

Events, Errors, Alarms and AMR Profile Status Code.

Rev. 1.0

Revision History

Version	Date	Description
Rev. 1.0	20.04.2024	Initial document revision.

1. Event and error handling

This paragraph gives an overview of the event and error handling based on DLMS objects. A lot of events are generated by meter itself or by its environment. All these events are logged in several event logs. In addition, they are also used to set and clear errors as well as to trigger alarms.

1.1 Events

There are 6 groups of events. Some of them have subgroups. Each group or subgroup has its own event log, i.e., 14 event logs.

Every event has a unique code to identify the action which has triggered it. Every event is assigned to one event log and it is only stored there. This assignment is fixed and can't be changed dynamically.

Event Codes

Group	Subgroup	Name	Min Entries	Description
1	10	Power down/up	200	Related to power down/up
	11	Standard	200	Not special events
	12	Firmware	200	Firmware changed with values of new and former firmware version
	13	Synchronization	200	Clock synchronization with values of new and former date-time
2	20	Disconnect control	200	Related to connector
3	30	Non-finished Quality	200	Related to quality
	31	Finished Quality	200	Related to quality
4	40	Cover opening	200	Related for opening the terminal and main cover
	41	Fraud	200	Related to fraud detection
5	50	Communication	200	Communication related events
6	60	Correct Security	200	Correct security related events
	61	Failed Security		Failed security related events

Number	Group	Subgroup	Description	Event Description
1	1	10	Power up/down	Reboot with loss of data
2				Reboot without loss of data
3				Power failure
4	1	11	Power failure	Power failure. Phase 1
5				Power failure. Phase 2
6				Power failure. Phase 3
7				End of power failure. Phase 1
8				End of power failure. Phase 2

9				End of power failure. Phase 3
10-20			Manufacturer. Other errors	Other Errors (optional)
21				Official change local time Winter->Summer
22				Official change local time Summer->Winter
23				Automatic daylight-saving time change
24				Activity calendar has wrong configuration
25			Change of parameters	Clock object parameters changed
26				Demand configuration changed
27				Device ID changed
28				Display config changed
29				Disconnect control mode changed
30				Modification of parameters load limitation
31				Load profile with period 1 changed
32				Load profile with period 2 changed
33				Load profile with period 3 changed
34			Communication configuration	Communication ports parameters change
35				PLC modem configuration changed
36			Billing and calendar	Billing Profile Config Changed
37				Closure command prompted
38				Activity calendar parameters changed
39				Special days table passive change
40				Seasons table passive change
41				Automatic billing end passive change
42				Activation date passive change
43			Quality parameters change	Time threshold for voltage sags and swells changed
44				Time threshold for long power failures changed
45				Threshold for voltage sags and swells changed
46				Threshold for long power failures changed
47				Alarm object is cleared
48				Error object is cleared
49				Safe parametrization message activated
50				Current tariff changed
51				Clock invalid
52				Neutral loss
53				Neutral recovery
54				Low battery
55				Battery cleared
56			Load limitation	Total active power error
57				Total active power Ok
58				Current exceed phase L1 error
59				Current exceed phase L1 Ok
60				Current exceed phase L2 error

61				Current exceed phase L2 Ok
62				Current exceed phase L3 error
63				Current exceed phase L3 Ok
64				Demand Error
65				Demand Ok
66			Battery related events	Low battery
67				Battery cleared
166				Changed legally relevant software
167				Test mode start
168				Test mode end
201	1	12	Firmware	Firmware changed
202				Firmware activated
203				Firmware ready for activation
204				Firmware Image block transfer initiated
205				Firmware Image block transfer finished
206				Firmware Image verification initiated
207				Firmware Image verification successful
208				Firmware Image verification failed
209				Firmware Image activation initiated
210				Firmware Image activation failed
211				Digital signature valid
212				Digital signature invalid
98	1	13	Synchronization	Clock synchronization
1	2	20	Disconnect control	Manual Power control connection from meter push bottom
2				Manual disconnection
3				Remote disconnection (command)
4				Remote connection (command)
5				Residual power control disconnection
6				Residual power control connection
2	3	30	Quality non finished Events	Under limit voltage L1 (sag1)
3				Under limit voltage L2 (sag1)
4				Under limit voltage L3 (sag1)
6				Over limit voltage L1 (swell)
7				Over limit voltage L2 (swell)
8				Over limit voltage L3 (swell)
9				Long power failure for all phases
10				Long power failure L1
11				Long power failure L2
12				Long power failure L3
25				Under limit voltage L1 (sag2)
26				Under limit voltage L2 (sag2)
27				Under limit voltage L3 (sag2)
28				Under limit voltage L1 (sag3)
29				Under limit voltage L2 (sag3)
30				Under limit voltage L3 (sag3)
41				Over limit average voltage phase L1
42				Over limit average voltage phase L2

43				Over limit average voltage phase L3
44				Under limit average voltage phase L1
45				Under limit average voltage phase L2
46				Under limit average voltage phase L3
14	3	31	Quality finished Events	Under limit voltage L1
15				Under limit voltage L2
16				Under limit voltage L3
17				Reserved for future use
18				Over limit voltage L1
19				Over limit voltage L2
20				Over limit voltage L3
21				Long power failure for all phases
22				Long power failure L1
23				Long power failure L2
24				Long power failure L3
31				Under limit voltage L1 (sag2)
32				Under limit voltage L2 (sag2)
33				Under limit voltage L3 (sag2)
34				Under limit voltage L1 (sag3)
35				Under limit voltage L2 (sag3)
36				Under limit voltage L3 (sag3)
1	4	40	Cover opening	Cover opened
2				Cover closed
3				Terminal cover opened
4				Terminal cover closed
5	4	41	Fraud	Strong DC field detected
6				No strong DC field anymore
7				Current reverse L1 present
8				Current reverse L1 not present
9				Current reverse L2 present
10				Current reverse L2 not present
11				Current reverse L3 present
12				Current reverse L3 not present
13				Differential current appeared
14				Differential current disappeared
1	5	50	PLC Communication	Begin communication PLC port
2				End communication PLC port
3				Communication with the PLC modem is failed
4				Communication with the PLC modem is Ok
5				There was a restart of the PLC modem
6			Optical Communication	Begin communication optical port
7				End communication optical port
8			WAN 3GPP Communication	Begin communication 3GPP port
9				End communication 3GPP port
10-20				Reserved for future use
1	6	60		Master key changed
2				Reading client GUEK changed

3			Correct changes for reading client	Reading client Authentication key changed
4				Reading client password changed
5				Reading client Security policy changed
6			Correct changes for management client	Management client GUEK changed
7				Management client Authentication key changed
8				Management client password changed
9			Correct changes for firmware update client	Management client Security policy changed
10				Firmware update client GUEK changed
11				Firmware update client Authentication key changed
12				Firmware update client password changed
13				Firmware update client Security policy changed
14			Correct changes for test client	Test client password changed
33				Test client GUEK changed
34				Test client Authentication key changed
35				Test client Security policy changed
15				Application level association Ok
16	6	61	Failed changes for reading client	Error changing Master key
17				Reading client error changing GUEK
18				Reading client error changing authentication key
19				Reading client error in association with dedicated key
20			Failed changes for management client	Reading client error changing security policy
21				Management client error changing GUEK
22				Management client error changing authentication key
23				Management client error in association with dedicated key
24				Management client error changing security policy
25			Failed changes for firmware update client	Firmware update client error changing GUEK
26				Firmware update client error changing authentication key
27				Firmware update client error in association with dedicated key
28				Firmware update client error changing security policy
36			Failed changes for test client	Test client error changing GUEK
37				Test client error changing authentication key
38				Test client error in association with dedicated key
39				Test client error changing security policy

29				Error in transport messages with ciphering or authentication
30				Application level association error
31				Association lock
32				Association unlock

1.2 Event Logs

The meter features 13 different event logs as described below. The event logs have different basic structure.

Power down/up Event Log [0-0:99.98.6.255]

Contains power down/up events

Structure: Timestamp – Event Code

Minimum size: 200 entries

Standard Event Log [0-0:99.98.0.255]

Contains all events not recorded in a special event log, e.g. end of billing periods, changes of the configuration, all kind of self-test errors, alarms, etc.

Structure: Timestamp – Event Code

Minimum size: 200 entries

Disconnect Control Log [0-0:99.98.2.255]

Contains all events related to the breaker, e.g. connect, disconnect.

Structure: Timestamp – Event Code – current disconnect control status – disconnection reason

Minimum size: 200 entries

Cover opening event Log [0-0:99.98.14.255]

Contains all events related to removal of terminal cover and removal of meter cover.

Structure: Timestamp – Event Code

Minimum size: 200 entries

Fraud Detection Log [0-0:99.98.1.255]

Contains all events related to the detection of fraud attempts, e.g. strong DC field detection, etc.

Structure: Timestamp – Event Code

Minimum size: 200 entries

Power Quality Event Log [0-0:99.98.5.255]

Contains all events related to voltage variations, e.g. changes of voltage under or over a threshold of Vn for non finished events.

Structure: Timestamp – Event Code

Minimum size: 200 entries

Finished Quality Event Log [0-0:99.98.9.255]

Contains all events related to voltage variations, e.g. changes of voltage under or over a threshold of Vn for finished events

Structure: Timestamp – Event Code – Timestamp (begin of event)

Minimum size: 200 entries

PLC Communication Events Logs (0-0:99.98.7.255)

Contains events related communication via PLC.

Structure: Timestamp – Event Code

Minimum size: 200 entries

Optical Communication Events Logs (0-0:99.98.3.255)

Contains events related communication via optical port.

Structure: Timestamp – Event Code

Minimum size: 200 entries

Firmware Events Logs (0-0:99.98.4.255)

Contains all events related to firmware change.

Structure: Timestamp – Event Code – Former Firmware Version – New Firmware

Minimum size: 200 entries

Synchronization Events Logs (0-0:99.98.8.255)

Contains all events related to clock synchronization.

Structure: Timestamp – Event Code – Timestamp (former clock time)

Minimum size: 200 entries

Correct Security Events Logs (0-0:99.98.11.255)

Contains all events related to correct security operation.

Structure: Timestamp – Event Code – Client ID – Interface ID – System Title

Minimum size: 200 entries

Failed Security Events Logs (0-0:99.98.12.255)

Contains all events related to failed security operation.

Structure: Timestamp – Event Code – Client ID – Interface ID – System Title

Minimum size: 200 entries

1.3 Error Handling

A predefined selection of events set and clear flags in the error object. The error object can be read and displayed at anytime to see, if there is a malfunction in the device.

Depending on the type of error, some errors clear themselves if the reason for the error has disappeared. Other must be cleared via CAS. Critical errors mean meter substitution. However this kind of events is stored in one of the event logs.

Error Codes

The table below gives an overview of all errors and their assignment.

Non Critical Errors								Reserved				Critical Errors								Non Critical Errors							
Byte 4								Byte 3				Byte 2								Byte 1							
8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1
												Clock invalid								Replace battery							
												Fraud Detection								Terminal Cover Opened							
												Meter Cover Opened								Strong DC Field							
												Optic Active								Program memory error							
												RAM error								NV Memory error							
												Measurement system error								Watchdog error							
												Power Failure								Firmware changed							
												Coefficient changed								not used							
												not used								not used							
												not used								not used							
												not used								not used							
												not used								Phase1 Error							
												not used								Phasel2 Error							
												not used								Phasel3 Error							
												not used								Phase Connection Error							
												not used								not used							
												not used								not used							
												not used								not used							
												not used								not used							

1.4 Alarm Handling

A selection of events can be made which are treated as alarms (alarm filter). If one of these events occurs, the corresponding flag in the alarm register is set.

Alarm Codes

The table below gives an overview of all possible alarms and their assignment.

Byte 4										Byte 3										Byte 2										Byte 1									
8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1								

Clock invalid
Replace battery
Fraud detection
Terminal Cover Opened
Strong DC Field
Meter Cover Opened
Optic Active
Program memory error
RAM error
NV Memory error
Measurement system error
Watchdog error
Power Failure
Firmware changed
Coefficient changed
not used
not used
not used
not used
not used
not used
not used
not used
not used
Phase1 Error
Phase2 Error
Phase3 Error
Phase Connection Error
not used
not used
not used
not used

1.5 Alarm Filters

Depending on the capabilities of the CAS not all the possible alarms are wanted. Therefore, an alarm filter (0-0:97.98.10.255) can be programmed to mask out unwanted alarms.

The structure of the filter is the same as for the alarm codes.

The Event Notification Service

Any events can makes the server builds an EVENT-NOTIFICATION-Request APDU and send it out in order to inform the client of the value of it.

The events that are affected by this Service are configurable through Objects Events Log Filters.

1.6 AMR Profile Status Code

In all load profiles a status code is used for every entry.

The AMR status code has a size of 1 byte and it is shown in hexadecimal form.

The following table describes the state and the function of all bits:

Flag	Description
Bit 7 (IV)	Data not valid
Bit 6 (CA)	Clock adjusted: The bit is set when clock has been adjusted more or equal than the synchronization limit.
Bit 5 (CY)	Overflow: The bit is set when the value of the register overloads its limit. It is considered as RES (not used) in load profile 1.
Bit 4 (VH)	Clock verified: The bit is set when clock has been adjusted less than the synchronization limit.
Bit 3 (MP)	Parameters changed: Indicates some parameter has been modified.
Bit 2 (INT)	Communication fraud detection: This bit is set to indicate that someone tried to connect to the meter without permission.
Bit 1 (AL)	Power down: This bit is set to indicate that a power failure has occurred.
Bit 0 (DBV)	Doubtful value: This bit is set when device is started. Also it is set after 7 days without synchronization

1.7 State Codes

A predefined selection of events set and clear flags in the "State 1" and "State 2" objects. The State objects can be read at any time to see. Flags clear themselves if the reason for the has disappeared.

State 1

[illegible]

State 2

[illegible]