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	Title: **CAN OPEN dictionary for BMM**		

Title: CAN OPEN dictionary for BMM

Program: Generic

Product: Battery

Customer: SAFT

Contract: N/A

Scope: CAN Open object dictionary definition for customer interface in SAFT project with new BMM.

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[1] Griser la case concernée. / *Fill the appropriate box.*

Document change status			
Revision	**Date**	**Pages or chapter**	**EVOLUTION/Change**
A	16/09/2009	All	Initial Issue
B	10/02/2010	§5.3 §6.2.2 §6.3.2 §6.7.2 §7.3.3	See §7.3.3 instead of §7.2.3 Sub-index 03_h refers to object 2052_h instead of 2053_h Default value of Sub-index 00h is 08_h instead of 03_h Mapping of TPD04 changed: Internal battery voltage at Sub-index 01_h, Battery current at Sub-index 02_h and Battery system mode at Sub-index 03_h PDO mapping to 'Default' for Sub-index 01_h to 06_h
C	22/02/2010	All	See modifications with "Marques"
D	01/03/2010		Modifications of objects 2028, 2029, 202A, 202B, 202C
E	07/06/2010	All §6.3.1 §6.6.2 §7.2 §7.3.1 §7.3.11 §7.3.15 §7.3.19 §7.3.20 §7.3.26 §7.3.27 §7.3.28 §7.3.29 §7.3.37 §7.3.41 §7.3.42 §7.3.45 §7.3.46 §7.4	See modifications with "Marques" Add object 2055 in RPDO2 Add object 2018 in TPDO3 Modify records 0080 and 0081. Add records 0084 and 0085. Modify object 2000 Add object 2018 Add object 2018 Modify object 2027 Modify object 2028 Modify object 2030 Modify object 2031 Suppress object 2032 Suppress object 2033 Add object 2046 Add explanation and bit reset Add explanation and bit reset Add object 2057 Add object 2058 Update overview table
F	18/11/2010	§ 4.3	Modification of CAN Open state Update of object 2031 : table 11*7 Update of object 2055 : suppression of contactor authorization for opening
G	07/03/2011	§ 7.3.12 § 7.3.41 § 7.3.42	Modification of BMU states Modification of fault codes reset principle Modification of self-test request principle
H	11/05/2011	§ 7.3	Modification Device type object 1000h Modification Object 2018 Modification Object 2023 Modification Object 2024 Modification Object 2028 Addition Object 202D Addition Object 202E Addition Object 202F Modification Object 2034 Modification Object 2035 Modification Object 2042 Modification Object 2043 Modification Object 2054 Modification Object 2055 Addition of Object 2201
I	22/12/2011	§7.2.2 §7.2.4 §7.3.14 §7.3.20 §7.3.23 §7.3.24 §7.3.25	Correction of temperature coding Correction of temperature coding Correction of current coding Correction of temperature coding Correction of temperature coding Correction of temperature coding Correction of temperature coding

		§7.3.26 §7.3.27	Correction of temperature coding Correction of temperature coding
J	11/04/2012	§6.1.3 §6.1.4 §6.1.5 §6.1.8 §6.1.10	Add information regarding objects 1008h, 1009h, 100Ah, 1018h Add Time Stamp object 1012h
K	02/07/2012	§7.2.49 §6.3.2 §7.3.12	Add Sleep mode command object 2059h Add Sleep mode command object 2059h in RPDO2 Modification of battery system state
	19/07/2012	§7.3.17 §7.3.16 §6.7.2	Suppression of object 2025h (SOC without SOC no more provided by SOC algorithm (SOC_NCA v1.2)) SOC_With_SOH renamed SOC Sub-index 5 of TPDO4 forced to 0
	24/07/2012	§7.3.48 §7.3.49	Object 2058h: BMU reset requested on transition, not on state Object 2059h: Sleep command requested on transition, not on state
L	24/09/2012	§6.3.2 §7.4	Sub-index 03 of RPO2 (2059h object) deleted: with K version, compatibility is not guaranteed because RDPO2 DLC is different. Now, L an J version are compliant. 2059h object modification: RPDO2 to SDO
M	24/01/2012		Add xBIT results object 2060h (SDO)
N	01/10/2013	§6.3 §1.1.1 §7.3.11 §7.3.45 §6.1.8	Add Customer Toggle bit Object 2061h on RPDO2 Add Customer Toggle bit Object 2061h Modification of the battery requests object 2018h Change comments for MAIN+ / MAIN- contactors bit Add configuration information regarding Time Stamp Object
O	17/11/2013	§6.1.10 §6.2.2 §7.3.40 %7.3.41 §7.3.42 §1.1.1	Update dictionary version Remove Customer Toggle bit Object from 2061h on RPDO2 Rename object 2050h in Reserved Rename object 2051h in Reserved Reuse of object 2052h for object 2051h Customer Toggle bit Removal of object 2061h (previously used for Customer Toggle bit)

Table of Contents

1. SCOPE

This document describes dictionary object and associated data messages (PDO) for a SAFT battery including a CANopen communication device.

This document is based in respect of CIA 301 [DR1]. The messages, defined in this document, are intended to be sufficient to manage battery charge, discharge and life expectancy. They are completed by data commonly used in the industry to provide enhanced features and reached via SDO protocol.

Battery modules compliant to this standard shall use communication techniques, which conforms to those described in the CANopen application layer and communication profile.

2. REFERENCES

[DR1] CiA Draft Standard 301: Application Layer and Communication Profile

[DR2] CAN Specification 2.0, Part B

3. ABBREVIATIONS AND DEFINITIONS

3.1. ABBREVIATIONS

BIT	:	Built In Test
BMU	:	Battery Monitoring Unit
BMM	:	Battery Management Module
CAN	:	Controller Area Network
CAN-ID	:	CAN IDentifier
COB-ID	:	Communication Object IDentifier
CBIT	:	Continuous BIT
DOD	:	Depth Of Discharge
IBIT	:	Initialize BIT
LSB	:	Less Significant Bit
MSB	:	Most Significant Bit
N/A	:	Not Applicable
PDO	:	Process Data Object
PBIT	:	Power BIT
RPDO	:	Receive Process Data Object
SDO	:	Service Data Object
TBD	:	To Be Defined
TPDO	:	Transmit Process Data Object
SOC	:	State Of Charge
SOH	:	State Of Health

4. OPERATING PRINCIPLES

4.1. GENERAL

The objects listed in this document allow communication during the use of the battery.
Four default TPDO and two default RPDO are defined and shall contain all the information needed by the application.
Saft battery support dynamic PDO mapping in order to be easily adapted for specific needs.
Saft battery also provides data for battery maintenance (history, state of health, warranty status, …) that are not needed in application.

4.2. PHYSICAL LAYER

4.2.1. Connector

The battery module shall have a 4-wire interconnect. The communication bus shall use two of these lines (CAN_L, CAN_H), two others are used for power (+Bat and –Bat). Ground and –Bat are common. The actual connector used and its pin configuration will vary depending on the battery application, and thus is outside of the scope of this document.
Nota: CIA battery profile requires a 5-wire interconnect and indicates that a pilot signal may be used so that battery and charger can detect each other.

4.2.2. CAN transceiver

The CAN bus shall use standard high-speed differential transceivers. The battery module shall support at least the 125 kbit/s default bit-rate. Battery shall be compliant to CAN V2.0B (cf. [DR2]).
As several batteries may be connected on the same bus line and the number should not affect the bus impedance, the termination resistor shall not be included in the default battery module configuration.

4.3. CANOPEN STATE

The boot-up sequence must follow §9.4 of [DR1].
The Transmission mode can be asynchronous or synchronous :

- In asynchronous mode, the BMM sends its TPDO periodically without waiting any request. Transmission period is defined inside each Object description (Event timer)
- In synchronous mode, the BMM sends its TPDO based on the SYNC object received.

Nota : the transmission mode of the BMM is not modifiable via CAN Open. It is configured inside the BMM by a software parameter.

5. ERROR HANDLING

5.1. PRINCIPLE

Emergency messages are triggered by internal errors in the device, and are assigned the highest possible priority to minimize latency on access to the bus. The emergency message contains the emergency error code, and the error register object (cf. [DR1]). Additional data bytes are included in the message, which may be used for manufacturer specific information.

5.2. ERROR BEHAVIOUR

If a serious device failure is detected, the module shall enter the pre-operational state by default. If object 1029h is implemented, the module may be configured to enter the stopped state or remain in the current state as alternatives. Device failures shall include the following communication errors:

- CAN bus-off condition
- Heartbeat event with the state 'occurred'

Device failure may also be caused by internal module failures, e.g. missing the pilot signal. See also §9.2.5 in [DR1].

5.3. ADDITIONAL ERROR CODE MEANINGS

An objet in the dictionary object is used to define battery system error. See §7.3.3. This object doesn't use the CAN Open error handling.

5.4. HEARTBEAT

The heartbeat mechanism for a device is established through cyclically transmitting a message by a heartbeat producer. One or more devices in the network are aware of this heartbeat message. If the heartbeat cycle fails for the heartbeat producer the local application on the heartbeat consumer will be informed about that event.

6. COMMUNICATION OBJECT DEFINITIONS

6.1. MANDATORY OBJECTS DEFINITION

6.1.1. Object 1000h: Device type

31 … 16	15 … 0
Additional information	Device profile number
MSB	LSB

Device profile number:*0x00: reserved*
0x01: MBMM
0x02: BMU
0x03 to 0xFF: reserved

Additional information: reserved bits (shall read as 0).

6.1.2. Object 1001h: Error register

Bit	M/O	Meaning
0	M	Generic error
1	O	Current
2	O	Voltage
3	O	Temperature
4	O	Communication error (overrun, error state)
5	O	Device profile specific
6	O	Reserved (always 0)
7	O	Manufacturer specific

An object in the dictionary object is used to define battery system error. See §7.2.3.

6.1.3. Object 1008h: Manufacturer device name

String "SAFT".

6.1.4. Object 1009h: Manufacturer hardware version

String “BMU”.

6.1.5. Object 100Ah: Manufacturer software version

String “BMU_Vx.xx-x”, with x.xx-x the software revision. Example: 0.62-0.

6.1.6. Object 1010h: Store parameters

6.1.7. Object 1011h: Restore default parameters

6.1.8. Object 1012h: Time Stamp

This object must be sent to the BMM in order to have a time reference. Refer to [DR1] for more detail about this object.

Default value: 80_h 00_h 01_h 00_h

- BMM consumes Time Stamp sent on 100_h COB-ID

6.1.9. Object 1017h: Producer heartbeat time

Heartbeat time should be 500ms.

6.1.10. Object 1018h: Identity object

Vendor ID (sub-index 1): string “SAFT” (no CIA account).

Product code (sub-index 2): String “0909”.

Revision number (sub-index 3): string “74_O”.

Serial number (sub-index 4): string with the BMU serial number.

Product code and Revision number strings are representing the CAN open specification number and the revision (09-0974_O).

6.2. 1st RPDO

6.2.1. Object 1400h: External data

OBJECT DESCRIPTION

INDEX	1400_h
Name	RPDO1 Param
Object code	RECORD
Data type	PDO CommPar
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	05_h

Sub-index	01_h
Description	COB-ID
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	see [DR1]
Default value	0200_h + Node ID

Sub-index	02_h
Description	Transmission type
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	255

Sub-index	05_h
Description	Event timer
Entry category	Optional
Access	rw
PDO mapping	No
Value range	UNSIGNED16
Default value	0

6.2.2. Object 1600_h: Mapping parameter

OBJECT DESCRIPTION

INDEX	1600_h
Name	RPDO1 Mapping
Object code	RECORD
Data type	PDO Mapping
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	Rw
PDO mapping	No
Value range	see [DR1]
Default value	03_h

Sub-index	01_h
Description	Reserved
Entry category	Mandatory
Access	Rw
PDO mapping	No
Value range	see [DR1]
Default value	$2050_h\ 00_h\ 10_h$

Sub-index	02_h
Description	Reserved
Entry category	Mandatory
Access	Rw
PDO mapping	No
Value range	see [DR1]
Default value	$2051_h\ 00_h\ 10_h$

Sub-index	03_h
Description	Customer Toggle Bit (optional)
Entry category	Mandatory
Access	Rw
PDO mapping	No
Value range	see [DR1]
Default value	$2052_h\ 00_h\ 08_h$

6.3. 2nd RPDO

6.3.1. Object 1401h: External battery control

OBJECT DESCRIPTION

INDEX	1401_h
Name	RPDO2 Param
Object code	RECORD
Data type	PDO CommPar
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	05_h

Sub-index	01_h
Description	COB-ID
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	see [DR1]
Default value	0300_h + Node ID

Sub-index	02_h
Description	Transmission type
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	255

Sub-index	05_h
Description	Event timer
Entry category	Optional
Access	rw
PDO mapping	No
Value range	UNSIGNED16
Default value	0

6.3.2. Object 1601_h: Mapping parameter

OBJECT DESCRIPTION

INDEX	1601_h
Name	RPDO2 Mapping
Object code	RECORD
Data type	PDO Mapping
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	see [DR1]
Default value	03_h

Sub-index	01_h
Description	Vcell Min
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	see [DR1]
Default value	$2056_h\ 00_h\ 10_h$

Sub-index	02_h
Description	Battery contactors authorization
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	see [DR1]
Default value	$2055_h\ 00_h\ 08_h$

6.4. 1st TPDO

6.4.1. Object 1800h: Battery alarm and security

OBJECT DESCRIPTION

INDEX	1800_h
Name	TPDO1 Param
Object code	RECORD
Data type	PDO CommPar
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	05_h

Sub-index	01_h
Description	COB-ID
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	see [DR1]
Default value	0180_h + Node ID

Sub-index	02_h
Description	Transmission type
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	255 if BMM is in asynchronous mode 1 if BMM is in synchronous mode

Sub-index	03_h
Description	Inhibit time
Entry category	Optional
Access	rw
PDO mapping	No
Value range	UNSIGNED16
Default value	0

Sub-index	05_h
Description	Event timer
Entry category	Optional
Access	rw
PDO mapping	No
Value range	UNSIGNED16
Default value	100

6.4.2. Object $1A00_h$: Mapping parameter

OBJECT DESCRIPTION

INDEX	$1A00_h$
Name	TPDO1 Mapping
Object code	RECORD
Data type	PDO Mapping
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	see [DR1]
Default value	08_h

Sub-index	01_h
Description	Global battery status
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	2000_h 00_h 08_h

Sub-index	02_h
Description	SOC_threshold
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	2001_h 00_h 08_h

Sub-index	03_h
Description	Battery fault codes status n°1 to 8
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	2002_h 01_h 08_h

Sub-index	04_h
Description	Battery fault codes status n°8 to 16
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	2002_h 02_h 08_h

Sub-index	05_h
Description	Battery fault codes status n°17 to 24
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	2002_h 03_h 08_h

Sub-index	06_h
Description	Battery fault codes status n°25 to 32
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	2002_h 04_h 08_h

Sub-index	07_h
Description	Battery fault codes status n°33 to 40
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	2002_h 05_h 08_h

Sub-index	08_h
Description	Battery fault codes status n°41 to 48
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	2002_h 06_h 08_h

6.5. 2nd TPDO

6.5.1. Object 1801h: Battery charge limits

OBJECT DESCRIPTION

INDEX	1801_h
Name	TPDO2 Param
Object code	RECORD
Data type	PDO CommPar
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	05_h

Sub-index	01_h
Description	COB-ID
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	see [DR1]
Default value	0280_h + Node ID

Sub-index	02_h
Description	Transmission type
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	255 if BMM is in asynchronous mode 1 if BMM is in synchronous mode

Sub-index	03_h
Description	Inhibit time
Entry category	Optional
Access	rw
PDO mapping	No
Value range	UNSIGNED16
Default value	0

Sub-index	05_h
Description	Event timer
Entry category	Optional
Access	rw
PDO mapping	No
Value range	UNSIGNED16
Default value	100

6.5.2. Object $1A01_h$: Mapping parameter

OBJECT DESCRIPTION

INDEX	$1A01_h$
Name	TPDO2 Mapping
Object code	RECORD
Data type	PDO Mapping
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	see [DR1]
Default value	04_h

Sub-index	01_h
Description	IMR Continuous
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	$2011_h\ 00_h\ 10_h$

Sub-index	02_h
Description	IMR
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	$2013_h\ 00_h\ 10_h$

Sub-index	03_h
Description	VMR
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	$2015_h\ 00_h\ 10_h$

Sub-index	04_h
Description	PMR
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	$2017_h\ 00_h\ 10_h$

6.6. 3rd TPDO

6.6.1. Object 1802h: Battery discharge limits and requests

OBJECT DESCRIPTION

INDEX	1802_h
Name	TPDO3 Param
Object code	RECORD
Data type	PDO CommPar
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	05_h

Sub-index	01_h
Description	COB-ID
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	see [DR1]
Default value	0380_h + Node ID

Sub-index	02_h
Description	Transmission type
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	255 if BMM is in asynchronous mode 1 if BMM is in synchronous mode

Sub-index	03_h
Description	Inhibit time
Entry category	Optional
Access	rw
PDO mapping	No
Value range	UNSIGNED16
Default value	0

Sub-index	05_h
Description	Event timer
Entry category	Optional
Access	rw
PDO mapping	No
Value range	UNSIGNED16
Default value	100

6.6.2. Object $1A02_h$: Mapping parameter

OBJECT DESCRIPTION

INDEX	$1A02_h$
Name	TPDO3 Mapping
Object code	RECORD
Data type	PDO Mapping
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	see [DR1]
Default value	04_h

Sub-index	01_h
Description	IMD
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	$2012_h\ 00_h\ 10_h$

Sub-index	02_h
Description	VMD
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	$2014_h\ 00_h\ 10_h$

Sub-index	03_h
Description	PMD
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	$2016_h\ 00_h\ 10_h$

Sub-index	04_h
Description	Battery requests
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	$2018_h\ 00_h\ 08_h$

6.7. 4th TPDO

6.7.1. Object 1803h: Battery data

OBJECT DESCRIPTION

INDEX	1803_h
Name	TPDO4 Param
Object code	RECORD
Data type	PDO CommPar
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	Ro
PDO mapping	No
Value range	see [DR1]
Default value	05_h

Sub-index	01_h
Description	COB-ID
Entry category	Mandatory
Access	Rw
PDO mapping	No
Value range	see [DR1]
Default value	0480_h + Node ID

Sub-index	02_h
Description	Transmission type
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	255 if BMM is in asynchronous mode 1 if BMM is in synchronous mode

Sub-index	03_h
Description	Inhibit time
Entry category	Optional
Access	rw
PDO mapping	No
Value range	UNSIGNED16
Default value	0

Sub-index	05_h
Description	Event timer
Entry category	Optional
Access	rw
PDO mapping	No
Value range	UNSIGNED16
Default value	100

6.7.2. Object $1A03_h$: Mapping parameter

OBJECT DESCRIPTION

INDEX	$1A03_h$
Name	TPDO4 Mapping
Object code	RECORD
Data type	PDO Mapping
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	see [DR1]
Default value	06_h

Sub-index	01_h
Description	Internal battery voltage
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	2021_h 00_h 10_h

Sub-index	02_h
Description	Internal battery current
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	2022_h 00_h 10_h

Sub-index	03_h
Description	Battery system mode
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	2020_h 00_h 08_h

Sub-index	04_h
Description	Battery contactors status
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	2024_h 00_h 08_h

Sub-index	05_h
Description	Reserved
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	0
Default value	0

Sub-index	06_h
Description	SOC
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	see [DR1]
Default value	$2026_h\ 00_h\ 08_h$

7. APPLICATION OBJECT DEFINITIONS

7.1. Introduction

Object description and entry description attributes are specified in [DR1] document. The *default value* attribute defines the value of an object with access attribute of the value 'rw' and 'wo' after power-on or application reset.
Detailed object description are given in the following sections.

7.2. Complex data type definition

7.2.1. Record 0080h: CellsVoltage

Voltage of one cell or all cells in a module in the battery system. The maximum cells in the module is 18.

Sub-index 01_h: Module number (virtual ID between 1 and Number of modules)

- 00_h = error, module not defined in battery system.
- XX_h = module number of the cell voltage(s) returned.

Sub-index 02_h: SMU serial number. Four bytes in the following format: YYWWXX

- YY: most significant byte (MSB). Represent the year.
- WW: represent the week.
- XX: less significant bytes (LSB) for the identifier.

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
YY								WW								XX															
Unsigned integer 8 bits (0 to 255 since 2000)								Unsigned integer 8 bits (0 to 53)								Unsigned integer 16 bits (0 to 65535)															
-								-								MSB								LSB							

Sub-index 03_h: Synchronization. Used to synchronize data between client and server
Bit0:

- 0 = server reset bit to 0 to warn the client that data requested are available
- 1 = client set bit to 1 to ask data about one module

Sub-index 04_h: Number of cells

- 01_h to 12_h = total number of cells per module.

Sub-index 05_h to 14_h: Cell n°x voltage

- 1mV per bit.

Index	Sub-Index	CellsVoltage record	Data type
0080$_h$	00$_h$	Highest sub-index supported	UNSIGNED8
	01$_h$	Module number	UNSIGNED8
	02$_h$	SMU serial number	UNSIGNED32
	03$_h$	Synchro	UNSIGNED8
	04$_h$	Number of cells	UNSIGNED8
	05$_h$	Cell n°01 voltage	UNSIGNED16
	06$_h$	Cell n°02 voltage	UNSIGNED16
	07$_h$	Cell n°03 voltage	UNSIGNED16
	08$_h$	Cell n°04 voltage	UNSIGNED16
	09$_h$	Cell n°05 voltage	UNSIGNED16
	0A$_h$	Cell n°06 voltage	UNSIGNED16
	0B$_h$	Cell n°07 voltage	UNSIGNED16
	0C$_h$	Cell n°08 voltage	UNSIGNED16
	0D$_h$	Cell n°09 voltage	UNSIGNED16
	0E$_h$	Cell n°10 voltage	UNSIGNED16
	0F$_h$	Cell n°11 voltage	UNSIGNED16
	10$_h$	Cell n°12 voltage	UNSIGNED16
	11$_h$	Cell n°13 voltage	UNSIGNED16
	12$_h$	Cell n°14 voltage	UNSIGNED16
	13$_h$	Cell n°15 voltage	UNSIGNED16
	14$_h$	Cell n°16 voltage	UNSIGNED16
	15$_h$	Cell n°17 voltage	UNSIGNED16
	16$_h$	Cell n°18 voltage	UNSIGNED16

7.2.2. Record 0081h: BatteryTemperature

One or all temperature in a module in the battery system. The maximum temperature in the module is 4.

Sub-index 01$_h$: Module number (virtual ID between 1 and Number of modules)

- 00$_h$ = error, module not defined in battery system.
- XX$_h$ = module number of the cell temperature(s) returned.

Sub-index 02$_h$: SMU serial number. Four bytes in the following format: YYWWXX

- YY: most significant byte (MSB). Represent the year.
- WW: represent the week.
- XX: less significant bytes (LSB) for the identifier.

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
YY								WW								XX															
Unsigned integer 8 bits (0 to 255 since 2000)								Unsigned integer 8 bits (0 to 53)								Unsigned integer 16 bits (0 to 65535)															
-								-								MSB														LSB	

Sub-index 03$_h$: Synchronization. Used to synchronize data between client and server
Bit0:

- 0 = server reset bit to 0 to warn the client that data requested are available
- 1 = client set bit to 1 to ask data about one module

Sub-index 04$_h$: Number of sensors

- 01$_h$ to 04$_h$ = total number of temperature sensors per module.

Sub-index 05$_h$ to 08$_h$: Sensor temperature values

- 1°C per bit (00 $_h$ = 0°C, 7F $_h$= 127°C, 80 $_{h=}$ -128°C, FF$_h$ = -1°C).

Index	Sub-Index	BatteryTemperature record	Data type
0081_h	00_h	Highest sub-index supported	UNSIGNED8
	01_h	Number of temperature sensors	UNSIGNED8
	02_h	SMU serial number	UNSIGNED32
	03_h	Synchro	UNSIGNED8
	04_h	Sensor number	UNSIGNED8
	05_h	Sensor n°01 temperature	SIGNED8
	06_h	Sensor n°02 temperature	SIGNED8
	07_h	Sensor n°03 temperature	SIGNED8
	08_h	Sensor n°04 temperature	SIGNED8

7.2.3. Record 0082h: MinMaxCellVoltage

Minimum or maximum cell voltage in the battery system.

Sub-index 01_h: Module serial number of the cell concerned by the maximum or minimum voltage.

Four bytes in the following format: YYWWXX:

- YY: most significant byte (MSB). Represent the year.
- WW: represent the week.
- XX: less significant bytes (LSB) for the identifier.

31 30 29 28 27 26 25 24	23 22 21 20 19 18 17 16	15 14 13 12 11 10 09 08 07 06 05 04 03 02 01 00	
YY	WW	XX	
Unsigned integer 8 bits (0 to 255 since 2000)	Unsigned integer 8 bits (0 to 53)	Unsigned integer 16 bits (0 to 65535)	
-	-	MSB	LSB

Sub-index 02_h: Cell number

- 01_h to xx_h = cell number concerned by the maximum or minimum voltage (xx is corresponding to the Number of cells per module (object 2045_h)).

Sub-index 03_h: Cell voltage

- 1mV per bit.

Index	Sub-Index	MinMaxCellsVoltage record	Data type
0082_h	00_h	Highest sub-index supported	UNSIGNED8
	01_h	SMU serial number	UNSIGNED32
	02_h	Cell number	UNSIGNED8
	03_h	Cell voltage	UNSIGNED16

7.2.4. Record 0083h: MinMaxTemperature

Minimum or maximum temperature in the module (cells or module terminals).

Sub-index 01_h: SMU serial number concerned by the maximum or minimum temperature.

Four bytes in the following format: YYWWXX:

- YY: most significant byte (MSB). Represent the year.
- WW: represent the week.
- XX: less significant bytes (LSB) for the identifier.

31 30 29 28 27 26 25 24	23 22 21 20 19 18 17 16	15 14 13 12 11 10 09 08 07 06 05 04 03 02 01 00	
YY	WW	XX	
Unsigned integer 8 bits (0 to 255 since 2000)	Unsigned integer 8 bits (0 to 53)	Unsigned integer 16 bits (0 to 65535)	
-	-	MSB	LSB

Sub-index 02_h: Temperature

- 1°C per bit (00_h = 0°C, $7F_h$= 127°C, 80_h= -128°C, / FF_h = -1°C).

Index	Sub-Index	MinMaxBatteryTemperature record	Data type
0083_h	00_h	Highest sub-index supported	UNSIGNED8
	01_h	SMU serial number	UNSIGNED32
	02_h	Temperature	SIGNED8

7.2.5. Record 0084h: ModuleCyclingSOH

Gives information about the module cycling condition depending of SOH.

Sub-index 01_h: Module number (virtual ID between 1 and Number of modules)

- 00_h = error, module not defined in battery system.
- XX_h = module number

Sub-index 02_h: SMU serial number. Four bytes in the following format: YYWWXX

- YY: most significant byte (MSB). Represent the year.
- WW: represent the week.
- XX: less significant bytes (LSB) for the identifier.

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
YY								WW								XX															
Unsigned integer 8 bits (0 to 255 since 2000)								Unsigned integer 8 bits (0 to 53)								Unsigned integer 16 bits (0 to 65535)															
-								-								MSB								LSB							

Sub-index 03_h: Synchronization. Used to synchronize data between client and server
Bit0:

- 0 = server reset bit to 0 to warn the client that data requested are available
- 1 = client set bit to 1 to ask data about one module

Sub-index 04_h to $0D_h$: Number of charge/discharge cycles versus SOH

- 1 cycle per bit.

Index	Sub-Index	ModuleCyclingSOH record	Data type
0084_h	00_h	Highest sub-index supported	UNSIGNED8
	01_h	Module number	UNSIGNED8
	02_h	SMU serial number	UNSIGNED32
	03_h	Synchro	UNSIGNED8
	04_h	SOH < 10% DOD	UNSIGNED16
	05_h	10% DOD ≤ SOH < 20% DOD	UNSIGNED16
	06_h	20% DOD ≤ SOH < 30% DOD	UNSIGNED16
	07_h	30% DOD ≤ SOH < 40% DOD	UNSIGNED16
	08_h	40% DOD ≤ SOH < 50% DOD	UNSIGNED16
	09_h	50% DOD ≤ SOH < 60% DOD	UNSIGNED16
	$0A_h$	60% DOD ≤ SOH < 70% DOD	UNSIGNED16
	$0B_h$	70% DOD ≤ SOH < 80% DOD	UNSIGNED16
	$0C_h$	80% DOD ≤ SOH < 90% DOD	UNSIGNED16
	$0D_h$	90% DOD ≤ SOH < 100% DOD	UNSIGNED16

7.2.6. Record 0085h: ModuleCalendarSOH

Gives information about the module calendar SOH.

Sub-index 01_h: Module number (virtual ID between 1 and Number of modules)

- 00_h = error, module not defined in battery system.
- XX_h = module number

Sub-index 02_h: SMU serial number. Four bytes in the following format: YYWWXX

- YY: most significant byte (MSB). Represent the year.
- WW: represent the week.
- XX: less significant bytes (LSB) for the identifier.

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
YY								WW								XX															
Unsigned integer 8 bits (0 to 255 since 2000)								Unsigned integer 8 bits (0 to 53)								Unsigned integer 16 bits (0 to 65535)															
-								-								MSB								LSB							

Sub-index 03_h: Synchronization. Used to synchronize data between client and server
Bit0:

- 0 = server reset bit to 0 to warn the client that data requested are available
- 1 = client set bit to 1 to ask data about one module

Sub-index 04_h to $3F_h$: time spent inside the considered T°C and SOC classes.

- 1 hour per bit.

Index	Sub-Index	ModuleCalendarSOH record	Data type
0085$_h$	00$_h$	Highest sub-index supported	UNSIGNED8
	01$_h$	Module number	UNSIGNED8
	02$_h$	SMU serial number	UNSIGNED32
	03$_h$	Synchro	UNSIGNED8
	04$_h$	55°C < T°C ≤ 65°C & SOC < 10%	UNSIGNED16
	05$_h$	55°C < T°C ≤ 65°C & 10% ≤ SOC < 20%	UNSIGNED16
	06$_h$	55°C < T°C ≤ 65°C & 20% ≤ SOC < 30%	UNSIGNED16
	07$_h$	55°C < T°C ≤ 65°C & 30% ≤ SOC < 40%	UNSIGNED16
	08$_h$	55°C < T°C ≤ 65°C & 40% ≤ SOC < 50%	UNSIGNED16
	09$_h$	55°C < T°C ≤ 65°C & 50% ≤ SOC < 60%	UNSIGNED16
	0A$_h$	55°C < T°C ≤ 65°C & 60% ≤ SOC < 70%	UNSIGNED16
	0B$_h$	55°C < T°C ≤ 65°C & 70% ≤ SOC < 80%	UNSIGNED16
	0C$_h$	55°C < T°C ≤ 65°C & 80% ≤ SOC < 90%	UNSIGNED16
	0D$_h$	55°C < T°C ≤ 65°C & 90% ≤ SOC	UNSIGNED16
	0E	45°C < T°C ≤ 55°C & SOC < 10%	UNSIGNED16
	0F	45°C < T°C ≤ 55°C & 10% ≤ SOC < 20%	UNSIGNED16
	10	45°C < T°C ≤ 55°C & 20% ≤ SOC < 30%	UNSIGNED16
	11	45°C < T°C ≤ 55°C & 30% ≤ SOC < 40%	UNSIGNED16
	12	45°C < T°C ≤ 55°C & 40% ≤ SOC < 50%	UNSIGNED16
	13	45°C < T°C ≤ 55°C & 50% ≤ SOC < 60%	UNSIGNED16
	14	45°C < T°C ≤ 55°C & 60% ≤ SOC < 70%	UNSIGNED16
	15	45°C < T°C ≤ 55°C & 70% ≤ SOC < 80%	UNSIGNED16
	16	45°C < T°C ≤ 55°C & 80% ≤ SOC < 90%	UNSIGNED16
	17	45°C < T°C ≤ 55°C & 90% ≤ SOC	UNSIGNED16
	18	30°C < T°C ≤ 45°C & SOC < 10%	UNSIGNED16
	19	30°C < T°C ≤ 45°C & 10% ≤ SOC < 20%	UNSIGNED16
	1A	30°C < T°C ≤ 45°C & 20% ≤ SOC < 30%	UNSIGNED16
	1B	30°C < T°C ≤ 45°C & 30% ≤ SOC < 40%	UNSIGNED16
	1C	30°C < T°C ≤ 45°C & 40% ≤ SOC < 50%	UNSIGNED16
	1D	30°C < T°C ≤ 45°C & 50% ≤ SOC < 60%	UNSIGNED16
	1E	30°C < T°C ≤ 45°C & 60% ≤ SOC < 70%	UNSIGNED16
	1F	30°C < T°C ≤ 45°C & 70% ≤ SOC < 80%	UNSIGNED16
	20	30°C < T°C ≤ 45°C & 80% ≤ SOC < 90%	UNSIGNED16
	21	30°C < T°C ≤ 45°C & 90% ≤ SOC	UNSIGNED16
	22	25°C < T°C ≤ 30°C & SOC < 10%	UNSIGNED16
	23	25°C < T°C ≤ 30°C & 10% ≤ SOC < 20%	UNSIGNED16
	24	25°C < T°C ≤ 30°C & 20% ≤ SOC < 30%	UNSIGNED16
	25	25°C < T°C ≤ 30°C & 30% ≤ SOC < 40%	UNSIGNED16
	26	25°C < T°C ≤ 30°C & 40% ≤ SOC < 50%	UNSIGNED16
	27	25°C < T°C ≤ 30°C & 50% ≤ SOC < 60%	UNSIGNED16
	28	25°C < T°C ≤ 30°C & 60% ≤ SOC < 70%	UNSIGNED16
	29	25°C < T°C ≤ 30°C & 70% ≤ SOC < 80%	UNSIGNED16
	2A	25°C < T°C ≤ 30°C & 80% ≤ SOC < 90%	UNSIGNED16
	2B	25°C < T°C ≤ 30°C & 90% ≤ SOC	UNSIGNED16
	2C	20°C < T°C ≤ 25°C & SOC < 10%	UNSIGNED16
	2D	20°C < T°C ≤ 25°C & 10% ≤ SOC < 20%	UNSIGNED16
	2E	20°C < T°C ≤ 25°C & 20% ≤ SOC < 30%	UNSIGNED16
	2F	20°C < T°C ≤ 25°C & 30% ≤ SOC < 40%	UNSIGNED16
	30	20°C < T°C ≤ 25°C & 40% ≤ SOC < 50%	UNSIGNED16
	31	20°C < T°C ≤ 25°C & 50% ≤ SOC < 60%	UNSIGNED16
	32	20°C < T°C ≤ 25°C & 60% ≤ SOC < 70%	UNSIGNED16
	33	20°C < T°C ≤ 25°C & 70% ≤ SOC < 80%	UNSIGNED16
	34	20°C < T°C ≤ 25°C & 80% ≤ SOC < 90%	UNSIGNED16
	35	20°C < T°C ≤ 25°C & 90% ≤ SOC	UNSIGNED16
	36	T°C ≤ 20°C & SOC < 10%	UNSIGNED16
	37	T°C ≤ 20°C & 10% ≤ SOC < 20%	UNSIGNED16
	38	T°C ≤ 20°C & 20% ≤ SOC < 30%	UNSIGNED16
	39	T°C ≤ 20°C & 30% ≤ SOC < 40%	UNSIGNED16
	3A	T°C ≤ 20°C & 40% ≤ SOC < 50%	UNSIGNED16
	3B	T°C ≤ 20°C & 50% ≤ SOC < 60%	UNSIGNED16

	3C	T°C ≤ 20°C & 60% ≤ SOC < 70%	UNSIGNED16
	3D	T°C ≤ 20°C & 70% ≤ SOC < 80%	UNSIGNED16
	3E	T°C ≤ 20°C & 80% ≤ SOC < 90%	UNSIGNED16
	3F	T°C ≤ 20°C & 90% ≤ SOC	UNSIGNED16

7.2.7. Record 0086h: SMUConfiguration

Gives the configuration of SMU.

Sub-index 01_h: Module number (virtual ID between 1 and Number of modules)

- 00_h = error, module not defined in battery system.
- XX_h = module number of the cell voltage(s) returned.

Sub-index 02_h: SMU serial number. Four bytes in the following format: YYWWXX

- YY: most significant byte (MSB). Represent the year.
- WW: represent the week.
- XX: less significant bytes (LSB) for the identifier.

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
YY								WW								XX															
Unsigned integer 8 bits (0 to 255 since 2000)								Unsigned integer 8 bits (0 to 53)								Unsigned integer 16 bits (0 to 65535)															
-								-								MSB								LSB							

Sub-index 03_h: Synchronization. Used to synchronize data between client and server
Bit0:

- 0 = server reset bit to 0 to warn the client that data requested are available
- 1 = client set bit to 1 to ask data about one module

Sub-index 04_h: P: number of branches in parallel in module

Sub-index 05_h: S: number of cells in series per branch

Index	Sub-Index	CellsVoltage record	Data type
0086_h	00_h	Highest sub-index supported	UNSIGNED8
	01_h	Module number	UNSIGNED8
	02_h	SMU serial number	UNSIGNED32
	03_h	Synchro	UNSIGNED8
	04_h	P	UNSIGNED8
	05_h	S	UNSIGNED8

7.3. Detailed object definitions

7.3.1. Object 2000_h: Global battery status

This object shall indicate the battery status:

Major error: shall indicate a major error in the battery. Major error can have different causes but means that battery system is out of order. Major error is active as soon as at least one ALARM is present on the BMM.

Minor error: shall indicate a minor error in the battery. The battery system is not out of order but in downgraded mode. Nevertheless, battery system stays in safe perimeter. Minor error is active as soon as at least one WARNING is present on the BMM.

Self-test in progress: shall indicate that a self-test is in progress (PBIT or IBIT).

Battery unbalanced: shall indicate that the a balancing is needed to equalize the cell voltage.

BMU watchdog: shall indicate the battery system software is working properly.

VALUE DEFINITION

The Global battery status has the following format:

7	6	5	4	3	2	1	0
Reserved (0)		BMU watchdog	End of charge	Battery unbalanced	Self-test in progress	Minor error	Major error
MSB							LSB

Bit 0: Major error
- 0 = no error
- 1 = major error

Bit 1: Minor error
- 0 = no error
- 1 = minor error

Bit 2: Self-test in progress
- 0 = no self-test in progress
- 1 = self-test in progress

Bit 3: Battery unbalanced
- 0 = battery balanced
- 1 = battery unbalanced

Bit 4: End of charge
- 0 = battery in charge
- 1 = battery charge is finished

Bit 5: Watchdog BMU
- Toggle each time the object is sent

OBJECT DESCRIPTION

INDEX	2000_h
Name	Global battery status
Object code	VAR
Data type	UNSIGNED8
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	ro
PDO mapping	Default
Value range	See value definition in this §
Default value	No

7.3.2. Object 2001_h: SOC_threshold

This object shall indicate if the battery SOC has reached some predefined thresholds:

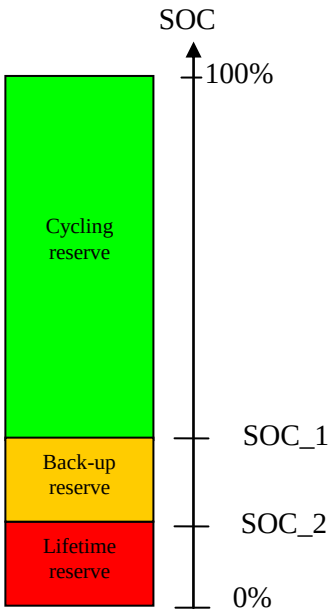
Back-up SOC (SOC1): shall indicate if the battery SOC is below the back-up SOC limit.

Lifetime reserve SOC (SOC2): shall indicate if the battery SOC is below the Lifetime reserve SOC limit.

VALUE DEFINITION

The SOC_threshold has the following format:

7 ... 2	1	0
Reserved (0)	Lifetime reserve SOC (SOC2)	Back-up reserve SOC (SOC1)
MSB		LSB



Bit 0: Back-up SOC (SOC_1)

- 0 = the battery SOC is above the Back-up SOC limit.
- 1 = the battery SOC is below the Back-up SOC limit (Back-up reserve is consumed).

Bit 1: Lifetime reserve SOC (SOC_2)

- 0 = the battery SOC is above the Lifetime reserve SOC limit.
- 1 = the battery SOC is below the Lifetime SOC limit (Lifetime reserve is consumed).

OBJECT DESCRIPTION

INDEX	2001_h
Name	SOC_threshold
Object code	VAR
Data type	UNSIGNED8
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	ro
PDO mapping	Default
Value range	See value definition in this §
Default value	00_h

7.3.3. Object 2002_h: Battery fault codes status n°1 to 48

This object shall indicate the fault codes' activation in the battery system.
External system has the possibility to reset the fault code by sending 'Battery fault code n°1 to 48 reset' object (2053_h).

VALUE DEFINITION

The battery fault codes have the following format:

	bit									
	7	6	5	4	3	2	1	0		
fault code	8	6	6	5	4	3	2	1	1	byte
	16	15	14	13	12	11	10	9	2	
	24	23	22	21	20	19	18	17	3	
	32	31	30	29	28	27	26	25	4	
	34	39	38	37	36	35	34	33	5	
	48	47	46	45	44	43	42	41	6	
	MSB								LSB	

Bit 'x':

- 0 = fault code 'x' is not present
- 1 = fault code 'x' is present

OBJECT DESCRIPTION

INDEX	2002_h
Name	Battery fault codes status n°1 to 48
Object code	ARRAY
Data type	UNSIGNED8
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	06_h
Default value	06_h

Sub-index	01_h
Description	Fault codes n°1 to 8
Entry category	Mandatory
Access	ro
PDO mapping	Default
Value range	See VALUE DEFINITION in this §
Default value	00_h

Sub-index	02_h
Description	Fault codes n°9 to 16
Entry category	Mandatory
Access	ro
PDO mapping	Default
Value range	See VALUE DEFINITION in this §
Default value	00_h

Sub-index	03_h
Description	Fault codes n°17 to 24
Entry category	Mandatory
Access	ro
PDO mapping	Default
Value range	See VALUE DEFINITION in this §
Default value	00_h

Sub-index	04_h
Description	Fault codes n°25 to 32
Entry category	Mandatory
Access	ro
PDO mapping	Default
Value range	See VALUE DEFINITION in this §
Default value	00_h

Sub-index	05_h
Description	Fault codes n°33 to 40
Entry category	Mandatory
Access	ro
PDO mapping	Default
Value range	See VALUE DEFINITION in this §
Default value	00_h

Sub-index	06_h
Description	Fault codes n°41 to 48
Entry category	Mandatory
Access	ro
PDO mapping	Default
Value range	See VALUE DEFINITION in this §
Default value	00_h

7.3.4. Object 2011_h: IMR continuous

This object shall provide to external system the recommended maximum continuous electrical current for the charge.

VALUE DEFINITION

The resolution shall be 0.25A per bit.

OBJECT DESCRIPTION

INDEX	2011_h
Name	IMR continuous
Object code	VAR
Data type	UNSIGNED16
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	ro
PDO mapping	Default
Value range	UNSIGNED16
Default value	No

7.3.5. Object 2012_h: IMD

This object shall indicate the maximum dynamic (peak) discharge current that battery system can admit.

VALUE DEFINITION

The resolution shall be 0.25A per bit.

OBJECT DESCRIPTION

INDEX	2012_h
Name	IMD
Object code	VAR
Data type	UNSIGNED16
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	ro
PDO mapping	Default
Value range	UNSIGNED16
Default value	No

7.3.6. Object 2013_h: IMR

This object shall indicate the maximum dynamic (peak) charge current that battery system can admit.

VALUE DEFINITION

The resolution shall be 0.25A per bit.

OBJECT DESCRIPTION

INDEX	2013_h
Name	IMR
Object code	VAR
Data type	UNSIGNED16
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	ro
PDO mapping	Default
Value range	UNSIGNED16
Default value	No

7.3.7. Object 2014_h: VMD

This object shall indicate the minimum authorized battery voltage in discharge. The battery voltage must not be less than VMD.

VALUE DEFINITION

The resolution shall be 25mV per bit.

OBJECT DESCRIPTION

INDEX	2014_h
Name	VMD
Object code	VAR
Data type	UNSIGNED16
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	Ro
PDO mapping	Default
Value range	UNSIGNED16
Default value	No

7.3.8. Object 2015_h: VMR

This object shall indicate the maximum authorized battery voltage in charge. The battery voltage must not be more than VMR.

VALUE DEFINITION

The resolution shall be 25mV per bit.

OBJECT DESCRIPTION

INDEX	2015_h
Name	VMR
Object code	VAR
Data type	UNSIGNED16
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	ro
PDO mapping	Default
Value range	UNSIGNED16
Default value	No

7.3.9. Object 2016_h: PMD

This object shall indicate the maximum authorized battery power in discharge (long PMD). The battery power must not be more than PMD.

VALUE DEFINITION

The resolution shall be 10W per bit.

OBJECT DESCRIPTION

INDEX	2016_h
Name	PMD
Object code	VAR
Data type	UNSIGNED16
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	ro
PDO mapping	Default
Value range	UNSIGNED16
Default value	No

7.3.10. Object 2017_h: PMR

This object shall indicate the maximum authorized battery power in charge (long PMR). The battery power must not be more than PMR.

VALUE DEFINITION

The resolution shall be 10W per bit.

OBJECT DESCRIPTION

INDEX	2017_h
Name	PMR
Object code	VAR
Data type	UNSIGNED16
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	ro
PDO mapping	Default
Value range	UNSIGNED16
Default value	No

7.3.11. Object 2018_h: Battery requests

This object shall indicate the battery requests:

Self-test required: shall indicate that a self-test will be started [Self-test_time] seconds minimum after sending this object (PBIT). [Self-test_time] is software parameter to configure.

Contactor opening required: shall indicate that contactors must be opened.

Thermal regulation required: shall indicate that a thermal regulation system must be started to cool or heat the battery or to balance the module temperature dispatched in the whole battery. A thermal regulation system produces a fluid flow (air or liquid) that is regulated to a fixed temperature (typical 20°C)

Cooling required : shall indicate that a cooling system must be started to cool the battery

Heating required : shall indicate that a heating system must be started to heat the battery

VALUE DEFINITION

The Global battery status has the following format:

7	6	5	4	3	2	1	0
Reserved (0)			Heating required	Cooling required	Circulation required	Contactor opening required	Self-test required
MSB							LSB

Bit 0: Self-test required
- 0 = no self-test needed
- 1 = a self-test is required

Bit 1: Contactor opening required
- 0 = no contactor opening required
- 1 = contactor opening required

Bit 2: Circulation required
- 0 = Circulation not required
- 1 = Circulation required

Bit 3: Cooling required
- 0 = cooling not required
- 1 = cooling required

Bit 4: Heating required
- 0 = cooling not required
- 1 = cooling required

OBJECT DESCRIPTION

INDEX	2018_h
Name	Battery requests
Object code	VAR
Data type	UNSIGNED8
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	ro
PDO mapping	Default
Value range	See value definition in this §
Default value	No

7.3.12. Object 2020_h: Battery system state

This object shall indicate in which state the battery system is in.

VALUE DEFINITION

The Battery system state shall have the following coding:

00h	Off state	System battery is powered OFF
01h	Init state	Before pre-charge mode, self-test of the system
02h	Pre-charge state	Battery system is not connected, electric adaptation period before battery system connection to customer system
03h	Nominal state	Battery system is connected. Battery system is in a safe perimeter
04h	Standby state	Battery system is disconnected and wait for authorization to connect
05h	Not used	Not used
06h	After run state	Battery system is disconnected but battery system makes some checks and cooling management (if required)
07h	Sleep SMU state	Battery system is disconnected and SMU are put in sleep state when after-run is finished.
08h	Safe state	Battery system is disconnected because the battery system went out of safe perimeter
09h to FFh	Reserved	

Sleep state cannot be displayed because in sleep state, CAN drivers are not supplied, so information is not transmitted between BMM and client.

OBJECT DESCRIPTION

INDEX	2020_h
Name	Battery system state
Object code	VAR
Data type	UNSIGNED8
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	Ro
PDO mapping	Default
Value range	UNSIGNED8
Default value	No

7.3.13. Object 2021_h: Internal battery voltage

This object shall provide the instantaneous battery voltage measured by the battery system.

VALUE DEFINITION

The resolution shall be 25mV per bit. The range of value shall be 0000_h to $FFFF_h$.

OBJECT DESCRIPTION

INDEX	2021_h
Name	Internal battery voltage
Object code	VAR
Data type	UNSIGNED16
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	ro
PDO mapping	Default
Value range	UNSIGNED16
Default value	No

7.3.14. Object 2022_h: Internal battery current

This object shall provide the instantaneous current measured by the battery system.

VALUE DEFINITION

The resolution shall be 0.25A per bit. The range of value shall be 0000_h to $FFFF_h$ (0000_h =0A, for $-7FFF_h$ = 8191.75A, 8000_h = -8192A and $FFFF_h$ =-0.25A).

OBJECT DESCRIPTION

INDEX	2022_h
Name	Internal battery current
Object code	VAR
Data type	SIGNED16
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	ro
PDO mapping	Default
Value range	See VALUE DEFINITION in this §
Default value	No

7.3.15. Object 2023_h: HVDC1 voltage

This object shall provide the instantaneous battery voltage measured by the battery system after contactor.

VALUE DEFINITION

2 cases :

- In case the BMM is equipped with a voltage measurement, the resolution shall be 25mV per bit. The range of value shall be 0000_h to $FFFF_h$.

- In case the BMM is equipped with a voltage detection :

FFFF = voltage present after contactors

0 = no voltage present after contactors

OBJECT DESCRIPTION

INDEX	2023_h
Name	HVDC1 voltage
Object code	VAR
Data type	UNSIGNED16
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	ro
PDO mapping	Default
Value range	UNSIGNED16
Default value	No

7.3.16. Object 2024_h: Battery contactors status

This object shall indicate the state of battery system contactors (positive pole (+) and negative pole (-)):

Main+: shall indicate the contactor state on charge positive pole.

Optional Main+ : shall indicate the contactor state on optional positive pole.

Precharge+: shall indicate the contactor state on precharge positive pole.

Optional Precharge+: shall indicate the contactor state on optional precharge positive pole.

Main -: shall indicate the contactor state on negative pole.

VALUE DEFINITION

The Global battery status has the following format:

7	6	5	4	3	2	1	0
Reserved (0)		Reserved (0)	Main -	Optional Precharge+	Precharge +	Optional Main+	Main+
MSB							LSB

Bit 0: Main +

- 0 = contactor opened
- 1 = contactor closed

Bit 1: Optional Main+

- 0 = contactor opened
- 1 = contactor closed

Bit 2: Precharge+

- 0 = contactor opened
- 1 = contactor closed

Bit 3: Optional Precharge+

- 0 = contactor opened
- 1 = contactor closed

Bit 4: Main -

- 0 = contactor opened
- 1 = contactor closed

OBJECT DESCRIPTION

INDEX	2024_h
Name	Global battery status
Object code	VAR
Data type	UNSIGNED8
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	ro
PDO mapping	Default
Value range	See value definition in this §
Default value	No

7.3.17. Deleted in K version

7.3.18. Object 2026_h: SOC

This object shall provide the amount of capacity contained in the battery (State Of Charge), expressed as a percentage of the total amount of actual battery capacity. The calculation is done taking SOH into account.

VALUE DEFINITION

The resolution shall be 1% per bit. FF_h shall indicate an invalid value.

OBJECT DESCRIPTION

INDEX	2026_h
Name	Remaining battery capacity
Object code	VAR
Data type	UNSIGNED8
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	ro
PDO mapping	No
Value range	00_h to 64_h and FF_h
Default value	No

7.3.19. Object 2027_h: Cells voltage

This object shall indicate the voltage of one cell or all cells in a module in the battery system.
This object has to be updated by the server when Synchro bit is set by the client.
The client has the possibility to choose the module by writing the module ID in Module number. If the module ID is not found, the server will write 0 in this field.
Number of cells indicates how many cells there are in the module concerned by the request.
The SMU serial number is used to do physically the link with the virtual module ID. This field is updated by server.
The maximum cells in the module is 18.

VALUE DEFINITION

See also § 7.2.1 (Record 0080_h definition)

Module number: (virtual ID between 1 and Number of modules)

- 00_h = error, module not defined in battery system.
- XX_h = module number of the cell voltage(s) returned (between 1 and Number of modules).

SMU serial number: 4 bytes in the following format: YYWWXX

- YY: first byte for the year.
- WW: second byte for the week.
- XX: third and fourth bytes for the identifier.

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
YY								WW								XX															
Unsigned integer 8 bits (0 to 255 since 2000)								Unsigned integer 8 bits (0 to 53)								Unsigned integer 16 bits (0 to 65535)															
-								-								MSB								LSB							

Synchro: Used to synchronize data between client and server

Bit0:

- 0 = server reset bit to 0 to warn the client that data requested are available
- 1 = client set bit to 1 to ask data about one module

Cell number:

- 01_h to 12_h = number of cells returned (module cells number).

Cell n°x voltage resolution: 1mV per bit. The range of value shall be 0000_h to $FFFF_h$.

OBJECT DESCRIPTION

INDEX	2027_h
Name	Cells voltage
Object code	RECORD
Data type	CellsVoltage
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	16_h
Default value	16_h

Sub-index	01_h
Description	Module number
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	UNSIGNED8
Default value	No

Sub-index	02_h
Description	Module serial number
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

Sub-index	03_h
Description	Synchro
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	UNSIGNED8
Default value	No

Sub-index	04_h
Description	Cell number
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED8
Default value	No

Sub-index	05_h
Description	Cell n°01 voltage
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	06_h
Description	Cell n°02 voltage
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	07_h
Description	Cell n°03 voltage
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	08_h
Description	Cell n°04 voltage
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	09_h
Description	Cell n°05 voltage
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$0A_h$
Description	Cell n°06 voltage
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$0B_h$
Description	Cell n°07 voltage
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$0C_h$
Description	Cell n°08 voltage
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$0D_h$
Description	Cell n°09 voltage
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$0E_h$
Description	Cell n°10 voltage
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$0F_h$
Description	Cell n°11 voltage
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	10_h
Description	Cell n°12 voltage
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	11_h
Description	Cell n°13 voltage
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	12_h
Description	Cell n°14 voltage
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	13_h
Description	Cell n°15 voltage
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	14_h
Description	Cell n°16 voltage
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	15_h
Description	Cell n°17 voltage
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	16_h
Description	Cell n°18 voltage
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

7.3.20. Object 2028_h: Temperatures inside the module

This object shall indicate the temperature of one sensor or all sensor inside a module in the battery system.

This object has to be updated by the server when Synchro bit is set by the client.

The client has the possibility to choose the module by writing the module ID in Module number. If the module ID is not found, the server will write 0.

Sensor number indicates how many temperature sensors there are in the module concerned by the request.

The SMU serial number is used to do physically the link with the virtual module ID.

The maximum temperature sensors in the module is 4.

VALUE DEFINITION

See also § 7.2.2 (Record 0081_h definition)

Module number: (virtual ID between 1 and Number of modules)

- 00_h = error, module not defined in battery system
- XX_h = module number of the cell temperature(s) returned (between 1 and Number of modules).

SMU serial number: 4 bytes in the following format: YYWWXX

- YY: first byte for the year.
- WW: second byte for the week.
- XX: third and fourth bytes for the identifier.

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
YY								WW								XX															
Unsigned integer 8 bits (0 to 255 since 2000)								Unsigned integer 8 bits (0 to 53)								Unsigned integer 16 bits (0 to 65535)															
-								-								MSB								LSB							

Synchro: Used to synchronize data between client and server

Bit0:

- 0 = server reset bit to 0 to warn the client that data requested are available
- 1 = client set bit to 1 to ask data about one module

Sensor number:

- 01_h to 04_h = number of temperature sensor returned

Sensor n°x temperature resolution: 1°C per bit (00_h = 0°C, $7F_h$ = 127°C, $80_{h=}$-128°C, FF_h = -1°C).

OBJECT DESCRIPTION

INDEX	2028_h
Name	Battery temperature
Object code	RECORD
Data type	BatteryTemperature
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	08_h
Default value	08_h

Sub-index	01_h
Description	Module number
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	UNSIGNED8
Default value	No

Sub-index	02_h
Description	SMU serial number
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

Sub-index	03_h
Description	Synchro
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	UNSIGNED8
Default value	No

Sub-index	04_h
Description	Sensor number
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED8
Default value	No

Sub-index	05_h
Description	Sensor n°01 temperature
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	SIGNED8
Default value	No

Sub-index	06_h
Description	Sensor n°02 temperature
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	SIGNED8
Default value	No

Sub-index	07_h
Description	Sensor n°03 temperature
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	SIGNED8
Default value	No

Sub-index	08_h
Description	Sensor n°04 temperature
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	SIGNED8
Default value	No

Usually:
Sensor n°01 temperature: cells temperature
Sensor n°02 temperature: module terminals temperature n°1
Sensor n°03 temperature: module terminals temperature n°2
Sensor n°04 temperature: not used

7.3.21. Object 2029_h: Max cell voltage

This object shall indicate the maximum voltage of all cells in battery system and the module concerned by this maximum voltage.

VALUE DEFINITION

See also § 7.2.3 (Record 0082_h definition)

SMU serial number: 4 bytes in the following format: YYWWXX

- YY: first byte for the year.
- WW: second byte for the week.
- XX: third and fourth bytes for the identifier.

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
YY								WW								XX															
Unsigned integer 8 bits (0 to 255 since 2000)								Unsigned integer 8 bits (0 to 53)								Unsigned integer 16 bits (0 to 65535)															
-								-								MSB								LSB							

Cell number:

- 01_h to xx_h = cell number concerned by the maximum voltage (xx is corresponding to the Number of cells per module (object 2045_h)).

Cell voltage: Maximum cell voltage in the battery. The resolution shall be 1mV per bit. The range of value shall be 0000_h to $FFFF_h$.

OBJECT DESCRIPTION

INDEX	2029_h
Name	Max cell voltage
Object code	RECORD
Data type	MinMaxCellVoltage
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	3_h
Default value	3_h

Sub-index	01_h
Description	SMU serial number
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

Sub-index	02_h
Description	Cell number
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED8
Default value	No

Sub-index	03_h
Description	Cell voltage
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

7.3.22. Object 202A$_h$: Min cell voltage

This object shall indicate the minimum voltage of all cells in battery system and the module concerned by this minimum voltage.

VALUE DEFINITION

See also § 7.2.3 (Record 0082$_h$ definition)

SMU serial number: 4 bytes in the following format: YYWWXX

- YY: first byte for the year.
- WW: second byte for the week.
- XX: third and fourth bytes for the identifier.

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
YY								WW								XX															
Unsigned integer 8 bits (0 to 255 since 2000)								Unsigned integer 8 bits (0 to 53)								Unsigned integer 16 bits (0 to 65535)															
-								-								MSB								LSB							

Cell number:

- 01$_h$ to xx$_h$ = cell number concerned by the minimum voltage (xx is corresponding to the Number of cells per module (object 2045$_h$)).

Cell voltage: Minimum cell voltage. The resolution shall be 1mV per bit. The range of value shall be 0000$_h$ to FFFF$_h$.

OBJECT DESCRIPTION

INDEX	202A$_h$
Name	Min Cell Voltage
Object code	RECORD
Data type	MinMaxCellVoltage
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00$_h$
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	3$_h$
Default value	3$_h$

Sub-index	01$_h$
Description	SMU serial number
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

Sub-index	02$_h$
Description	Cell number
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED8
Default value	No

Sub-index	03_h
Description	Cell voltage
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

7.3.23. Object $202B_h$: Max battery temperature

This object shall indicate the maximum temperature in the battery system and the module concerned by this maximum temperature. This temperature is the maximum temperature among the sensor that corresponds to the cell temperature (module terminals temperatures are not included).

VALUE DEFINITION

See also § 7.2.4 (Record 0083_h definition)

SMU serial number: 4 bytes in the following format: YYWWXX

- YY: first byte for the year.
- WW: second byte for the week.
- XX: third and fourth bytes for the identifier.

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
YY								WW								XX															
Unsigned integer 8 bits (0 to 255 since 2000)								Unsigned integer 8 bits (0 to 53)								Unsigned integer 16 bits (0 to 65535)															
-								-								MSB								LSB							

Temperature: Maximum temperature in the battery. The resolution shall be 1°C per bit (00_h = 0°C, $7F_h$ = 127°C, 80_h=-128°C, FF_h = -1°C).

OBJECT DESCRIPTION

INDEX	$202B_h$
Name	Max battery temperature
Object code	RECORD
Data type	MinMaxTemperature
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	2_h
Default value	2_h

Sub-index	01_h
Description	SMU serial number
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

Sub-index	02_h
Description	Temperature
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	SIGNED8
Default value	No

7.3.24. Object 202C$_h$: Min battery temperature

This object shall indicate the minimum temperature in battery system and the module concerned by this minimum temperature. This temperature is the minimum temperature among the sensor that corresponds to the cell temperature (module terminals temperatures are not included).

VALUE DEFINITION

See also § 7.2.4 (Record 0083$_h$ definition)

SMU serial number: 4 bytes in the following format: YYWWXX

- YY: first byte for the year.
- WW: second byte for the week.
- XX: third and fourth bytes for the identifier.

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
YY								WW								XX															
Unsigned integer 8 bits (0 to 255 since 2000)								Unsigned integer 8 bits (0 to 53)								Unsigned integer 16 bits (0 to 65535)															
-								-								MSB								LSB							

Temperature: Minimum temperature in the battery. The resolution shall be 1°C per bit (00$_h$ = 0°C, 7F$_h$ = 127°C, 80$_h$=-128°C, / FF$_h$ = -1°C).

OBJECT DESCRIPTION

INDEX	202C$_h$
Name	Min battery temperature
Object code	RECORD
Data type	MinMaxTemperature
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00$_h$
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	2$_h$
Default value	2$_h$

Sub-index	01$_h$
Description	SMU serial number
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

Sub-index	02$_h$
Description	Temperature
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	SIGNED8
Default value	No

7.3.25. Object 202D$_h$: Max connection temperature

This object shall indicate the maximum connection temperature in battery system and the module concerned by this maximum temperature. This temperature is the maximum temperature among the sensor that corresponds to the connection temperature (cell temperatures are not included).

VALUE DEFINITION

See also § 7.2.4 (Record 0083$_h$ definition)

SMU serial number: 4 bytes in the following format: YWXX

- YY: first byte for the year.
- WW: second byte for the week.
- XX: third and fourth bytes for the identifier.

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
YY								WW								XX															
Unsigned integer 8 bits (0 to 255 since 2000)								Unsigned integer 8 bits (0 to 53)								Unsigned integer 16 bits (0 to 65535)															
-								-								MSB								LSB							

Temperature: Minimum temperature in the battery. The resolution shall be 1°C per bit (00$_h$ = 0°C, 7F$_h$ = 127°C, 80$_h$=-128°C, / FF$_h$ = -1°C).

OBJECT DESCRIPTION

INDEX	202D$_h$
Name	Max connection temperature
Object code	RECORD
Data type	MinMaxTemperature
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00$_h$
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	2$_h$
Default value	2$_h$

Sub-index	01$_h$
Description	SMU serial number
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

Sub-index	02$_h$
Description	Temperature
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	SIGNED8
Default value	No

7.3.26. Object $202E_h$: Min connection temperature

This object shall indicate the minimum connection temperature in battery system and the module concerned by this minimum temperature. This temperature is the minimum temperature among the sensor that corresponds to the connection temperature (cell temperatures are not included).

VALUE DEFINITION

See also § 7.2.4 (Record 0083_h definition)

SMU serial number: 4 bytes in the following format: YWXX

- YY: first byte for the year.
- WW: second byte for the week.
- XX: third and fourth bytes for the identifier.

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
YY								WW								XX															
Unsigned integer 8 bits (0 to 255 since 2000)								Unsigned integer 8 bits (0 to 53)								Unsigned integer 16 bits (0 to 65535)															
-								-								MSB								LSB							

Temperature: Minimum temperature in the battery. The resolution shall be 1°C per bit (00_h = 0°C, $7F_h$ = 127°C, 80_h=-128°C, / FF_h = -1°C).

OBJECT DESCRIPTION

INDEX	$202E_h$
Name	Min connection temperature
Object code	RECORD
Data type	MinMaxTemperature
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	2_h
Default value	2_h

Sub-index	01_h
Description	SMU serial number
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

Sub-index	02_h
Description	Temperature
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	SIGNED8
Default value	No

7.3.27. Object $202F_h$: External temperatures

This object shall indicate the value of the 2 external temperature sensors of the BMM.

VALUE DEFINITION

The resolution shall be 1°C per bit (00_h = 0°C, $7F_h$ = 127°C, $80_{h=}$-128°C, / FF_h = -1°C).

OBJECT DESCRIPTION

INDEX	$202F_h$
Name	External temperatures
Object code	ARRAY
Data type	UNSIGNED8
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	ro
PDO mapping	No
Value range	02_h
Default value	02_h

Sub-index	01_h
Description	External temperature N°1
Entry category	Mandatory
Access	ro
PDO mapping	Default
Value range	SIGNED8
Default value	00_h

Sub-index	02_h
Description	External temperature N°2 (optional)
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	SIGNED8
Default value	No

7.3.28. Object 2030_h: Module cycling SOH table

This object shall indicate the module cycling versus DOD variation.

This object has to be updated by the server when Synchro bit is set by the client.

The client has the possibility to choose the module by writing the module ID in Module number. If the module ID is not found, the server will write 0.

The SMU serial number is used to do physically the link with the virtual module ID.

VALUE DEFINITION

See also § 7.2.5 (Record 0084_h definition)

Module number: (virtual ID between 1 and Number of modules)

- 00_h = error, module not defined in battery system.
- XX_h = module number

SMU serial number: 4 bytes in the following format: YYWWXX

- YY: first byte for the year.
- WW: second byte for the week.
- XX: third and fourth bytes for the identifier.

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
YY								WW								XX															
Unsigned integer 8 bits (0 to 255 since 2000)								Unsigned integer 8 bits (0 to 53)								Unsigned integer 16 bits (0 to 65535)															
-								-								MSB								LSB							

Synchro: Used to synchronize data between client and server

Bit0:

- 0 = server reset bit to 0 to warn the client that data requested are available
- 1 = client set bit to 1 to ask data about one module

xx% DOD ≤ DOD < yy% DOD: number of module charge/discharge cycles versus DOD variation

- 1 cycle per bit

OBJECT DESCRIPTION

INDEX	2030_h
Name	Module cycling SOH
Object code	RECORD
Data type	ModuleCyclingSOH
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	$0D_h$
Default value	$0D_h$

Sub-index	01_h
Description	Module number
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	UNSIGNED8
Default value	No

Sub-index	02_h
Description	SMU serial number
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

Sub-index	03_h
Description	Synchro
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	UNSIGNED8
Default value	No

Sub-index	04_h
Description	DOD < 10% DOD
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	05_h
Description	10% DOD ≤ DOD < 20% DOD
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	06_h
Description	20% DOD ≤ DOD < 30% DOD
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	07_h
Description	30% DOD ≤ DOD < 40% DOD
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	08_h
Description	40% DOD ≤ DOD < 50% DOD
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	09_h
Description	50% DOD ≤ DOD < 60% DOD
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$0A_h$
Description	60% DOD ≤ DOD < 70% DOD
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$0B_h$
Description	70% DOD ≤ DOD < 80% DOD
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$0C_h$
Description	80% DOD ≤ DOD < 90% DOD
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$0D_h$
Description	90% DOD ≤ DOD < 100% DOD
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

7.3.29. Object 2031_h: Module calendar SOH

This object shall indicate the time spent by the module at different temperature and SOC.

This object has to be updated by the server when Synchro bit is set by the client.

The client has the possibility to chose the module by writing the module ID in Module number. If the module ID is not found, the server will write 0.

The SMU serial number is used to do physically the link with the virtual module ID.

VALUE DEFINITION

See also § 7.2.6 (Record 0085_h definition)

Module number: (virtual ID between 1 and Number of modules)

- 00_h = error, module not defined in battery system.
- XX_h = module number

SMU serial number: 4 bytes in the following format: YYWWXX

- YY: first byte for the year.
- WW: second byte for the week.
- XX: third and fourth bytes for the identifier.

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
YY								WW								XX															
Unsigned integer 8 bits (0 to 255 since 2000)								Unsigned integer 8 bits (0 to 53)								Unsigned integer 16 bits (0 to 65535)															
-								-								MSB														LSB	

Synchro: Used to synchronize data between client and server

Bit0:

- 0 = server reset bit to 0 to warn the client that data requested are available
- 1 = client set bit to 1 to ask data about one module
-

xx°C < T°C ≤ yy°C & aa% ≤ SOC < bb%: time spent by the module versus temperature and SOC.

- 1 hour per bit

OBJECT DESCRIPTION

INDEX	2031_h
Name	Module calendar SOH
Object code	RECORD
Data type	ModuleCalendarSOH
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	$0D_h$
Default value	$0D_h$

Sub-index	01_h
Description	Module number
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	UNSIGNED8
Default value	No

Sub-index	02_h
Description	SMU serial number
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

Sub-index	03_h
Description	Synchro
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED8
Default value	No

Sub-index	04_h
Description	T°C ≤ T0 & SOC =< S0 (T[0][0])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	05_h
Description	T°C ≤ T0 & S0<SOC =< S1 (T[0][1])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	06_h
Description	T°C ≤ T0 & S1<SOC =< S2 (T[0][2])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	07_h
Description	T°C ≤ T0 & S2<SOC =< S3 (T[0][3])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	08_h
Description	T°C ≤ T0 & S3<SOC =< S4 (T[0][4])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	09_h
Description	T°C ≤ T0 & S4<SOC =< S5 (T[0][5])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$0A_h$
Description	T°C ≤ T0 & S5<SOC (T[0][6])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$0B_h$
Description	T0<T°C ≤ T1 & SOC =< S0 (T[1][0])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$0C_h$
Description	T0<T°C ≤ T1 & S0<SOC =< S1(T[1][1])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$0D_h$
Description	T0<T°C ≤ T1 & S1<SOC =< S2 (T[1][2])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$0E_h$
Description	T0<T°C ≤ T1 & S2<SOC =< S3 (T[1][3])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$0F_h$
Description	T0<T°C ≤ T1 & S3<SOC =< S4 (T[1][4])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	10_h
Description	T0<T°C ≤ T1 & S4<SOC =< S5 (T[1][5])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	11_h
Description	T0<T°C ≤ T1 & S5<SOC (T[1][6])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	12_h
Description	T1<T°C ≤ T2 & SOC =< S0 (T[2][0])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	13_h
Description	T1<T°C ≤ T2 & S0<SOC =< S1 (T[2][1])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	14_h
Description	T1<T°C ≤ T2 & S1<SOC =< S2 (T[2][2])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	15_h
Description	T1<T°C ≤ T2 & S2<SOC =< S3 (T[2][3])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	16_h
Description	T1<T°C ≤ T2 & S3<SOC =< S4 (T[2][4])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	17_h
Description	T1<T°C ≤ T2 & S4<SOC =< S5 (T[2][5])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	18_h
Description	T1<T°C ≤ T2 & S5<SOC (T[2][6])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	19_h
Description	T2<T°C ≤ T3 & SOC =< S0 (T[3][0])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$1A_h$
Description	T2<T°C ≤ T3 & S0<SOC =< S1 (T[3][1])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$1B_h$
Description	T2<T°C ≤ T3 & S1<SOC =< S2 (T[3][2])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$1C_h$
Description	T2<T°C ≤ T3 & S2<SOC =< S3 (T[3][3])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$1D_h$
Description	T2<T°C ≤ T3 & S3<SOC =< S4 (T[3][4])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$1E_h$
Description	T2<T°C ≤ T3 & S4<SOC =< S5 (T[3][5])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$1F_h$
Description	T2<T°C ≤ T3 & S5<SOC (T[3][6])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	20_h
Description	T3<T°C ≤ T4 & SOC =< S0 (T[4][0])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	21_h
Description	T3<T°C ≤ T4 & S0<SOC =< S1 (T[4][1])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	22_h
Description	T3<T°C ≤ T4 & S1<SOC =< S2 (T[4][2])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	23_h
Description	T3<T°C ≤ T4 & S2<SOC =< S3 (T[4][3])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	24_h
Description	T3<T°C ≤ T4 & S3<SOC =< S4 (T[4][4])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	25_h
Description	T3<T°C ≤ T4 & S4<SOC =< S5 (T[4][5])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	26_h
Description	T3<T°C ≤ T4 & S5<SOC (T[4][6])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	27_h
Description	T4<T°C ≤ T5 & SOC =< S0 (T[5][0])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	28_h
Description	T4<T°C ≤ T5 & S0<SOC =< S1 (T[5][1])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	29_h
Description	T4<T°C ≤ T5 & S1<SOC =< S2 (T[5][2])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$2A_h$
Description	T4<T°C ≤ T5 & S2<SOC =< S3 (T[5][3])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$2B_h$
Description	T4<T°C ≤ T5 & S3<SOC =< S4 (T[5][4])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$2C_h$
Description	T4<T°C ≤ T5 & S4<SOC =< S5 (T[5][5])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$2D_h$
Description	T4<T°C ≤ T5 & S5<SOC (T[5][6])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$2E_h$
Description	T5<T°C ≤ T6 & SOC =< S0 (T[6][0])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$2F_h$
Description	T5<T°C ≤ T6 & S0<SOC =< S1 (T[6][1])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	30_h
Description	T5<T°C ≤ T6 & S1<SOC =< S2 (T[6][2])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	31_h
Description	T5<T°C ≤ T6 & S2<SOC =< S3 (T[6][3])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	32_h
Description	T5<T°C ≤ T6 & S3<SOC =< S4 (T[6][4])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	33_h
Description	T5<T°C ≤ T6 & S4<SOC =< S5 (T[6][5])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	34_h
Description	T5<T°C ≤ T6 & S5<SOC (T[6][6])c
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	35_h
Description	T6<T°C ≤ T7 & SOC =< S0 (T[7][0])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	36_h
Description	T6<T°C ≤ T7 & S0<SOC =< S1 (T[7][1])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	37_h
Description	T6<T°C ≤ T7 & S1<SOC =< S2 (T[7][2])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	38_h
Description	T6<T°C ≤ T7 & S2<SOC =< S3 (T[7][3])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	39_h
Description	T6<T°C ≤ T7 & S3<SOC =< S4 (T[7][4])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$3A_h$
Description	T6<T°C ≤ T7 & S4<SOC =< S5 (T[7][5])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$3B_h$
Description	T6<T°C ≤ T7 & S5<SOC (T[7][6])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$3C_h$
Description	T7<T°C ≤ T8 & SOC =< S0 (T[8][0])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$3D_h$
Description	T7<T°C ≤ T8 & S0<SOC =< S1 (T[8][1])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$3E_h$
Description	T7<T°C ≤ T8 & S1<SOC =< S2 (T[8][2])
Entry category	Mandatory
Access	Ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$3F_h$
Description	T7<T°C ≤ T8 & S2<SOC =< S3 (T[8][3])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	40_h
Description	T7<T°C ≤ T8 & S3<SOC =< S4 (T[8][4])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	41_h
Description	T7<T°C ≤ T8 & S4<SOC =< S5 (T[8][5])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	42_h
Description	T7<T°C ≤ T8 & S5<SOC (T[8][6])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	43_h
Description	T8<T°C ≤ T9 & SOC =< S0 (T[9][0])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	44_h
Description	T8<T°C ≤ T9 & S0<SOC =< S1 (T[9][1])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	45_h
Description	T8<T°C ≤ T9 & S1<SOC =< S2 (T[9][2])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	46_h
Description	T8<T°C ≤ T9 & S2<SOC =< S3 (T[9][3])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	47_h
Description	T8<T°C ≤ T9 & S3<SOC =< S4 (T[9][4])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	48_h
Description	T8<T°C ≤ T9 & S4<SOC =< S5 (T[9][5])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	49_h
Description	T8<T°C ≤ T9 & S5<SOC (T[9][6])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$4A_h$
Description	T9<T°C & SOC=< S0 (T[10][0])
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$4B_h$
Description	T9<T°C & S0< SOC=< S1 (T[10][1])
Entry category	Mandatory
Access	Ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$4C_h$
Description	T9<T°C & S1< SOC=< S2 (T[10][2])
Entry category	Mandatory
Access	Ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$4D_h$
Description	T9<T°C & S2< SOC=< S3 (T[10][3])
Entry category	Mandatory
Access	Ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$4E_h$
Description	T9<T°C & S3< SOC=< S4 (T[10][4])
Entry category	Mandatory
Access	Ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	$4F_h$
Description	T9<T°C & S4< SOC=< S5 (T[10][5])
Entry category	Mandatory
Access	Ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

Sub-index	50_h
Description	T9<T°C & S5< SOC (T[10][6])
Entry category	Mandatory
Access	Ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

7.3.30. Object 2034_h: Cumulative total kWh charged

This object shall provide the cumulative of kWh received by the battery over its life.

VALUE DEFINITION

The resolution shall be 10kWh per bit.

OBJECT DESCRIPTION

INDEX	2034_h
Name	Cumulative total kWh charged
Object code	VAR
Data type	UNSIGNED16
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

7.3.31. Object 2035_h: Cumulative total kWh discharged

This object shall provide the cumulative of kW-hours delivered by the battery to the external system over the life of the battery.

VALUE DEFINITION

The resolution shall be 10kWh per bit.

OBJECT DESCRIPTION

INDEX	2035_h
Name	Cumulative total kWh discharged
Object code	VAR
Data type	UNSIGNED16
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

7.3.32. Object 2036_h: SOH

This object shall indicate the State Of Health of the battery capacity.

VALUE DEFINITION

The resolution shall be 1% per bit. FF_h shall indicate an invalid value.

OBJECT DESCRIPTION

INDEX	2036_h
Name	SOH
Object code	VAR
Data type	UNSIGNED8
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	ro
PDO mapping	No
Value range	00_h to 64_h and FF_h
Default value	No

7.3.33. Object 2040_h: Battery Ah capacity

This object shall indicate the rated capacity in Ampere-hours as provided by the battery manufacturer.

VALUE DEFINITION

The resolution shall be 1Ah per bit.

OBJECT DESCRIPTION

INDEX	2040_h
Name	Battery Ah capacity
Object code	VAR
Data type	UNSIGNED16
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

7.3.34. Object 2041_h: Battery system software version

This object shall indicate the software version in battery system which communicates with customer software. It is composed with a major version and a minor version. Battery system software version = MajorVersion.MinorVersion.

VALUE DEFINITION

15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Major Version								Minor Version							
Unsigned integer 8 bits (0 to 99)								Unsigned integer 8 bits (0 to 99)							
-								-							

Be careful: if MajorVersion = 1 and MinorVersion = 5 then Battery system software version = 1.05 (not 1.5)

OBJECT DESCRIPTION

INDEX	2041_h
Name	Battery system software version
Object code	VAR
Data type	UNSIGNED16
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	ro
PDO mapping	Default
Value range	UNSIGNED16
Default value	No

7.3.35. Object 2042_h: BMM serial number

This object shall provide a serial number UNSIGNED32 associated with a battery pack, usually applied by the battery manufacturer to identify the battery. It shall be packed into UNSIGNED32 object to allow them to be transferred using expedited SDO services.

VALUE DEFINITION

Four bytes in the following format: YYWXX

- YY: most significant bytes (MSB). Represent the year.
- WW: represent the week.
- XX: less significant bytes (LSB) for the identifier.

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
YY								WW								XX															
Unsigned integer 8 bits (0 to 255 since 2000)								Unsigned integer 8 bits (0 to 53)								Unsigned integer 16 bits (0 to 65535)															
-								-								MSB								LSB							

OBJECT DESCRIPTION

INDEX	2042_h
Name	BMM serial number
Object code	VAR
Data type	UNSIGNED32
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	ro
PDO mapping	Default
Value range	UNSIGNED32
Default value	No

7.3.36. Object 2043_h: Battery ID

This object shall provide a UNSIGNED associated with a battery pack that uniquely identifies it to the owner. The Battery ID correspond to the Node_ID of the BMM on the customer CAN bus (1 to 40).

VALUE DEFINITION

N.A.

OBJECT DESCRIPTION

INDEX	2043_h
Name	Battery ID
Object code	VAR
Data type	UNSIGNED8
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	ro
PDO mapping	Default
Value range	UNSIGNED8
Default value	No

7.3.37. Object 2044_h: Number of modules

This object shall indicate the number of modules in battery system (1 to 40).

VALUE DEFINITION

The resolution shall be 1 module per bit.

OBJECT DESCRIPTION

INDEX	2044_h
Name	Number of modules
Object code	VAR
Data type	UNSIGNED8
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED8
Default value	No

7.3.38. Object 2045_h: SMU configuration

This object shall indicate the configuration of each module in the battery system. Number of cells for each module can be different. This number depends of P and S (P x S).
This object has to be updated by the server when Synchro bit is set by the client.
The client has the possibility to choose the module by writing the module ID in Module number. If the module ID is not found, the server will write 0 in this field.
P indicates how many cells in parallel there are in the module concerned by the request.
S indicates how many cells in series there are per branches in the module concerned by the request.
The SMU serial number is used to do physically the link with the virtual module ID. This field is updated by server.

VALUE DEFINITION

See also § 7.2.7 (Record 0086_h definition)

Sub-index 01_h: Module number (virtual ID between 1 and Number of modules)

- 00_h = error, module not defined in battery system.
- XX_h = module number of the cell voltage(s) returned.

Sub-index 02_h: SMU serial number. Four bytes in the following format: YYWWXX

- YY: most significant byte (MSB). Represent the year.
- WW: represent the week.
- XX: less significant bytes (LSB) for the identifier.

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
YY								WW								XX															
Unsigned integer 8 bits (0 to 255 since 2000)								Unsigned integer 8 bits (0 to 53)								Unsigned integer 16 bits (0 to 65535)															
-								-								MSB								LSB							

Sub-index 03_h: Synchronization. Used to synchronize data between client and server
Bit0:

- 0 = server reset bit to 0 to warn the client that data requested are available
- 1 = client set bit to 1 to ask data about one module

Sub-index 04_h: P: number of branches in parallel in module

Sub-index 05_h: S: number of cells in series per branch

OBJECT DESCRIPTION

INDEX	2045_h
Name	SMU Configuration
Object code	RECORD
Data type	SMUConfiguration
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	05_h
Default value	05_h

Sub-index	01_h
Description	Module number
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	UNSIGNED8
Default value	No

Sub-index	02_h
Description	Module serial number
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

Sub-index	03_h
Description	Synchro
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	UNSIGNED8
Default value	No

Sub-index	04_h
Description	P
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED8
Default value	No

Sub-index	05_h
Description	S
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED8
Default value	No

7.3.39. Object 2046_h: Modules software version

This object shall indicate the module software version (in SMU board). It is composed with a major version and a minor version. Battery system software version = MajorVersion.MinorVersion. Each module has the same software version (alarm if it is not the case): only one version is available.

VALUE DEFINITION

15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Major Version								Minor Version							
Unsigned integer 8 bits (0 to 99)								Unsigned integer 8 bits (0 to 99)							
-								-							

Be careful: if MajorVersion = 1 and MinorVersion = 5 then Module software version = 1.05 (not 1.5)

OBJECT DESCRIPTION

INDEX	2046_h
Name	Module software version
Object code	VAR
Data type	UNSIGNED16
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	ro
PDO mapping	Default
Value range	See VALUE DEFINITION in this §
Default value	No

7.3.40. Object 2050_h: Reserved 1

This object is reserved.

VALUE DEFINITION

N/A.

OBJECT DESCRIPTION

INDEX	2050_h
Name	Reserved 1
Object code	VAR
Data type	UNSIGNED16
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	Rw
PDO mapping	RPDO1
Value range	UNSIGNED16
Default value	No

7.3.41. Object 2051_h: Reserved 2

This object is reserved.

VALUE DEFINITION

N/A.

OBJECT DESCRIPTION

INDEX	2051_h
Name	Reserved 2
Object code	VAR
Data type	UNSIGNED16
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	Rw
PDO mapping	RPDO1
Value range	UNSIGNED16
Default value	No

7.3.42. Object 2052_h: Customer Toggle Bit

This object contains a toggle Bit sent by the Customer. This toggle bit could be used to detect loss of Customer Communication.

VALUE DEFINITION

The insulation monitoring authorization has the following format:

7	1	0
Reserved (0)		Customer Toggle Bit
MSB		LSB

Bit 0: Customer Toggle Bit: 0 to 1

Shall be updated at each frame reception

OBJECT DESCRIPTION

INDEX	2052_h
Name	Customer Toggle Bit
Object code	VAR
Data type	UNSIGNED8
Category	Mandatory

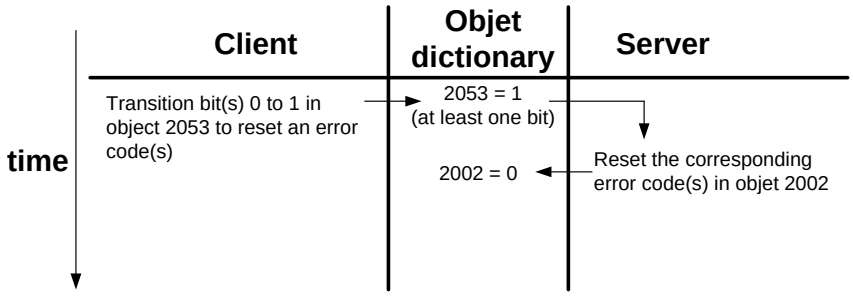
ENTRY DESCRIPTION

Sub-index	00_h
Access	r/w
PDO mapping	RPDO1
Value range	0 to 1
Default value	0

7.3.43. Object 2053_h: Battery fault codes n°1 to 48 reset

This object shall indicate the fault codes in the battery system to reset.

When the client set one or several bit to 1 in this object, the BMU update the object 'Battery fault codes n°1 to 48' (2002_h) (reset the corresponding error codes). The fault are reset on transition from 0 to 1 of the bit from Object 2053h.



VALUE DEFINITION

The battery fault codes have the following format:

	bit									
	7	6	5	4	3	2	1	0		
fault code	8	6	6	5	4	3	2	1	1	byte
	16	15	14	13	12	11	10	9	2	
	24	23	22	21	20	19	18	17	3	
	32	31	30	29	28	27	26	25	4	
	34	39	38	37	36	35	34	33	5	
	48	47	46	45	44	43	42	41	6	
	MSB								LSB	

Bit 'x':

- Transition 0 to 1 = request to reset the fault code(s)

OBJECT DESCRIPTION

INDEX	2053_h
Name	Battery fault code n°1 to 48 reset
Object code	ARRAY
Data type	UNSIGNED8
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	06_h
Default value	06_h

Sub-index	01_h
Description	Fault code n°1 to 8 reset
Entry category	Mandatory
Access	rw
PDO mapping	Default
Value range	See VALUE DEFINITION in this §
Default value	No

Sub-index	02_h
Description	Fault code n°9 to 16 reset
Entry category	Mandatory
Access	rw
PDO mapping	Default
Value range	See VALUE DEFINITION in this §
Default value	No

Sub-index	03_h
Description	Fault code n°17 to 24 reset
Entry category	Mandatory
Access	rw
PDO mapping	Default
Value range	See VALUE DEFINITION in this §
Default value	No

Sub-index	04_h
Description	Fault code n°25 to 32 reset
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	See VALUE DEFINITION in this §
Default value	No

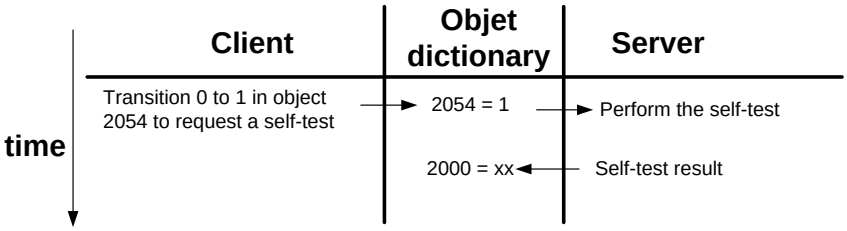
Sub-index	05_h
Description	Fault code n°33 to 40 reset
Entry category	Mandatory
Access	rw
PDO mapping	Default
Value range	See VALUE DEFINITION in this §
Default value	No

Sub-index	06_h
Description	Fault code n°41 to 48 reset
Entry category	Mandatory
Access	rw
PDO mapping	Default
Value range	See VALUE DEFINITION in this §
Default value	No

7.3.44. Object 2054_h: Self-test requested

This object shall indicate if external system (client) requests for a self-test of battery system (server).

When the client set bit from 0 to 1 in this object (i.e. on transition 0 to 1), the server will perform a self-test. The status of the self-test is given in bit 2 of object 2000_h. The result of the self-test is given by a fault code on the object 2002_h



VALUE DEFINITION

The Self-test request shall have the following format:

7	...	1	0
Reserved (0)			Bit 0
MSB			LSB

Bit 0:

- Transition 0 to 1 = self-test requested

OBJECT DESCRIPTION

INDEX	2054_h
Name	Self-test request
Object code	VAR
Data type	UNSIGNED8
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	rw
PDO mapping	Default
Value range	See VALUE DEFINITION in this §
Default value	No

7.3.45. Object 2055_h: Battery contactors authorization

This object indicates:

- the authorization to close contactors when value is 1 (BMU is authorized to close the contactor)
- the command to open contactors when value is 0 (BMU must open the contactor)

This object concerns:

- the positive pole (main+)
- the optional positive pole (optional main+).

NB: main – is not driven by customer but depends of Main + and/or optional main + authorization.

VALUE DEFINITION

The Battery contactors closing demand has the following format:

7 4	3	2	1	0
Reserved (0)			Authorization for optional Main+	Authorization for contactors
MSB				LSB

When the authorization value is 0, the battery system goes in Standby mode (or remains in Standby mode if already in Standby). Contactors are opened.
When the authorization value is 1, the battery system goes in Nominal mode and contactors are closed. The authorization must be kept at 1 in order to keep the battery system in Nominal mode.

Bit 0: Authorization for Main contactors (Main+ and Main- if available and precharge if available)

- 0 = not authorized to close Main contactors or command to open Main contactors (Main+ and Main- if available and precharge if available)
- 1 = authorized to close Main contactors (Main+ and Main- if available and precharge if available)

Bit 1: Authorization for optional Main +

- 0 = not authorized to close optional Main+ or command to open optional Main+
- 1 = authorized to close optional Main+

OBJECT DESCRIPTION

INDEX	2055_h
Name	Battery contactors authorization
Object code	VAR
Data type	UNSIGNED8
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	rw
PDO mapping	Default
Value range	See value definition in this §
Default value	00_h

7.3.46. Object 2056_h: Vcell Min

This object shall indicate the minimum cell voltage in a macro battery in order to equalize the cell voltage.

VALUE DEFINITION

The resolution shall be 1mV per bit.

OBJECT DESCRIPTION

INDEX	2056_h
Name	Vcell Min
Object code	VAR
Data type	UNSIGNED16
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	rw
PDO mapping	Default
Value range	See VALUE DEFINITION in this §
Default value	No

7.3.47. Object 2057_h: Insulation monitoring authorization

This object shall indicate if external system authorizes the battery system to do the insulation monitoring.

VALUE DEFINITION

The insulation monitoring authorization has the following format:

7	1	0
Reserved (0)		Authorization to do insulation monitoring
MSB		LSB

Bit 0: Authorization to do insulation monitoring

- 0 = not authorized to do insulation monitoring
- 1 = authorized to do insulation monitoring

OBJECT DESCRIPTION

INDEX	2057_h
Name	Insulation monitoring authorization
Object code	VAR
Data type	UNSIGNED8
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	rw
PDO mapping	Default
Value range	See VALUE DEFINITION in this §
Default value	No

7.3.48. Object 2058_h: BMU reset

This object shall is used to reset the BMU by external.
After the reset BMU reset bit should be set to 0.

VALUE DEFINITION

The BMU reset has the following format:

7	1	0
Reserved (0)		BMU reset
MSB		LSB

Bit 0: BMU reset

- Transition 0 to 1 = BMU reset requested

OBJECT DESCRIPTION

INDEX	2058_h
Name	BMU reset
Object code	VAR
Data type	UNSIGNED8
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	rw
PDO mapping	Default
Value range	See VALUE DEFINITION in this §
Default value	0

7.3.49. Object 2059h: Sleep mode command

This object allows to sleep the battery group (MBMM + BMMs + SMUs)

VALUE DEFINITION

Sleep mode command Transition 0 to 1 = Sleep command requested

OBJECT DESCRIPTION

INDEX	2059_h
Name	Sleep mode command
Object code	VAR
Data type	UNSIGNED8
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	r/w
PDO mapping	Default
Value range	0 to 1
Default value	0

7.3.50. Object 2060h: xBIT results

This object contains the results of the PBIT, CBIT, IBIT and POffBIT.

Each sub-index contains a bit field composed of the test listed below.

Bitfield	Test	PBIT	CBIT	IBIT	POffBIT
bit0	Not used				
bit1	Not used				
bit2	TEST_SOFTWARE_CRC	X	X		

bit3	TEST_PARAMETERS_CRC	X	X		
bit4	TEST_CHECK_MEMORY	X			
bit5	TEST_NEGATIVE_CONTACTOR_CLOSING	X			
bit6	TEST_POSITIVE_CONTACTORS_CLOSING	X			
bit7	TEST_NEGATIVE_CONTACTOR_OPENING	X		X	X
bit8	TEST_POSITIVE_CONTACTORS_OPENING	X		X	X
bit9	Not used				
bit10	TEST_AUTOTEST_SMU	X	X		
bit11	TEST_REDUNDANT_CHANNEL_ACTIVATION		X		
bit12	TEST_REDUNDANT_CHANNEL_FULL			X	X
bit13	TEST_CURRENT_SENSORS_CALIBRATION	X		X	
bit14	TEST_CHECK_FUSE_STATUS	X			
bit15	Not used				
bit16	Not used				
bit17	TEST_SMU_ALLOCATION	X			
bit18	TEST_SMU_CONFIGURATION	X			
bit19	Not used				
bit20	Not used				
bit21	Not used				
bit22	TEST_CONTACTORS_OPENED	X			
bit23	TEST_INIT_LIB_SOC	X			
bit24	TEST_INIT_LIB_SOH	X			
bit25	TEST_INIT_LIB_IMD_IMR	X			
bit26	TEST_INIT_LIB_SET_CYCLIC_COUNTER	X			
bit27	TEST_BALANCING_SMU		X		
bit28	Not used				
bit29	Not used				
bit30	Not used				
bit31	Not used				

PBIT : From bit32 to bit0 ? 00 04 20 08
The following tests failed:
TEST_PARAMETERS_CRC
TEST_CURRENT_SENSORS_CALIBRATION
TEST_SMU_CONFIGURATION

CBIT : From bit32 to bit0 ? 08 00 00 08
The following tests failed:
TEST_PARAMETERS_CRC
TEST_BALANCING_SMU

OBJECT DESCRIPTION

INDEX	2060_h
Name	xBIT results
Object code	ARRAY
Data type	UNSIGNED32
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h

Description	Highest sub-index supported
Access	ro
PDO mapping	No
Value range	04_h
Default value	04_h

Sub-index	01_h
Description	PBIT result
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	0

Sub-index	02_h
Description	CBIT result
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	0

Sub-index	03_h
Description	IBIT result
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	0

Sub-index	04_h
Description	POffBIT result
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	0

7.3.51. Object 2201h: IMR_C

This object shall provide to external system the recommended maximum continuous electrical current for the charge. The value of this object is equal to the 0x2011 object (IMR Continuous) defined in this document but the resolution is different.
The MBMM dictionary has the same object at the same address.

VALUE DEFINITION

The resolution shall be 1A per bit.

OBJECT DESCRIPTION

INDEX	2011_h
Name	IMR_C
Object code	VAR
Data type	UNSIGNED16
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00_h
Access	ro
PDO mapping	Default
Value range	UNSIGNED16
Default value	No

7.4. Overview on application objects

Index	Name	Object code	Data type	Access	PDO
2000	Global battery status	VAR	Unsigned8	ro	TPDO1
2001	SOC_threshold	VAR	Unsigned8	ro	TPDO1
2002	Battery fault codes status n°1 to 48	ARRAY	6 * Unsigned8	ro	TPDO1
2011	IMR Continuous	VAR	Unsigned16	ro	TPDO2
2012	IMD	VAR	Unsigned16	ro	TPDO3
2013	IMR	VAR	Unsigned16	ro	TPDO2
2014	VMD	VAR	Unsigned16	ro	TPDO3
2015	VMR	VAR	Unsigned16	ro	TPDO2
2016	PMD	VAR	Unsigned16	ro	TPDO3
2017	PMR	VAR	Unsigned16	ro	TPDO2
2018	Battery requests	VAR	Unsigned8	ro	TPDO3
2020	Battery system mode	VAR	Unsigned8	ro	TPDO4
2021	Internal battery voltage	VAR	Unsigned16	ro	TPDO4
2022	Internal battery current	VAR	Signed16	ro	TPDO4
2023	HVDC1 voltage	VAR	Unsigned16	ro	SDO
2024	Battery contactors status	VAR	Unsigned8	ro	TPDO4
2026	SOC	VAR	Unsigned8	ro	TPDO4
2027	Cells voltage	RECORD	-	rw	SDO
2028	Battery temperature	RECORD	-	rw	SDO
2029	Max cell voltage	RECORD	-	ro	SDO
202A	Min cell voltage	RECORD	-	ro	SDO
202B	Max battery temperature	RECORD	-	ro	SDO
202C	Min battery temperature	RECORD	-	ro	SDO
202D	Max connection temperature	RECORD	-	ro	SDO
202E	Min connection temperature	RECORD	-	ro	SDO
202F	External temperatures	ARRAY	2*Signed8	ro	SDO
2030	Module cycling SOH table	RECORD	-	rw	SDO
2031	Module calendar SOH table	RECORD	-	rw	SDO
2034	Cumulative total kWh charged	VAR	Unsigned16	ro	SDO
2035	Cumulative total kWh discharged	VAR	Unsigned16	ro	SDO
2036	SOH	VAR	Unsigned8	ro	SDO
2040	Battery Ah capacity	VAR	Unsigned16	ro	SDO
2041	Battery system software version	ARRAY	3 * Unsigned32	ro	SDO
2042	BMM serial number	ARRAY	3 * Unsigned32	ro	SDO
2043	Battery ID	ARRAY	5 * Unsigned32	ro	SDO
2044	Number of modules	VAR	Unsigned8	ro	SDO
2045	Number of cells per module	VAR	Unsigned8	ro	SDO
2046	Module software version	ARRAY	3 * Unsigned32	ro	SDO
2050	Reserved	VAR	Unsigned16	rw	RPDO1
2051	Reserved	VAR	Unsigned16	rw	RPDO1
2052	Customer Toggle Bit	VAR	Unsigned8	rw	RPDO1
2053	Battery fault codes n°1 to 48 reset	ARRAY	6 * Unsigned8	rw	SDO
2054	Self-test requested	VAR	Unsigned8	rw	SDO
2055	Battery contactors authorization	VAR	Unsigned8	rw	RPDO2
2056	Vcell Min	VAR	Unsigned16	rw	RPDO2
2057	Insulation monitoring authorization	VAR	Unsigned8	rw	SDO
2058	BMU reset	VAR	Unsigned8	rw	SDO
2201	IMR_C	VAR	Unsigned16	ro	SDO
2059	Sleep mode command	VAR	Unsigned8	rw	SDO
2060	xBIT Results	ARRAY	Unsigned32	ro	SDO