour level of lighting in the current "Lighting mode setting" by the number of steps. This property is also used to set the light colour and to acquire the current setting. The maximum value of settable light colour level is acquired by the "Maximum specifiable values" property (EPC = 0xB4) and the "Maximum value of settable level for night lighting" property (EPC = 0xB5). No actual value is specified for light colour level. However, the light colour becomes closer to incandescent lamp colour as the level setting becomes smaller and closer to white as it becomes greater. Only property values for functions supported by a device of this class may be implemented. When this property and the "Light colour setting" property (EPC = 0xB1) are implemented, their values shall be associated with each other. With this property, the "Maximum specifiable values" property (0xB4) shall be implemented. When the "Night lighting" function (0x43) of the "Lighting mode setting" property (0xB6) is implemented, the "Maximum value of settable level for night lighting" property (0xB5) shall also be implemented.

The light colour step setting indicated by this property is that of the actual device when the "Lighting mode setting" property (0xB6) does not have the Automatic function (0x41) or when the function is implemented but the lighting mode setting is Main lighting (0x42) or Night lighting (0x43). When the lighting mode setting is Automatic (0x41), the light colour level step setting at the time of acquisition is recommended. Since the light colour level step setting indicated by this property is unknown in the Automatic status, the property value shall be 0x00 (setting unknown).

Even when the "Operation status" property (0x80) is OFF (0x31), the effectiveness of this property shall be guaranteed.

9.46.7 Maximum specifiable values property

This property is used to acquire the maximum specifiable illuminance level and light colour values for main lighting. This is a 2-byte property. The first byte represents the maximum specifiable illuminance level step value, and the second byte represents the maximum specifiable light colour step value. Each of the 2 bytes indicates the respective maximum specifiable value using a 255-step scale (0x01 to 0xFF). The maximum specifiable value for an unimplemented function shall be 0x00.

9.46.8 Maximum value of settable level for night lighting property

This property is used to acquire the maximum specifiable illuminance level and light colour values for night lighting. This is a 2-byte property. The first byte represents the maximum specifiable illuminance level step value, and the second byte represents the maximum specifiable light colour step value. Each of the 2 bytes indicates the respective maximum specifiable value using a 255-step scale (0x01 to 0xFF). The maximum specifiable value for an unimplemented function shall be 0x00.

9.46.9 Lighting mode setting property

This property is used to set automatic, main lighting, night lighting, or colour lighting and to acquire the current setting.

Automatic (0x41): the lighting instrument automatically selects main lighting or night lighting and controls illuminance level setting, illuminance level step setting, light colour setting, or light colour level step setting by using illuminance sensors and automatic dimming algorithms.

- Main lighting (0x42): the main light is lit.
- Night lighting (0x43): not the main light but a night light (such as a midget lamp) is lit.
- Colour lighting (0x45): colour lights are lit.

Only property values for functions supported by a device of this class may be implemented. For a device of this class not supporting the automatic function, there is no need to implement 0x41 for automatic.

9.46.10 Illuminance level setting for main lighting property

This property indicates the illuminance level in % when the "Lighting mode setting" property (EPC = 0xB6) is set to main lighting. This property is also used to set the illuminance level and to acquire the current setting. If the illuminance level setting of the actual device is smaller or greater than the property value in %, the value of the actual device shall be assigned to this property.

This property allows setting and acquisition even when the "Lighting mode setting" property (0xB6) is set to other than main lighting mode. When this property and the "Illuminance level step setting for main lighting" property (0xB8) are implemented, their values shall be associated with each other.

Even when the "Operation status" property (0x80) is OFF (0x31), the effectiveness of this property shall be guaranteed.

9.46.11 Illuminance level step setting for main lighting property

This property indicates the illuminance level by the number of steps when the "Lighting mode setting" property (EPC = 0xB6) is set to main lighting. This property is also used to set the illuminance level and to acquire the current setting. The maximum value of settable illuminance level is acquired by the "Maximum specifiable values" property (EPC = 0xB4). No actual value is specified for illuminance level. However, the illuminance decreases as the level setting becomes smaller and increases as it becomes greater. Only property values for functions supported by a device of this class may be implemented. When this property and the "Illuminance level setting for main lighting" property (EPC = 0xB7) are implemented, their values shall be associated with each other. With this property, the "Maximum specifiable values" property (0xB4) shall be implemented.

This property allows setting and acquisition even when the "Lighting mode setting" property (0xB6) is set to other than main lighting mode.

Even when the "Operation status" property (0x80) is OFF (0x31), the effectiveness of this property shall be guaranteed.

9.46.12 Illuminance level setting for night lighting property

This property indicates the illuminance level in % when the "Lighting mode setting" property (EPC = 0xB6) is set to night lighting mode. This property is also used to set the illuminance level and to acquire the current setting. If the illuminance level setting of the actual device is smaller or greater than the property value in %, the value of the actual device shall be assigned to this property.

This property allows setting and acquisition even when the "Lighting mode setting" property (0xB6) is set to other than night lighting mode. When this property and the "Illuminance level step setting in night lighting mode" property (0xBA) are implemented, their values shall be associated with each other.

Even when the "Operation status" property (0x80) is OFF (0x31), the effectiveness of this property shall be guaranteed.

9.46.13 Illuminance level step setting for night lighting property

This property indicates the illuminance level by the number of steps when the "Lighting mode setting" property (EPC = 0xB6) is set to night lighting. This property is also used to set the illuminance level and to acquire the current setting. The maximum value of settable illuminance level is acquired by the "Maximum value of settable level for night lighting" property (EPC = 0xB5). No actual value is specified for illuminance level. However, the illuminance decreases as the level setting becomes smaller and increases as it becomes greater. Only property values for functions supported by a device of this class may be implemented. When this property and the "Illuminance level setting for night lighting" property (EPC = 0xB9) are implemented, their values shall be associated with each other. With this property, the "Maximum value of settable level for night lighting" property (0xB5) shall also be implemented.

This property allows setting and acquisition even when the "Lighting mode setting" property (0xB6) is set to other than night lighting mode.

Even when the "Operation status" property (0x80) is OFF (0x31), the effectiveness of this property shall be guaranteed.

9.46.14 Light colour setting for main lighting property

This property is used to set a light colour (incandescent lamp colour 0x41/white 0x42/daylight white 0x43/daylight colour 0x44/other 0x40) when the "Lighting mode setting" property (EPC = 0xB6) is set to main lighting and to acquire the current setting. "Other" means a light colour not belonging to any specified colour. Only property values for functions supported by a device of this class may be implemented. For a device of this class not supporting the daylight white function, there is no need to implement 0x43 for daylight white.

This property allows setting and acquisition even when the "Lighting mode setting" property (0xB6) is set to other than main lighting mode. When this property and the "Light colour level step setting for main lighting" property (0xBC) are implemented, their values shall be associated with each other.

Even when the "Operation status" property (0x80) is OFF (0x31), the effectiveness of this property shall be guaranteed.

9.46.15 Light colour level step setting for main lighting property

This property indicates the light colour level by the number of steps when the "Lighting mode setting" property (EPC = 0xB6) is set to main lighting. This property is also used to set the light colour level and to acquire the current setting. The maximum value of settable light colour level is acquired by the "Maximum specifiable values" property (EPC = 0xB4). No actual value is specified for light colour level. However, the light colour becomes closer to incandescent lamp colour as the level setting becomes smaller and closer to white as it becomes greater. Only property values for functions supported by a device of this class may be implemented. Whenever this property is implemented, the "Maximum specifiable values" property (EPC = 0xB4) shall also be implemented.

This property allows setting and acquisition even when the "Lighting mode setting" property (0xB6) is set to other than main lighting mode. When this property and the "Light colour setting for main lighting" property (0xBB) are implemented, their values shall be associated with each other.

Even when the "Operation status" property (0x80) is OFF (0x31), the effectiveness of this property shall be guaranteed.

9.46.16 Light colour setting for night lighting property

This property is used to set a light colour (incandescent lamp colour 0x41/white 0x42/daylight white 0x43/daylight colour 0x44/other 0x40) when the "Lighting mode setting" property (EPC = 0xB6) is set to night lighting and to acquire the current setting. "Other" means a light colour not belonging to any specified colour. Only property values for functions supported by a device of this class may be implemented. For a device of this class not supporting the daylight white function, there is no need to implement 0x43 for daylight white.

This property allows setting and acquisition even when the "Lighting mode setting" property (0xB6) is set to other than night lighting mode. When this property and the "Light colour level step setting for night lighting" property (0xBE) are implemented, their values shall be associated with each other.

Even when the "Operation status" property (0x80) is OFF (0x31), the effectiveness of this property shall be guaranteed.

9.46.17 Light colour level step setting for night lighting property

This property indicates the light colour level by the number of steps when the "Lighting mode setting" property (EPC = 0xB6) is set to night lighting. This property is also used to set the light colour level and to acquire the current setting. The maximum value of settable light colour level is acquired by the "Maximum value of settable level for night lighting" property (EPC = 0xB5). No actual value is specified for light colour level. However, the light colour becomes closer to incandescent lamp colour as the level setting becomes smaller and closer to white as it becomes greater. Only property values for functions supported by a device of this class may be implemented. Whenever this property is implemented, the "Maximum value of settable level for night lighting" property (0xB5) shall also be implemented.

This property allows setting and acquisition even when the "Lighting mode setting" property (0xB6) is set to other than night lighting mode. When this property and the "Light colour setting for night lighting" property (0xBD) are implemented, their values shall be associated with each other.

Even when the "Operation status" property (0x80) is OFF (0x31), the effectiveness of this property shall be guaranteed.

9.46.18 Lighting mode status in automatic mode property

This property is used to acquire the lighting status of an actual device when the "Lighting mode setting" property (EPC = 0xB6) is set to automatic (0x41), main lighting (0x42), night lighting (0x43), off (0x44), or colour lighting (0x45).

Only property values for functions supported by a device of this class may be implemented. For a device of this class not supporting the night lighting function, there is no need to implement 0x43 for night lighting.

9.46.19 RGB setting for colour lighting property

This property is used to set the RGB value when the "Lighting mode setting" property (EPC = 0xB6) is set to colour lighting (0x45) and to acquire the current setting. No actual value is specified for RGB. Only property values for functions supported by a device of this class may be implemented. If the RGB setting by this property is not acceptable, the closest acceptable value is set. This property allows setting and acquisition even when the "Lighting mode setting" property (0xB6) is set to other than colour lighting mode (0x45).

9.46.20 ON timer reservation setting property

This property specifies whether the ON timer reservation is ON or OFF. This property shall be related to the "ON timer setting" property.

Reservation ON = 0x41; reservation OFF = 0x42

This property shall be effective even when the value of the "Operation status" property (0x80) is OFF (0x31).

9.46.21 ON timer setting property

This property indicates when the setting of the "ON timer reservation setting" property is "ON," the time at which the device will be turned on. The "hour (0x00 to 0x17 (0 to 23)): minute (0x00 to 0x3B (0 to 59))" format shall be used, with the higher- and lower-order bytes used for the "hour" and "minute" values, respectively.

This property shall be effective even when the value of the "Operation status" property (0x80) is OFF (0x31).

9.46.22 OFF timer reservation setting property

This property specifies whether the OFF timer reservation is ON or OFF. This property shall be related to the "OFF timer setting" property.

Reservation ON = 0x41; reservation OFF = 0x42

This property shall be effective even when the value of the "Operation status" property (0x80) is OFF (0x31).

9.46.23 OFF timer setting property

This property indicates when the setting of the "OFF timer reservation setting" property is "ON," the time at which the device will be turned off. The "hour (0x00 to 0x17 (0 to 23)); minute (0x00 to 0x3B (0 to 59))" format shall be used, with the higher- and lower-order bytes used for the "hour" and "minute" values, respectively.

This property shall be effective even when the value of the "Operation status" property (0x80) is OFF (0x31).

9.47 Mono functional lighting class specifications

9.47.1 General

The control commands of "mono functional lighting" are shown in Table 69.

Class group code : 0x02

Class code : 0x91

Table 69 – List of mono functional lighting properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	–	Set	○	○	
		ON = 0x30, OFF = 0x31				Get	○		
Illuminance level setting	0xB0	Indicates illuminance level in %.	unsigned char	1 byte	%	Set/Get			
		0x00 to 0x64 (0 % to 100 %)							

This class is used for lighting not supported by general lighting class requirements. Operation status settings of ON (when switched on) / OFF (when extinguished) are possible, irrespective of the lighting mode.

9.47.2 Operation status property

This property indicates whether the status of lighting devices is ON (switched on) or OFF (extinguished).

9.47.3 Illuminance level setting property

This property indicates the current illuminance level of lighting in %. This property is used to set the illuminance level and to acquire the current setting. If the illuminance level setting of the actual device is smaller or greater than the property value in %, the value of the actual device shall be assigned to the property value in % required for this property.

Solid light-emitting sources (e.g. LEDs or laser light sources) can emit a variety of lights in combination with light-emitting devices and phosphor. As they can greatly change colour and brightness by controlling light outputs that are created by synthesizing light sources with a variety of colours, their market penetration is expected to rapidly rise in near future. Figure 85 shows actual implementation cases from the solid light-emitting source class. As a type, multiple light sources are connected to a single instance. Figure 85 shows an example where multiple instances are connected; however, a single instance is also acceptable.

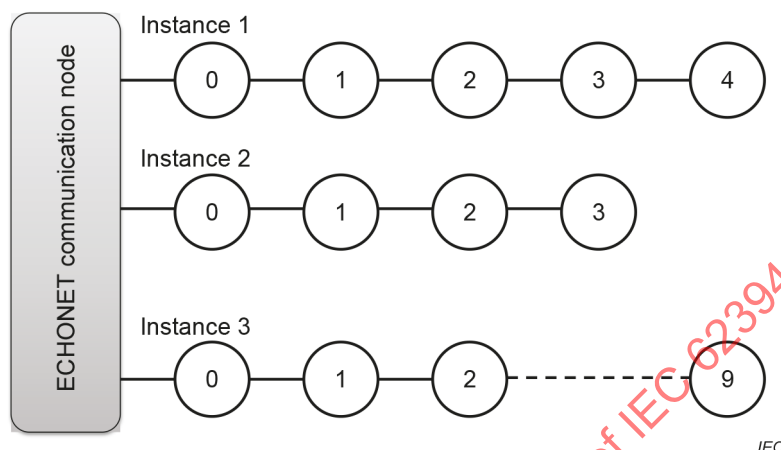


Figure 85 – Actual implementation cases from the solid light-emitting source class

The lighting will be completely dark when it is turned off using the controller, which can create safety concerns. Therefore, it is necessary to take into consideration the safety operation of the lighting setting.

9.48.2 Operation status property

This property indicates whether the lighting (overall light source) is turned on (ON state) or turned off (OFF state). For Set, ON/OFF for the light sources as a whole shall be designated. For Get, when one or more light sources are turned on, the light source shall respond in the ON state, while responding with OFF when all light sources are turned off.

9.48.3 Number of light sources property

This property indicates number of the target light sources. Possible values shall be 1 through 253.

9.48.4 List of the light source operation status property

This property indicates the ON/Off states for N light sources in a list form. The list is composed of one or more, up to N arraignment data [] (the size of each element is 1 byte). The data [0] indicates the operation status of the 1st light source, while the data [N - 1] indicates the operation status of the Nth light source. If the status in the "ith" light source cannot be acquired due to a failure, data [i - 1] shall be 0xFE (setting value unknown). The operation status value for each light source to be responded when receiving a read request shall be listed in either value of 0x30 (ON), 0x31 (OFF), or 0xFE (setting unknown).

When setting this property value, operation status values for all light sources from data [0] to data [N - 1] shall be written. In this case, 0xFF (setting value not reflected) shall be set for the light sources that do not change the operation status value, instead of the values of 0x30 (ON) and 0x31 (OFF). For example, if designating the ON or OFF state only for the "ith" light source and not making particular changes for other light sources when setting the value, 0xFF shall be designated as values of all elements excluding data [i - 1].

Table 71 shows the examples of the relevant list when operating Get. The optical output setting value of the 1st, 3rd, and 5th light source is turned on, while the 2nd light source is turned off, and 4th light source setting is unknown.

Table 71 – Examples of the list of the light source operation status when operating Get

	data [0]	data [1]	data [2]	data [3]	data [4]
Light source operation status	0x30	0x31	0x30	0xFE	0x30

Table 72 shows the examples of the relevant list when operating Set. The 1st and 3rd light sources are turned off.

Table 72 – Examples of the list of the light source operation status when operating Set

	data [0]	data [1]	data [2]	data [3]	data [4]
Light source operation status	0x31	0xFF	0x31	0xFF	0xFF

9.48.5 List of the light source optical output setting values property

This property indicates current optical output of the light sources in increments of maximum power ratio (%) for the N light sources in a list form. The list is composed of one or more, up to N arrangement data [] (the size of each element is 1 byte). The data [0] indicates the optical output setting value of the 1st light source, while the data [N – 1] indicates the optical output setting value of the Nth light source. If the optical output setting value in the "ith" light source cannot be acquired due to failure, data [i – 1] shall be 0xFE (setting value unknown). The optical output setting value for each light source to be responded when receiving a read request shall be listed in either value of 0x00 to 0x64 (0 % to 100 %) or 0xFE (setting unknown).

When setting this property value, optical output setting values for all light sources from data [0] to data [N – 1] shall be written. In this case, 0xFF (setting value not reflected) shall be set for the light sources not changing the optical output setting value, instead of values of 0x00 to 0x64 (0 % to 100 %). For example, if designating optical output setting value only for the "ith" light source and not making particular changes for other light sources when setting the value, 0xFF shall be designated as values of all elements excluding data [i – 1]. If the optical output setting of the actual device is lower or higher than the % unit, the property of the actual device shall be assigned to the property value of % unit specified in this property. This property shall be effective even when the value of the "Operation status" property (0x80) is OFF (0x31).

Table 73 shows the examples of the relevant list when operating Get. The optical output setting value of the 1st, 3rd, and 5th light source is 20 %, while that of the 2nd light source is 100 %, and that of the 4th light source setting is unknown.

Table 73 – Examples of the list of the light source optical output setting values when operating Get

	data [0]	data [1]	data [2]	data [3]	data [4]
Light source optical output setting value	0x14	0x64	0x14	0xFE	0x14

Table 74 shows the examples of the relevant list when operating Set. The optical output setting value of 1st and 3rd light sources is 100 %.

Table 74 – Examples of the list of the light source optical output setting values when operating Set

	data [0]	data [1]	data [2]	data [3]	data [4]
Light source optical output setting value	0x64	0xFF	0x64	0xFF	0xFF

9.48.6 List of light source colour temperature setting values property

This property indicates current colour temperature of the light sources in kelvin (unit: 50 K) for the N light sources in a list form. The list is composed of one or more, up to N arraignment data [] (the size of each element is 1 byte). The data [0] indicates the colour temperature setting value of the 1st light source, while the data [N – 1] indicates the colour temperature setting value of the Nth light source. If the colour temperature setting value in the "ith" light source cannot be acquired due to failure, data [i – 1] shall be 0xFE (setting value unknown). The colour temperature setting values for each light source to be responded when receiving a read request shall be listed in either value of 0x01 (50 K) to 0xFD (12 650 K) or 0xFE (setting unknown).

When setting this property value, colour temperature setting values for all light sources from data [0] to data [N – 1] shall be written. In this case, 0xFF (setting value not reflected) shall be set for the light sources not changing the colour temperature setting value, instead of values of 0x01 (50 K) to 0xFD (12 650 K). For example, if designating colour temperature setting value only for the "ith" light source and not making particular changes for other light sources when setting the value, 0xFF shall be designated as values of all elements excluding data [i – 1].

This property indicates that the colour temperature setting value is the colour temperature setting value of the actual devices. This property shall be effective even when the value of the "Operation status" property (0x80) is OFF (0x31). For example, under JIS Z 8725, the lower limit value of the colour temperature is 1 563 K, while the upper limit value of the colour temperature is infinite.

Table 75 shows the examples of the relevant list when operating Get. The colour temperature setting value of the 1st, 3rd, and 5th light source is 3 000 K, while that of the 2nd light source is 5 000 K, and that of the 4th light source setting is unknown.

Table 75 – Examples of the list of light source colour temperature setting values when operating Get

	data [0]	data [1]	data [2]	data [3]	data [4]
Light source colour temperature setting value	0x3C	0x64	0x3C	0xFE	0x3C

Table 76 shows the examples of the relevant list when operating Set. The colour temperature setting value of the 1st and 3rd light sources is 5 000 K.

Table 76 – Examples of the list of light source colour temperature setting values when operating Set

	data [0]	data [1]	data [2]	data [3]	data [4]
Light source colour temperature setting value	0x64	0xFF	0x64	0xFF	0xFF

9.48.7 ON timer reservation setting property

Reservation for on and off for the ON timer shall be set. This property relates to "ON timer setting" property.

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Remaining chargeable capacity of vehicle mounted battery	0xCF	Indicates the remaining chargeable capacity of a vehicle battery connected to an electric vehicle charger in Wh. 0x00000000 to 0x3B9AC9FF (0 Wh to 999 999 999 Wh)	unsigned long	4 bytes	Wh	Get	○		e
Used capacity of vehicle-mounted battery 1	0xD0	Indicates the capacity of a vehicle-mounted battery of an electric vehicle connected to an electric vehicle charger in Wh 0x00000000 to 0x3B9AC9FF (0 Wh to 999 999 999 Wh)	unsigned long	4 bytes	Wh	Get	○		b
Rated voltage	0xD2	Indicates the normal rated voltage of an electric vehicle charger in V 0x0000 to 0x7FFE (0 V to 32 766 V)	unsigned short	2 bytes	V	Get			
Measured instantaneous charging electric power	0xD3	Indicates the instantaneous charging electric power in W 0x00000000 to 0x3B9AC9FF (0 W to 999 999 999 W)	signed long	4 bytes	W	Get			
Measured cumulative amount of charging electric energy	0xD8	Indicates the cumulative amount of charging electric energy in increments of 0,001 kWh 0x00000000 to 0x3B9AC9FF (0 kWh to 999 999,999 kWh)	unsigned long	4 bytes	0,001 kWh	Get			
Cumulative amount of charging electric energy reset setting	0xD9	Resets the cumulative amount of charging electric energy Reset = 0x00	unsigned char	1 byte	–	Set			
Operating mode setting	0xDA	Sets the operating mode (Charging / Standby / Idle / Other) Charging = 0x42, Standby = 0x44, Idle = 0x47, Other = 0x40	unsigned char	1 byte	–	Set/Get	○	○	
Remaining stored electricity of vehicle-mounted battery 1	0xE2	Indicates the remaining stored electricity of a vehicle-mounted battery of an electric vehicle connected to an electric vehicle charger in Wh 0x00000000 to 0x3B9AC9FF (0 Wh to 999 999 999 Wh)	unsigned long	4 bytes	Wh	Get	○		c

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Remaining stored electricity of vehicle-mounted battery 3	0xE4	Indicates the remaining stored electricity of a vehicle-mounted battery an electric vehicle connected to an electric vehicle charger in % 0x00 to 0x64 (0 % to 100 %)	unsigned char	1 byte	%	Get	○		^c
Vehicle ID	0xE6	Indicates the vehicle ID information of an electric vehicle connected to an electric vehicle charger. First byte (data size for vehicle ID information): 0x01 through 0x18 (1 to 24), 0x00 if no vehicle ID is available. Second and succeeding bytes (vehicle ID information): data specified for each vehicle. No second and succeeding bytes exist if no vehicle ID information is available.	unsigned char	MAX 25 bytes	–	Get	○		
Charging amount setting	0xE7	Specifies the charging electric energy in Wh. 0x00000000 to 0x3B9AC9FF (0 Wh to 999 999 999 Wh)	unsigned long	4 bytes	Wh	Set/Get			
Charging electric power setting	0xEB	Designates the charging electric power in W 0x00000000 to 0x3B9AC9FF (0 W to 999 999 999 W)	unsigned long	4 bytes	W	Set/Get			
Charging current setting	0xED	Designates the charging current in increments of 0,1 A 0x0000 to 0xFFFFD (0 A to 6 553,3 A)	unsigned short	2 bytes	0,1 A	Set/Get			
^a "Vehicle connection confirmation" is only mandatory when the charger type is DC_type AA. ^b "Used capacity of vehicle-mounted battery 1" is mandatory in cases of output from an electric vehicle connected to an electric vehicle charger. If no response can be returned, "Response impossible" is returned. ^c Installation of either "Remaining stored electricity of vehicle-mounted battery 1" or "Remaining stored electricity of vehicle-mounted battery 3" is mandatory in cases of output from an electric vehicle connected to an electric vehicle charger. If no response can be returned, "Response impossible" is returned. ^d DC_type AA, DC_type BB, DC_type EE and DC_type FF charger shall be electric vehicle chargers with connectors of the shape specified in Configuration AA, Configuration BB, Configuration EE and Configuration FF as defined in IEC 62196-3. ^e The installation of "chargeable capacity of vehicle mounted battery" and "chargeable capacity of vehicle mounted battery" is mandatory in case of output from an electric vehicle connected to an electric vehicle charger.									

Electric vehicle chargers are chargers that include Electric Vehicle Power Systems (EVPS) connected to electric vehicles. Since an electric vehicle connected to an electric vehicle charger can be changed, the property values of the electric vehicle charger will also vary in accordance with the electric vehicle connected to the electric vehicle charger. Therefore, when the "Vehicle connection and chargeable status" changes from "Not connected to vehicle" to "Connected to vehicle", the connected electric vehicle may be different. For this reason, it is preferable to acquire property values for specifications determined by the electric vehicle and EVPS.

For example: used capacity of vehicle-mounted battery 1.

AC is assumed for currents, voltages and electric energies handled in this class.

A relationship between the properties related to electric energy that are handled in this class is shown in Figure 86. Actual capacities shall be determined based on the information from the electric vehicle connected to a charger, considering the efficiency of chargers.

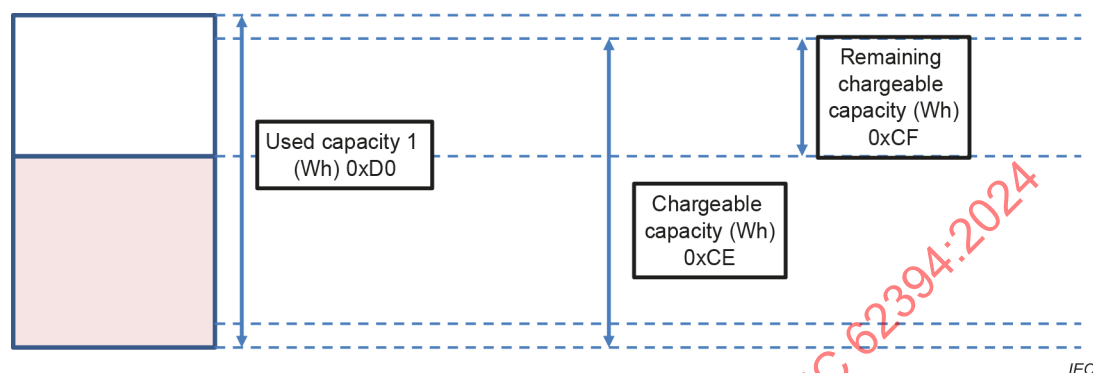


Figure 86 – Relationship between the properties related to electric energy handled in this class

The following properties are output as information of electric vehicle chargers, instead of information acquired from the electric vehicles.

- 0x80: Operation status
- 0xC5: Rated charge capacity
- 0xC8: Minimum/maximum charging electric power
- 0xCA: Minimum/maximum charging current
- 0xCC: Charger type
- 0xD2: Rated voltage
- 0xD3: Measured instantaneous charging electric power
- 0xD8: Measured cumulative amount of charging electric energy
- 0xDA: Operating mode setting

For properties based on the information acquired from electric vehicles connected to the electric vehicle chargers, an example of the conversion calculation is shown in each property description in 9.49. The examples are based on DC-type AA vehicles and assume the maximum charge efficiency of the chargers as 1.

The terms to be used in following detailed descriptions shall be defined as follows.

- Total battery capacity: "used capacity of vehicle-mounted battery 1" property.
- Charging rate of the battery: "remaining stored electricity of vehicle-mounted battery 3" property.
- Constant number for charging rate indication: a fixed number to indicate charging rate (100 % (0x64)).
- Charge upper limit for charging rate: the upper limit value to which a vehicle can allow charging.
- Charger charge efficiency: conversion efficiency between direct current and alternating current when charged from an electric vehicle charger.

9.49.2 Operation status property

This property indicates whether an electric vehicle charger is ready to acquire status and accept settings (ON) or not (OFF). The property value is 0x30 for ON and 0x31 for OFF.

9.49.3 Rated charge capacity property

This property indicates the rated charge capacity of an electric vehicle charger in increments of watts. The value range for this property shall be 0x00000000 to 0x3B9AC9FF (0 W to 999 999 999 W).

9.49.4 Vehicle connection and chargeable status property

This property indicates whether an electric vehicle charger can be charged. The property value shall be 0x30 when no vehicle is connected, 0x40 when a vehicle is connected but not chargeable, 0x41 when the vehicle is chargeable, and 0x44 when chargeable status is unknown.

"0x44" shall be used also, if the vehicle status is unknown until charging or is started, the chargeable status shall be output when a charging start instruction is given. If the connection status of a vehicle cannot be determined, this property indicates 0xFF as the undetermined status.

Vehicle connection and chargeable status shall be determined according to the combination of following information.

1) Vehicle connection/disconnection confirmation

Vehicles shall be considered "connected" when a charger connector is locked and/or a signal line between the charger and the vehicle is connected. Vehicles shall be considered "not connected" (0x30) when a charger connector is not locked and/or a signal line between the charger and the vehicle is not connected.

2) Chargeable/not chargeable determination

Chargeable/not chargeable determination shall be performed based on vehicle connection status.

When a vehicle does not support a discharging, the vehicle shall be chargeable.

When a vehicle supports a discharging, and a charge upper limit for charging rate is not 0, and charging rate is lower than charge upper limit for charging rate, the vehicle shall be chargeable.

When a vehicle supports a discharging, and a charge upper limit for charging rate is 0, the vehicle shall be chargeable.

When a vehicle does not support charging, the vehicle shall not be chargeable.

9.49.5 Minimum/maximum charging electric power property

This property indicates the minimum and maximum charging electric powers to an electric vehicle charger in increments of watts. The value range of each shall be 0x00000000 to 0x3B9AC9FF (0 W to 999 999 999 W). The property value represents minimum and maximum in sequence from the highest-order byte. When the property value of the actual device is higher than the property value range, overflow code 0xFFFFFFFF shall be used.

9.49.6 Minimum/maximum charging current property

This property indicates the minimum and maximum charging currents of an electric vehicle charger in increments of 0,1 A. The value range of each shall be 0x0000 to 0x7FFE (0 A to 3 276,6 A). The property value represents minimum and maximum in sequence from the highest-order byte. When the property value of the actual device is higher than the property value range, overflow code 0xFFFF shall be used.

9.49.7 Charger type property

This property indicates the type of electric vehicle charger. As the type of electric vehicle charger, it indicates one of AC_CPLT (0x11), AC_HLC (charging only) (0x12), DC_type AA (charging only) (0x21), DC_type BB (charging only) (0x31), DC_type EE (charging only) (0x41), and DC_type FF (charging only) (0x51).

Explanation of charger types

AC_CPLT (0x11): Uses alternating current to charge the electric vehicle and CPLT signals to communicate with the electric vehicle.

AC_HLC (charging only) (0x12): Uses alternating current to charge the electric vehicle and both CPLT and HLC signals to communicate with the electric vehicle.

DC_type AA (charging only) (0x21): Uses direct current to charge the electric vehicle and type AA signals to communicate with the electric vehicle.

DC_type BB (charging only) (0x31): Uses direct current to charge the electric vehicle and type BB signals to communicate with the electric vehicle.

DC_type EE (charging only) (0x41): Uses direct current to charge the electric vehicle and type EE signals to communicate with the electric vehicle.

DC_type FF (charging only) (0x51): Uses direct current to charge the electric vehicle and type FF signals to communicate with the electric vehicle.

Explanation of the relationship between charger type and "Vehicle connection and chargeable status" (0xC7).

AC_CPLT (0x11): Always undetermined (0xFF).

AC_HLC (charging only) (0x12): undetermined (0xFF) when only CPLT functions are installed in the connected vehicle. When both CPLT and HLC functions are installed in the vehicle, the content is as indicated under vehicle connection and chargeable status (0xC7).

DC_type AA (charging only) (0x21): undetermined (0xFF) until information is acquired via vehicle connection confirmation (0xCD). After information is acquired, the content is as indicated under vehicle connection and chargeable status.

DC_type BB (charging only) (0x31), DC_type EE (charging only) (0x41) and DC_type FF (charging only) (0x51): content is as indicated under vehicle connection and chargeable status (0xC7).

9.49.8 Vehicle connection confirmation property

This property confirms the connection status between an electric vehicle charger and an electric vehicle. "Connection status" shall mean a status that a charger connector is locked and/or a signal line between the charger and a vehicle is connected.

This property is only mandatory if the electric vehicle charger type is one of DC_type AA (charging only) (0x21).

9.49.9 Used capacity of vehicle-mounted battery 1 property

This property indicates the capacity of a battery fitted in an electric vehicle connected to an electric vehicle charger, in increments of Wh. The value range for this property shall be 0x00000000 to 0x3B9AC9FF (0 Wh to 999 999 999 Wh).

This property shall be output based on information acquired from the vehicle.

9.49.10 Rated voltage property

This property indicates the normal rated voltage of an electric vehicle charger in increments of V. The value range for this property shall be 0x0000 to 0x7FFE (0 V to 32 766 V).

9.49.11 Measured instantaneous charging electric power property

This property indicates the instantaneous electric power of an electric vehicle charger when in charging, in increments of watts. In case of charging, the value range for this property shall be 0x00000000 to 0x3B9AC9FF (0 W to 999 999 999 W). When the property value of the actual device is higher than the property value range, overflow code 0x7FFFFFFF shall be used. The value when not charging is 0.

9.49.12 Measured cumulative amount of charging electric energy property

This property indicates the cumulative amount of electric energy when charging an electric vehicle charger, in increments of 0,001 kWh. The value range for this property shall be 0x00000000 to 0x3B9AC9FF (0 kWh to 999 999,999 kWh). When the cumulative amount of electric energy overflows, the property value shall be incremented again from 0x00000000.

9.49.13 Cumulative amount of charging electric energy reset setting property

This property resets the measured cumulative amount of charging electric energy to zero by setting 0x00.

9.49.14 Operating mode setting property

This property indicates the operating mode of an electric vehicle charger. As operating modes, it indicates one of Charging (0x42), Standby (0x44), Idle (0x47) and Other (0x40).

Other (0x40) indicates that the charger is not in one of Charging, Standby or Idle modes. Standby (0x44) indicates that the power converter operation is halted or the charging path to the electric vehicle is open, and it can automatically switch to charging when detecting a chargeable electric vehicle connected to the charger. Idle (0x47) indicates that the power converter operation is halted or the charging path to the electric vehicle is open, and it will not automatically switch to charging when detecting a chargeable electric vehicle connected to the charger.

9.49.15 Remaining stored electricity of vehicle-mounted battery 1 property

This property indicates the remaining stored electricity of a battery fitted in an electric vehicle connected to an electric vehicle charger, in Wh. The value range for this property shall be 0x00000000 to 0x3B9AC9FF (0 Wh to 999 999 999 Wh).

9.49.16 Remaining stored electricity of vehicle-mounted battery 3 property

This property indicates the remaining stored electricity of a battery fitted in an electric vehicle connected to an electric vehicle charger (SOC: State of Charge) in %. The value range for this property shall be 0x00 to 0x64 (0 % to 100 %).

This property shall be output based on information acquired from the vehicle.

9.49.17 Charging electric power setting property

This property designates the electric power to the electric vehicle charger when charging, in increments of watts. The value range for this property shall be 0x00000000 to 0x3B9AC9FF (0 W to 999 999 999 W).

9.49.18 Charging current setting property

This property designates the amount of electric current to the electric vehicle charger when charging, in increments of 0,1 A. The value range for this property shall be 0x0000 to 0xFFFF (0 A to 6 553,3 A).

9.49.19 Chargeable capacity of vehicle mounted battery property

This property indicates the chargeable capacity of a vehicle battery connected to an electric vehicle charger in increments of Wh. The property value range shall be 0x00000000 to 0x3B9AC0FF (0 Wh to 999 999 999 Wh).

Based on information obtained from the vehicle, calculation shall be implemented using following formula:

$$(\text{Total battery capacity} \times \text{charge upper limit for charging rate} \div 100) \div \text{charger charge efficiency}$$

9.49.20 Remaining chargeable capacity of vehicle mounted battery property

This property indicates the remaining chargeable capacity of a vehicle battery connected to an electric vehicle charger in increments of Wh. The property value range shall be 0x00000000 to 0x3B9AC0FF (0 Wh to 999 999 999 Wh).

Based on information obtained from the vehicle, calculation shall be implemented using following formula:

$$(\text{Total battery capacity} \times (\text{charge upper limit for charging rate} - \text{charging rate of the battery}) \div 100) \div \text{charger charge efficiency}$$

9.49.21 Vehicle ID property

This property stores the data size of the vehicle ID information of an electric vehicle connected to an electric vehicle charger and vehicle ID information as shown in Figure 87. Data length shall be variable, and it shall be vehicle ID information + 1. If vehicle ID cannot be acquired, 0x00 shall be stored in the first byte (number of bytes of vehicle ID information). In this case, data size shall be 1 byte.

Data size of the vehicle ID information (1 byte)	Vehicle ID information (Max 24 bytes)

IEC

Figure 87 – Data structure of vehicle ID in electric vehicle charger class

This property shall be effective when a value of the vehicle connection and chargeable status (0xC7) is 0x40, 0x41, and 0x44. Using the vehicle ID for billing purposes is not recommended due to potential security issues.

This property specifies the charging electric energy in increments of Wh. The property value range shall be 0x00000000 to 0x3B9AC0FF (0 Wh to 999 999 999 Wh). The property value "0x00000000" shall be "not set". During charging operation based on this setting value, there is no change in the value based on the charging energy (there is no successive change corresponding to actual performance of charging energy). If this property is set during charging operation based on this setting value, charging shall start based on the cumulative value of electric energy from the point in time indicated by the charging amount setting if reflected, regardless of the charged amount. When charging operation based on this setting value is completed, the operation mode setting becomes "Standby". There are also cases where charging ends without the electric energy set for this setting value being charged. If charging until the chargeable capacity of the vehicle mounted battery becomes 0, specify a value greater than the chargeable capacity of the vehicle mounted battery for this setting value.

9.50.1 General

Class group code : 0x02

Class code : 0xA2

Table 78 – List of household small wind turbine power generation properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status	unsigned char	1 byte	–	Set		○	
		ON = 0x30, OFF = 0x31				Get	○		
System interconnection status	0xD0	Indicates system interconnection status	unsigned char	1 byte	–	Get			
		System interconnected = 0x00 Independent = 0x01 Hybrid = 0x02							
Measured instantaneous amount of electricity generated	0xE0	Indicates instantaneous generated power in W.	unsigned short	2 bytes	W	Get	○		
		0x0000 to 0xFFFFD (0 to 65 533)							
Measured cumulative amount of electricity generated	0xE1	Indicates integral electric energy in 0,001 kWh.	unsigned long	4 bytes	0,001 kWh	Get	○		
		0x0 to 0x3B9AC9FF (0 kWh to 999 999,999 kWh)							
Resetting cumulative amount of electricity generated	0xE2	Resets integral generated electric energy by setting 0x00.	unsigned char	1 byte	–	Set			
		Reset = 0x00							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Measured cumulative amount of electricity sold	0xE3	Indicates integral value of sold power in 0,001 kWh.	unsigned long	4 bytes	0.001 kWh	Get			
		0x0 to 0x3B9AC9FF (0 kWh to 999 999,999 kWh)							
Resetting cumulative amount of electricity sold	0xE4	Resets integral sold electric energy by setting 0x00.	unsigned char	1 byte	–	Set			
		Reset = 0x00							
Power generation output limit setting 1	0xE5	Specifies the power generation output as a percentage of the rated power generation output and to acquire the current setting.	unsigned char	1 byte	%	Set/Get			
		0x00 to 0x64 (0 % to 100 %)							
Power generation output limit setting 2	0xE6	Specifies the power generation output in watts and to acquire the current setting.	unsigned short	2 bytes	W	Set/Get			
		0x0000 to 0xFFFFD (0 to 65 533)							
Limit setting for the amount of electricity sold	0xE7	Specifies, in watts, the amount of electricity sold and to acquire the current setting.	unsigned short	2 bytes	W	Set/Get			
		0x0000 to 0xFFFFD (0 to 65 533)							
Rated power	0xE8	Indicates the rated power generation output in watts.	unsigned short	2 bytes	W	Get			
		0x0000 to 0xFFFFD (0 to 65 533)							
Measured wind speed	0xEA	Indicates the wind speed in meters per second.	unsigned char	1 byte	m/s	Get			
		0x00 to 0xFD (0 to 253)							
Rated wind speed	0xEB	Indicates the rated wind speed in meters per second.	unsigned char	1 byte	m/s	Get			
		0x00 to 0xFD (0 to 253)							
Cut-in wind speed	0xEC	Indicates the cut-in wind speed in meters per second.	unsigned char	1 byte	m/s	Get			
		0x00 to 0xFD (0 to 253)							
Cut-out wind speed	0xED	Indicates the cut-out wind speed in meters per second.	unsigned char	1 byte	m/s	Get			
		0x00 to 0xFD (0 to 253)							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Extreme wind speed	0xEE	Indicates the extreme wind speed in meters per second.	unsigned char	1 byte	m/s	Get			
		0x00 to 0xFD (0 to 253)							
Braking status	0xEF	Indicates the braking status of wind turbine.	unsigned char	1 byte	–	Set/Get	○	○	
		ON = 0x30, OFF = 0x31							

9.50.2 Operation status property

This property indicates the operation status as a household small wind turbine power generation inverter. The status where power is supplied to the system side shall be defined as the "Operating status"

9.50.3 System interconnection status property

This property indicates system interconnection status. System interconnected = 0x00, Independent = 0x01, Hybrid = 0x02

9.50.4 Measured instantaneous amount of electricity generated property

This property indicates the instantaneous output in watts. The property value range shall be 0x0000 to 0xFFFFD. When the property value of the actual piece of equipment is higher than the upper limit of the property value range, the overflow code 0xFFFF shall be used. When the property value is lower than the lower limit of the property value range, the underflow code 0xFFFE shall be used.

9.50.5 Measured cumulative amount of electricity generated property

This property indicates the integral generated electric energy in kWh. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 kWh to 999 999 999 kWh). When the integral electric energy overflows, the property value shall be incremented again from 0x00000000.

9.50.6 Resetting cumulative amount of electricity generated property

This property resets the integral generated electric energy to zero by setting 0x00.

9.50.7 Measured cumulative amount of electricity sold property

This property indicates the integral sold electric energy in kWh. The property value range shall be 0x00000000 to 0x3B9AC9FF (0 kWh to 999 999 999 kWh). When the integral electric energy overflows, the property value shall be incremented again from 0x00000000.

9.50.8 Resetting cumulative amount of electricity sold property

This property resets the integral generated electric energy to zero by setting 0x00.

9.50.9 Power generation output limit setting 1 property

This property is used to specify the power generation output as a percentage of the rated power generation output and to acquire the current setting. The value range for this property shall be from 0 to 100 (from 0x00 to 0x64), and the unit is %. When the value of this property is 100, no limit is imposed. In the case where it is not possible to limit the power generation output using the value specified by this property, the power generation output shall be limited using a value that is closest to and lower than the value specified by this property.

9.50.10 Power generation output limit setting 2 property

This property is used to specify the power generation output in watts and to acquire the current setting. The value range for this property shall be from 0x0000 to 0xFFFFD (from 0 to 65 533). In the case where it is not possible to limit the power generation output using the value specified by this property, the power generation output shall be limited using a value that is closest to and lower than the value specified by this property.

9.50.11 Limit setting for the amount of electricity sold property

This property is used to specify, in watts, the amount of electricity sold and to acquire the current setting. The value range for this property shall be from 0x0000 to 0xFFFFD (from 0 to 65 533). In the case where it is not possible to limit the amounts of electricity sold using the value specified by this property, the amount of electricity sold shall be limited using a value that is closest to and lower than the value specified by this property.

9.50.12 Rated power property

This property indicates the rated power generation output in watts. This value is very important, since when the wind speed exceeds rated wind speed, there must be a control operation to avoid exceeding this value and avoid damaging the machine. If the wind speed exceeds cut-out wind speed, where the machine cannot control the speed, it requires such action as a standstill. The value range for this property shall be from 0x0000 to 0xFFFFD (from 0 to 65 533).

9.50.13 Measured wind speed property

This property indicates the wind speed measured in metres per second. The value range for this property shall be from 0x00 to 0xFD (from 0 to 253).

9.50.14 Rated wind speed property

This property indicates the rated wind speed in metres per second. The value range for this property shall be from 0x00 to 0xFD (from 0 to 253).

9.50.15 Cut-in wind speed property

This property indicates the cut-in wind speed at which the turbine first starts to rotate and generate power. The value range for this property shall be from 0x00 to 0xFD (from 0 to 253).

9.50.16 Cut-out wind speed property

This property indicates the cut-out wind speed that may have a risk of damage to the rotor. As a result, a braking system is employed to bring the rotor to a standstill. The value range for this property shall be from 0x00 to 0xFD (from 0 to 253).

9.50.17 Extreme wind speed property

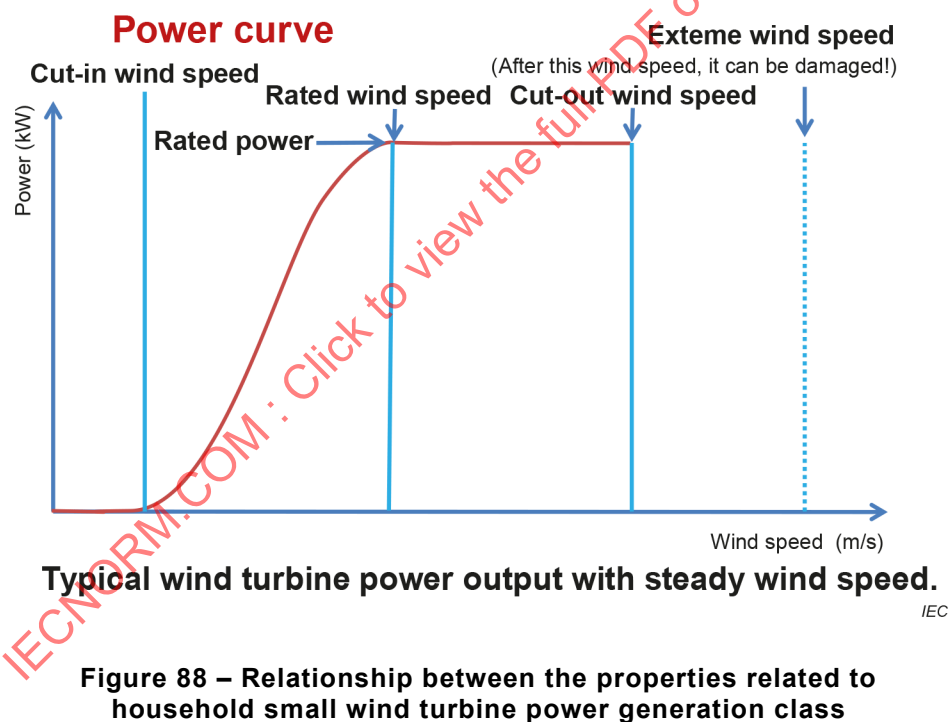
This property indicates the highest average wind speed, averaged over t seconds, that is likely to be experienced within a specified time period (recurrence period) of T years. As defined in the IEC 61400-1 wind turbine design/safety standard, the largest wind speed to be considered is called "Ve50," which is the maximum gust over a 50-year return period for a 3-s averaging time. The value range for this property shall be from 0x00 to 0xFD (from 0 to 253).

9.50.18 Braking status property

This property indicates the Braking status of household small wind turbine power generation that results from the achievement of cut-out wind speed. For emergency reasons, it can be controlled manually by the client, and some confirmation action (e.g. double check) shall be made on the control side.

[ON] means "forced stop". When the wind turbine continues to generate electricity even if wind speed is over Cut-out wind speed, the controller can stop the wind turbine with this command. [OFF] means that the status of "forced stop" is released.

Figure 88 shows relationship between the properties related to household small wind turbine power generation class.



9.51 Lighting system class specifications

9.51.1 General

The control commands of "lighting system" are shown in Table 79.

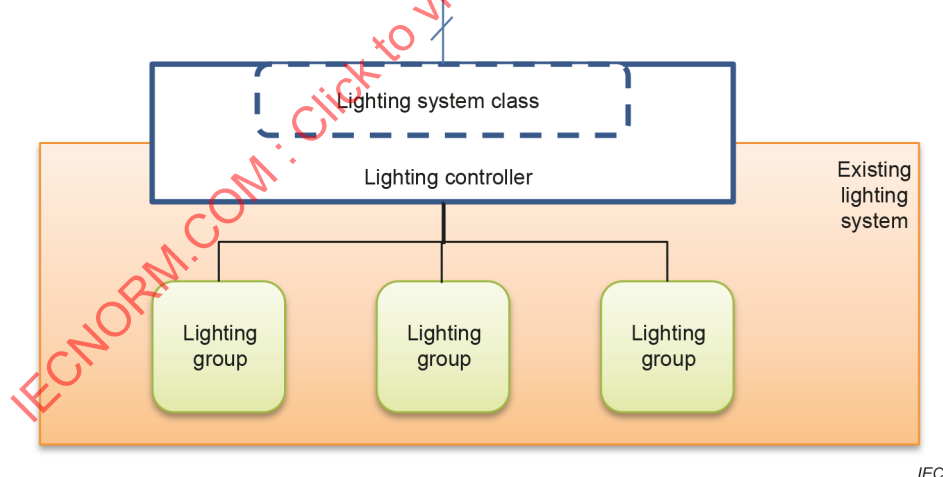
Class group code : 0x02

Class code : 0xA3

Table 79 – List of lighting system properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	–	Set		○	
		ON = 0x30, OFF = 0x31				Get	○		
Illuminance level setting	0xB0	Indicates illuminance level in % 0x00 shall be a state of lights-out.	unsigned char	1 byte	%	Set/Get			
		0x00 to 0x64 (0 % to 100 %)							
Scene control setting	0xC0	The maximum number shall be the one that can be assigned.	unsigned char	1 byte	–	Set	○		
		0x00: Not set 0x01 to 0xFD (1 to 253)				Get	○		
Number that can assign scene control setting	0xC1	Indicates the maximum number that can be assigned for scene control.	unsigned char	1 byte	–	Get	○		
		0x00 to 0xFD (0 to 253)							

This class is for connecting an existing lighting system to the "Control protocol 1st" or "Control protocol 2nd" system. Figure 89 shows an example of lighting system class setting.

**Figure 89 – A configuration of lighting system**

In this class, instance codes shall be given by lighting group. For example, with the configuration shown above, the instance codes are 0x01, 0x02, and 0x03 for each lighting group. Lighting group (instance code) may be configured with only one. If operating all lighting groups at a time, an instance code of 0x00 may be used.

9.51.2 Operation status property

This property indicates whether the lighting system is in the ON state (the lighting system can accept control) or OFF state (the lighting system cannot accept control). The property value shall be 0x30 for ON and 0x31 for OFF.

9.51.3 Illuminance level setting property

9.51.4 Scene control setting property

0x00: Not set

9.51.5 Number that can assign scene control setting property

9.52 Extended lighting system class specifications

The control commands of "extended lighting system" are shown in Table 80.

Class code : 0xA4

Table 80 – List of extended lighting system properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	—	Set		○	
		ON = 0x30, OFF = 0x31				Get	○		
Illuminance level setting	0xB0	Indicates illuminance level in % 0x00 shall be a state of lights-out.	unsigned char	1 byte	%	Set/Get			
		0x00 to 0x64 (0 % to 100 %)							
Scene control setting	0xC0	The maximum number shall be the one that can be assigned.	unsigned char	1 byte	—	Set	○		
		0x00: Not set 0x01 to 0xFD (1 to 253)				Get	○		
Number that can assign scene control setting	0xC1	Indicates the maximum number that can be assigned for scene control.	unsigned char	1 byte	—	Get	○		
		0x01 to 0xFD (1 to 253)							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Power consumption rate list	0xC2	Lists a number controllable by scene of power consumption ratio at scenes when defining a fully lighted as 100 % power consumption.	unsigned char × (MIN 1 to MAX 253)	Max 253 bytes	%	Get	○		
		0x00 to 0x64 (0 % to 100 %), 0xFF (unknown)							
Power consumption when fully lit	0xC3	Indicates power consumption (W) when the lighting of the applicable instance connected into an extended lighting system are fully lit.	unsigned short	2 bytes	W	Get	○		
		0x0000 to 0xFFFF (0 W to 65 533 W)							
Possible power savings	0xC4	Indicates possible power savings (W) based on current operation status	unsigned short	2 bytes	W	Get	○		
		0x0000 to 0xFFFF (0 W to 65 533 W)							
Power consumption limit setting	0xC5	Setting/Reading power (W) to be saved.	unsigned short	2 bytes	W	Set/Get	○		
		Cancelling power consumption restriction: 0x0000 0x0001 to 0xFFFF (1 W to 65 533 W)							
Automatic operation controlling setting	0xC6	Automatic operation controlling ON/OFF setting/reading (Automatic operation shall include schedule control, sensor control, etc.)	unsigned short	1 byte		Set/Get			
		ON = 0x30, OFF = 0x31							
Fading control change time setting	0xC7	Fading control change time shall be set/read. This property indicates the fading control change time in increments of seconds.	unsigned short	2 bytes	seconds	Set/Get			
		0x0000 to 0x0E10 (0 s to 3 600 s)							

This class is for connecting an existing lighting system to the "Control protocol 1st" or "Control protocol 2nd" system, thereby enables energy control and monitoring. Figure 90 shows an installation example of extended lighting system class setting.

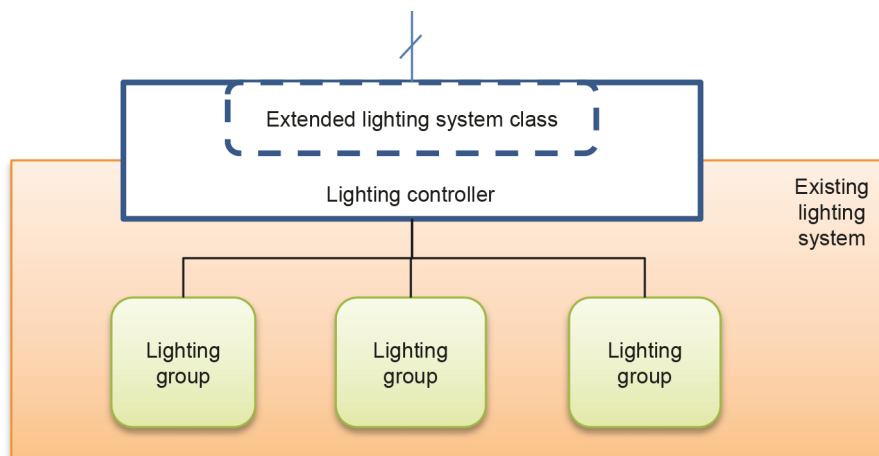


Figure 90 – A configuration of extended lighting system

In this class, instance codes shall be given by lighting group. For example, with the configuration shown above, the instance codes are 0x01, 0x02, and 0x03 for each lighting group. Of course a system may have only one lighting group with a single instance code. If operating all lighting groups at a time, an instance code of 0x00 may be used.

The lack of lighting would lead to a blackout if it is turned off by a controller, which may impose a safety concern. Therefore, it is necessary to take into the safety operation of the system control setting.

9.52.2 Operation status property

This property indicates if the extended lighting system class is acceptable (ON) or unacceptable (OFF) to receive control. 0x30 shall be made to correspond to ON and 0x31 to OFF.

In cases where the extended lighting system belongs to a node and the lighting system is ready to accept control as soon as the node starts up, this property may be implemented as the fixed value (0x30).

9.52.3 Illuminance level setting property

Lighting levels set in a batch by group are indicated in %. Set lighting level by group to acquire lighting level set by group. If the lighting level of the actual device is higher or lower than the % unit, the property of the actual device shall be assigned to the property value of % unit specified in this property.

9.52.4 Scene control setting property

The extended lighting system is controlled using the scene control numbers set in the extended lighting system. Also, the current scene control number set for the lighting system is obtained from this property.

0x00: Not set

For specific details on scene control indicated in property values, settings for each lighting system shall be set at the time of installation using the controller application or the like.

9.52.5 Number that can assign scene control setting property

This property indicates the maximum value of the number of scene control settings that can be assigned for the extended lighting system. "Not set" shall not be included but shall be a value greater than 1.

9.52.6 Power consumption rate list property

Listed power consumption ratios in % at all scenes when defining fully lighted as 100 % power consumption. This property shall include the power consumption ratio in a range between scene No. 1 to N (a number that can assign scene control settings). The " N " shall be equal at least 1 and not more than 253. "0xFF" shall be used if the power consumption ratio is unknown due to "not set/not measured". If the power consumption ratio becomes settable after 0xFF is set, the value can be replaced with the power consumption ratio. Scene No. 0 for the power consumption shall not be defined since it is "not set" (meaning that it shall not be included in the power consumption rate list). When the illuminance level setting is changed, the degree of impact on the power consumption rate value for the same case shall depend on the implementation.

Table 81 shows an example of the configuration of this property when the number of scene control setting " N " that can be assigned is 5, and scenes No. 3 and 4 are "unknown" (0xFF). When scenes No. 6 and later are not implemented on the device, the arrangement shall be in total 5 bytes.

Table 81 – An example of scene number set

Scene No.	1	2	3	4	5	...	...	253
Power consumption rate	80 %	90 %	0xFF	0xFF	60 %	-	-	-

9.52.7 Power consumption when fully lit property

This property indicates power consumption (rating) in W when the lighting of the applicable instances connected into an extended lighting system are fully lit. A power consumption ratio shall be calculated based on this property value. Basically, the value is constant even the scene is switched. However, the value can be set once again when adding the number of lighting devices to be connected physically or when resetting scenes.

9.52.8 Possible power savings property

This property indicates possible power savings in W based on current operation status (scene) of the applicable instance.

This property indicates normal values only when the operation status property value (0x80) is ON (0x30). The value when the illuminance level setting is changed shall depend on the implementation.

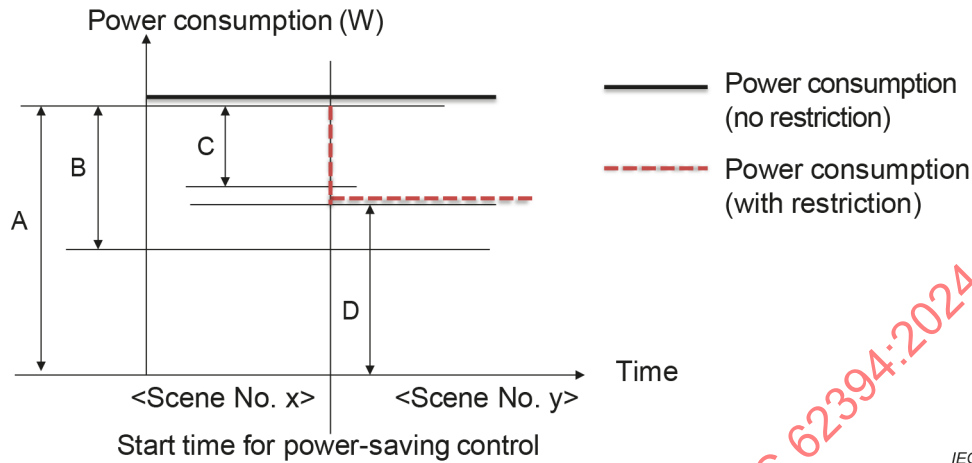
9.52.9 Power consumption limit setting property

Setting power (W) to be saved/reading set value to restrict power consumption. As a rule, set a numerical figure equal to or smaller than the possible power savings. "0x0000" shall be set when cancelling the control. If successfully controlled after setting the value, the value shall be retained and can be acquirable. If control is failed, the value shall be "0x0000"

The value of this property shall be set to 0x0000 30 min after setting, depending on the device. The range of property values when setting shall be 0x0001 to 0xFFFFD (1 W to 65 533 W).

NOTE Control considering the accuracy of the clock embedded in the device.

Figure 91 shows a setting scenario for power consumption when this property is set. The power consumption can be set according to the implementation specifications of the lighting system. Figure 91 is provided for reference purposes only when lowering power consumption by making the lighting system able to select an applicable scene based on the set property values.



Key

A: $(\text{Power consumption when fully lit}) \times (\text{power consumption rate for Scene No. } x) / 100$

B: Possible power savings

C: Power consumption limit setting

D: $(\text{Power consumption when fully lit}) \times (\text{power consumption rate for Scene No. } y) / 100$

The following relationship shall be maintained: $C \leq (A - D) \leq B \leq A$

Figure 91 – Explanation for power consumptions

When instructions are given to decrease power, the controlling side shall obtain information of the relationship between the power consumption and illuminance of lighting devices to be used, to avoid any problems that may arise from the decrease in illuminance. As an example of decreasing power under an appropriate illuminance, a value of possible power savings property can be set based on power consumption information at an illuminance that can avoid any problems in lighting space and the current illuminance of the lighting system. With LED lighting, the relationship between power consumption and illuminance is generally linear. Therefore, if power consumption is halved, for example, the illuminance is halved as well.

9.52.10 Automatic operation controlling setting property

When controlling and monitoring energy, if automatic operation of the lighting system (e.g. schedule and sensor control) is implemented, its ON/OFF (ON/OFF state) should be controlled. The "ON" state indicates a state where the automatic operation of the lighting system is currently working. The automatic operation shall have schedule control, sensor control, etc. The "OFF" state indicates a state that the automatic operation of the lighting system is currently stopped. Property values "0x30" shall be assigned to ON and "0x31" to OFF, respectively. For example, a controller turns off the automatic operation of the lighting system, when starting a specific energy management service such as demand response. When completing the service, the controller turns on the lighting system.

9.52.11 Fading control change time setting property

If illuminance changes due to scene switching or the like, the target user who is underneath the lighting is highly likely to be affected by the rapid illuminance change. Under an environment where there is a number of general customers who are underneath the lighting (e.g. in stores), there is a need to save power to the extent that the customers (users) do not sense the change in illuminance. Therefore, a property shall be set to control the time to change the illuminance from the set illuminance to another. Fading control change time shall be set/read. For devices that implement Set, the fading control change time setting can be changed according to the setting request. The maximum fading control time shall be 3 600 s.

9.53 Multiple input PCS class specifications

9.53.1 General

The control commands of "multiple input PCS" are shown in Table 82.

Class group code : 0x02

Class code : 0xA5

Table 82 – List of multiple input PCS properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	–	Set		○	
		ON = 0x30, OFF = 0x31				Get	○		
Identification number	0x83	A number that allows each object to be uniquely identified. The first byte: Lower-layer communication ID field 0x01 to 0xFD: If a unique number is assigned by the lower-layer communication protocols, an arbitrary ID number is set according to the protocol types. (Not used in control protocol 2nd shown in Clause 8.) 0xFE: 2nd through 17th bytes are defined by the manufacturer according to the product type. (Refer to the detailed explanation.) 0xFF: This ID number is used if 2nd through 9th bytes are randomly generated by the lower-layer communication protocols. 0x00: Identification number is not set. The second and succeeding bytes: unique number field	unsigned char	9 or 17 bytes	–	Get	○		

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Current time setting	0x97	Current time (HH: MM format)	unsigned char × 2	2 bytes	–	Set			a
		0x00 to 0x17: 0x00 to 0x3B (= 0 to 23):(= 0 to 59)				Get	○		
Current date setting	0x98	Current date (YYYY: MM: DD format)	unsigned char × 4	4 bytes	–	Set			a
		1 to 0x270F: 1 to 0x0C: 1 to 0x1F (= 1 to 9999): (= 1 to 12): (= 1 to 31)				Get	○		
System interconnection status	0xD0	Indicates system interconnection status	unsigned char	1 byte		Get	○		
		System interconnected (reverse power flow acceptable) = 0x00 Independent = 0x01 System interconnected (reverse power flow not acceptable) = 0x02							
Measured cumulative amount of electric energy (normal direction)	0xE0	Indicates the cumulative amount of electric energy when AC-DC conversion in increments of 0,001 kWh.	unsigned long	4 bytes	0,001 kWh	Get	○		
		0x00000000 to 0x3B9AC9FF (0 kWh to 999 999,999 kWh)							
Measured cumulative amount of electric energy (reverse direction)	0xE3	Indicates cumulative amount of electric energy when DC-AC conversion in increments of 0,001 kWh.	unsigned long	4 bytes	0,001 kWh	Get	○		
		0x00000000 to 0x3B9AC9FF (0 kWh to 999 999,999 kWh)							
Measured instantaneous electric power	0xE7	Indicates the measured effective instantaneous electric power in increments of 1 W.	signed long	4 bytes	W	Get	○		
		0x80000001 to 0x7FFFFFFD (–2 147 483 647 to 2 147 483 645)							
List of connected devices	0xE8	List of devices connected to the multiple input PCS.	unsigned char × (MAX)31	Max 31 bytes		Get	○		
		1st byte: Total number of connected device objects (0x01 to 0x0A) 2nd byte to max. 31st byte: EOJ 3 bytes × number of the connected device objects (max. 10)							

a Implementation in this class shall be required, if the device object included in the list of connected device properties is implemented.

The PCSs that are connected to the different energy devices such as solar power generation and storage batteries have the distinctive features of mixed power output from energy devices and direct power exchange between energy devices.

As PCS input/output cannot be acquired from device objects of energy devices, a class that has information regarding AC input/output is defined.

In this class, power and electric energy values shall be those of AC. Figure 92 shows an example configuration.

In addition to the multi-input PCS class, the multiple input PCS also has classes of devices connected (for example as shown in Figure 92, the household solar power generation class, storage battery class, and electric vehicle chargers/dischargers class).

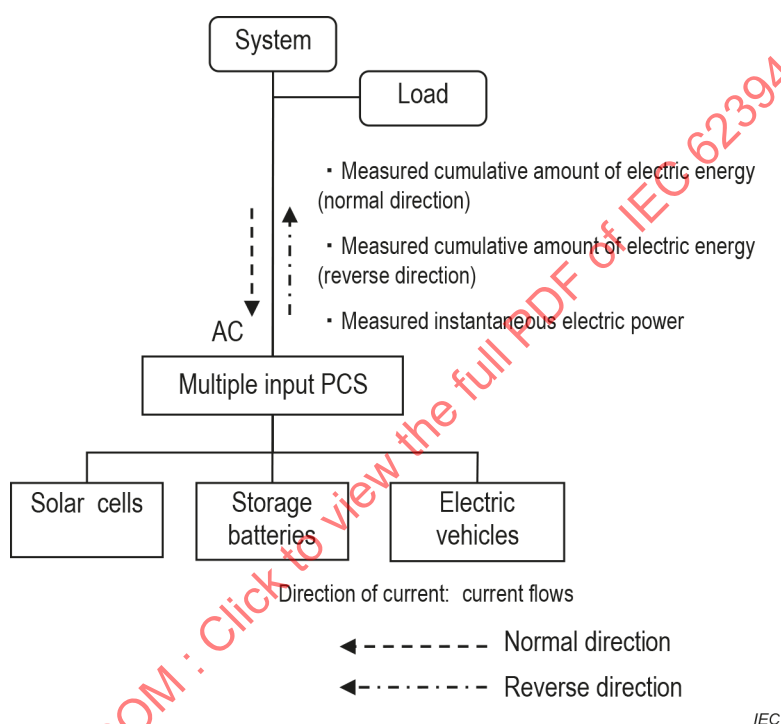


Figure 92 – An example of multiple input PCS configuration

9.53.2 Operation status property

This property indicates whether the functions specific to this class are operating (ON) or not (OFF). In the node mounting this class, if the function of this class is started concurrently with the start of node operation, this property may be implemented at a fixed value of 0x30 (Operation status ON).

9.53.3 Identification number property

The "identification number" property is a number that allows each device object to be uniquely identified. The first byte indicates the format of the unique number.

In the case where the unique number type is 0xFE ("defined by the manufacturer"), the unique number is comprised of a 3-byte manufacturer code field, which contains the unique manufacturer code assigned by the ECHONET Consortium to the manufacturer in question, and a 13-byte unique ID field, which contains the unique identification number defined by the manufacturer. This property's data structure is shown in Figure 46. Each vendor shall ensure that there will be no code value overlap.

9.53.4 Current time setting property

This property indicates the current local time using a value between 0x00 and 0x17 (0 to 23) for the hours and a value between 0x00 and 0x3B (0 to 59) for the minutes. The first byte of the property value indicates the hours and the second byte indicates the minutes.

9.53.5 Current date setting property

This property indicates the current date using a value between 0x0001 and 0x270F (1 to 9 999) for the year, a value between 0x01 and 0x0C (1 to 12) for the month and a value between 0x01 and 0x1F (1 to 31) for the day. The first and second bytes are treated as one piece of unsigned short data which indicates the year (2 bytes). The third byte indicates the month (1 byte) and the fourth byte indicates the day (1 byte). Only Get is required for this class.

9.53.6 System interconnection status property

This property indicates current status of interconnection with the system.

System interconnected (reverse power flow acceptable) = 0x00, Independent = 0x01, System interconnected (reverse power flow not acceptable) = 0x02.

9.53.7 Measured cumulative amount of electric energy (normal direction) property

This property indicates the measured cumulative amounts of electric energy when converting AC to DC in 0,001 kWh. The property value range shall be from 0x00000000 to 0x3B9AC9FF (0 kWh to 999 999,999 kWh). In the event of a cumulative amounts of electric energy overflows, the counting of the cumulative amounts of electric energy overflows shall be restarted from 0x00000000.

9.53.8 Measured cumulative amount of electric energy (reverse direction) property

This property indicates the measured cumulative amounts of electric energy when converting DC to AC in 0,001 kWh. The property value range shall be from 0x00000000 to 0x3B9AC9FF (0 kWh to 999 999,999 kWh). In the event of a cumulative amounts of electric energy overflows, the counting of the cumulative amounts of electric energy overflows shall be restarted from 0x00000000.

9.53.9 Measured instantaneous electric power property

This property indicates the measured effective instantaneous electric power in watts. The value range shall be: 0x80000001 to 0x7FFFFFFD (–2 147 483 647 to 2 147 483 645). The "normal direction" shall be defined as "positive", while the "reverse direction" is defined as "negative".

Range: –2 147 483 647 to 2 147 483 645 W (unit of measurement: W)

Underflow: 0x80000000

Overflow: 0x7FFFFFFF

9.53.10 List of connected devices property

List of device objects connected to multiple input PCS. The first byte is the number of device objects connected (excluding multiple input PCS objects), the second byte and successive bytes are a list of EOJ connected (3 bytes for each device object: class group code, class code, and instance code). Basically, it is expected to list the EOJ of energy creation and energy accumulation devices.

Specifically, for multiple input PCSs having the household solar power generation class, storage battery class, and electric vehicle chargers/dischargers class, 0x03, 0x02, 0x79, 0x01, 0x02, 0x7D, 0x01, 0x02, 0x7E, and 0x01 are listed.

9.54 Hybrid water heater class specifications

9.54.1 General

The control commands of "hybrid water heater" are shown in Table 83.

Class group code : 0x02

Class code : 0xA6

Table 83 – List of hybrid water heater properties

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Operation status	0x80	Indicates the ON/OFF status.	unsigned char	1 byte	—	Set		○	
		ON = 0x30, OFF = 0x31				Get	○		
Automatic water heating setting	0xB0	Indicates automatic water heating ON/OFF.	unsigned char	1 byte	—	Set/Get		○	
		Automatic water heating = 0x41 Water heating manual stop = 0x43 Manual water heating = 0x42							
Water heating status	0xB2	Indicates water heating status.	unsigned char	1 byte	—	Get		○	
		Water is heating = 0x41 Water is not heating = 0x42							
Heater status	0xB3	Indicates heater status.	unsigned char	1 byte	—	Get		○	
		Water is heating = 0x41 Water is not heating = 0x42							
Hot water supply mode setting for auxiliary heat source machine	0xB6	Set hot water supply operation to auxiliary heat source only.	unsigned char	1 byte	—	Set/Get			
		Set = 0x41 No setting = 0x42							
Heater mode setting for auxiliary heat source machine	0xB7	Set heater operation to auxiliary heat source only.	unsigned char	1 byte	—	Set/Get			
		Set = 0x41 No setting = 0x42							
Linkage mode setting for solar power generation	0xB8	Used to specify a mode when linked with the solar power generations, and to acquire the current setting.	unsigned char	1 byte	—	Set/Get	○	○	
		Mode off = 0x41 Household consumption = 0x42 Prioritizing electricity sales = 0x43 Economic efficiency = 0x44							

Property name	EPC	Contents of property	Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)							
Solar power generations utilization time	0xB9	Start time: End time HH:MM:HH:MM	unsigned char × 4	4 bytes	–	Set/Get			
		0x00 to 0x17:0x00 to 0x3B 0x00 to 0x17: 0x00 to 0x3B (= 0 to 23):(= 0 to 59): (= 0 to 23):(= 0 to 59)							
Hot water supply status	0xC3	Indicates the status of supplying hot water.	unsigned char	1 byte	–	Get		○	
		Supplying hot water = 0x41, not supplying hot water = 0x42							
Measured amount of hot water remaining in tank	0xE1	Indicates the measured amount of hot water left in the tank in litres.	unsigned char	2 bytes	litre	Get			
		0x0000 to 0xFFFFD (0 litres to 65 533 litres)							
Tank capacity	0xE2	Indicates the tank capacity in litres.	unsigned char	2 bytes	litre	Get			
		0x0000 to 0xFFFFD (0 litres to 65 533 litres)							

A hybrid water heater (water heater combining electric heat pump and gas instantaneous water heater) is a type of device with an instantaneous water heater that uses fossil fuels (e.g. gas and kerosene) and a storage tank that uses a heat pump at a same time. In this class, functions using the heat pump are primarily defined. The "instantaneous water heater class" shall be referenced for functions related to instantaneous water heaters using fossil fuels such as gas and kerosene. Accordingly, devices implementing this class are recommended to use this class and the "instantaneous water heater class" at the same time.

Hybrid water heaters include two types of devices: (1) those that operate the heat pump only when supplying hot water as shown in Figure 93; and (2) those that operate the heat pump when supplying hot water and heating as shown in Figure 94.