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TECHNICAL SPECIFICATION

Electric vehicles conductive charging system – Part 3-6: DC EV supply equipment where protection relies on double or reinforced insulation – Voltage converter unit communication

IEC TS 61851-3-6:2023-07(en)

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CONTENTS

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ELECTRIC VEHICLES CONDUCTIVE CHARGING SYSTEM –

Part 3-6: DC EV supply equipment where protection relies on double or reinforced insulation – Voltage converter unit communication

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IEC TS 61851-3-6 has been prepared by IEC technical committee 69: Electrical power/energy transfer systems for electrically propelled road vehicles and industrial trucks. It is a Technical Specification.

The text of this Technical Specification is based on the following documents:

Draft	Report on voting
69/652/DTS	69/673/RVDTS 69/673A/RVDTS

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

The language used for the development of this Technical Specification is English.

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

In this document, the following print types are used:

– requirements: in roman type;

– notes: in small roman type;

– **text formatted in bold and using mixed capital and underline are used as state names and are not to be translated**.

A list of all parts in the IEC 61851 series, published under the general title *Electric vehicles conductive charging system,* can be found on the IEC website.

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INTRODUCTION

This document is published in separate parts according to the following structure:

IEC TS 61851-3-1, *Electric vehicles conductive charging system – Part 3-1: DC EV supply equipment where protection relies on double or reinforced insulation – General rules and requirements for stationary equipment*

IEC TS 61851-3-2, *Electric vehicles conductive charging system – Part 3-2: DC EV supply equipment where protection relies on double or reinforced insulation – Particular requirements for portable and mobile equipment*

IEC TS 61851-3-4, *Electric vehicles conductive charging system – Part 3-4: DC EV supply equipment where protection relies on double or reinforced insulation – General definitions and requirements for CANopen communication*

IEC TS 61851-3-5, *Electric vehicles conductive charging system – Part 3-5: DC EV supply equipment where protection relies on double or reinforced insulation – Pre-defined communication parameters and general application objects*

IEC TS 61851-3-6, *Electric vehicles conductive charging system – Part 3-6: DC EV supply equipment where protection relies on double or reinforced insulation – Voltage converter unit communication*

IEC TS 61851-3-7, *Electric vehicles conductive charging system – Part 3-7: DC EV supply equipment where protection relies on double or reinforced insulation – Battery system communication*

ELECTRIC VEHICLES CONDUCTIVE CHARGING SYSTEM –

Part 3-6: DC EV supply equipment where protection relies on double or reinforced insulation – Voltage converter unit communication

1 Scope

This part of IEC 61851, which is a Technical Specification, applies to CANopen communication for the conductive transfer of electric power between the supply network and an electric road vehicle or a removable RESS or traction-battery of an electric road vehicle.

This document provides application objects provided by the AC/DC VCU or DC/DC VCU.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC TS 61851-3-2:2023, *Electric vehicles conductive charging system – Part 3-2: DC EV supply equipment where protection relies on double or reinforced insulation – Particular requirements for portable and mobile equipment*

IEC TS 61851-3-4: 2023, *Electric vehicles conductive charging system – Part 3-4:DC EV supply equipment where protection relies on double or reinforced insulation – General definitions and requirements for CANopen communication*

IEC TS 61851-3-5: 2023, *Electric vehicles conductive charging system – Part 3-5: DC EV supply equipment where protection relies on double or reinforced insulation – Pre-defined communication parameters and general application objects*

EN 50325-4:2002, *Industrial communications subsystem based on ISO 11898 (CAN) for controller- device interfaces – Part 4: CANopen*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC TS 61851-3-4:2023 apply.

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

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

4 Symbols and abbreviated terms

For the purposes of this document, the symbols and abbreviated terms given in IEC TS 61851-3-4:2023 apply.

5 Operating principles

5.1 General

In addition to the finite state automaton (FSA) defined by IEC TS 61851-3-4:2021, this document defines an additional VCU specific FSA to operate voltage converters in a common way. The FSA consists of mandatory and optional FSA states and sub-states. Any VCU supports the mandatory FSA states. Optional FSA states are only supported in case the related functionality is supported. State transitions within the FSA are based on device internal events (e.g. occurrence of device errors) or on the reception of the FSA command. The VCU typically has at least a voltage input at one side and a voltage output at the other side. In this document, the VCU is defined as a device that transfers power from the "side A" to the "side B" and from "side B" to "side A" as defined in Annex B of IEC TS 61851-3-2:2023.

5.2 Voltage converter unit specific FSA

The VCU specific FSA as defined in Figure 1 shall start with the initial entry in the EMS FSA state "**Operating**" and shall exist as long as the running state is not left.

The FSA defines the application behaviour of the VCU (see also Table 1). Due to the requirement that the VCU provides local control even when the CAN network is not working properly, the NMT slave FSA (VCU) as defined in EN 50325-4:2002, the EMS FSA and the VCU FSA are only coupled in the following way: a state change in any of the involved FSAs may trigger state changes in the other FSAs.

For state transitions (numbers in Figure 1), see Table 2.

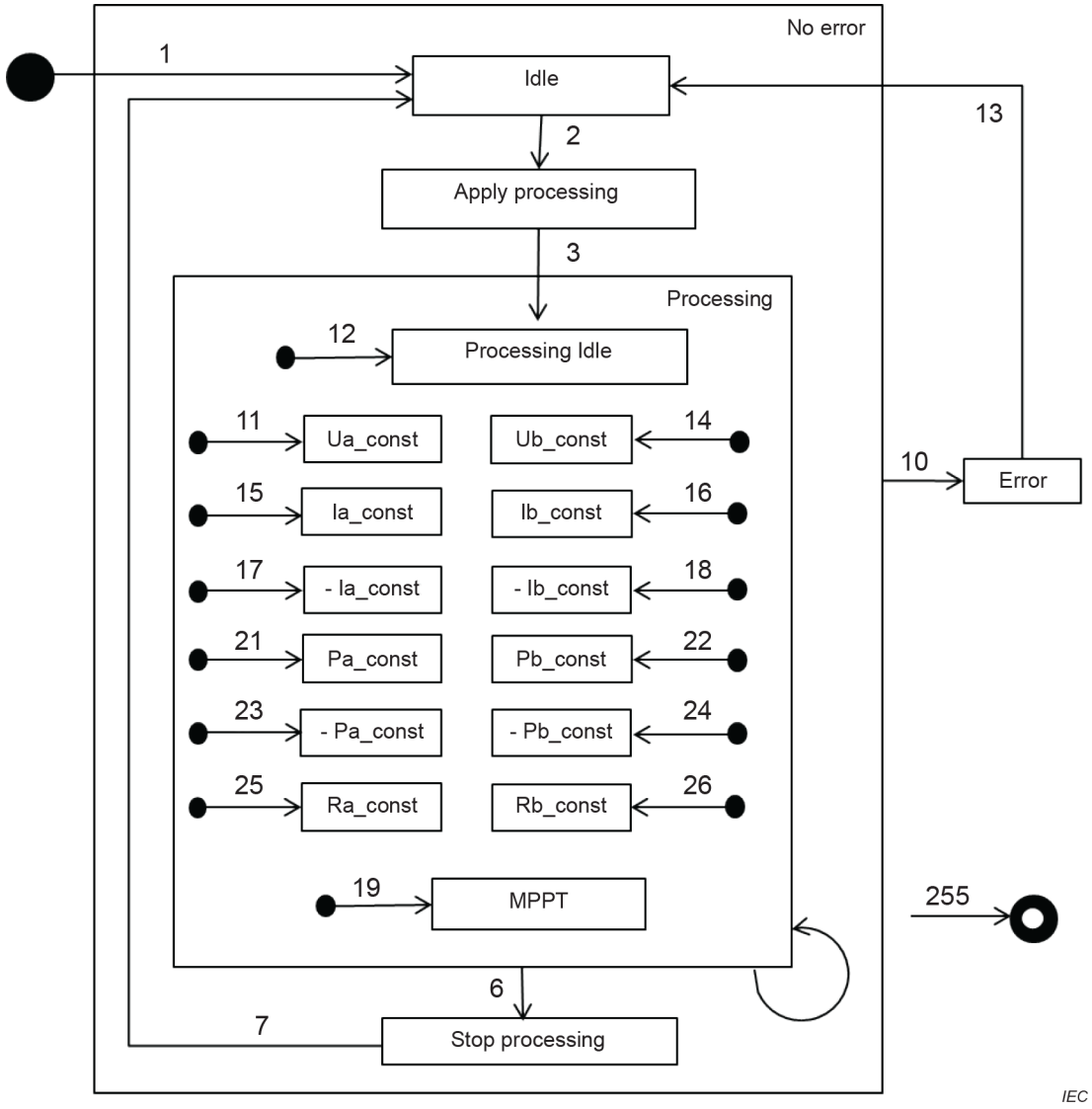

Figure 1 – FSA for voltage converter unit

5.3 State definitions

The FSA for voltage converters as shown in Figure 1 shall provide the following states with the described behaviour in Table 1 and state transitions in Table 2.

Table 1 – States behaviour

Name	Behaviour	Category of sub states
Initial	This shall be a pseudo state indicating the start when the FSA is activated during the initial entry into the running state.	-
IDLE	The VCU shall transit to this state after the initial entry in the running state of the EMS FSA (see 9.1 of IEC TS 61851-3-4:2021). The VCU shall be in **IDLE** state, when it is not in any other of the defined states.	-
Apply_Processing	Preparation of the VCU's process interface so that power transfer from one side to the other is possible.	-
Processing	State where the VCU operates. The VCU applies the adjusted power to the output lines at side A or B.	-
Processing_IDLE	Sub state of Processing; the VCU is ready to operate in principle. There is no power transferred from one side to the other.	-
Ua_const	Sub state of Processing; the power transfer shall be active in a way, that Ua remains constant.	o
Ub_const	Sub state of Processing; the power transfer shall be active in a way, that Ub remains constant.	m
Ia_const	Sub state of Processing; the power transfer shall be active in a way, that Ia remains constant and the current flow is from the VCU's side A into the power line.	o
Ib_const	Sub state of Processing; the power transfer shall be active in a way, that Ib remains constant and the current flow is from the VCU's side B into the power line.	m
-Ia_const	Sub state of Processing; the power transfer shall be active in a way, that Ia remains constant and the current flow is from the power line into VCU's side A.	o
-Ib_const	Sub state of Processing; the power transfer shall be active in a way, that Ib remains constant and the current flow is from the power line into VCU's side B.	o
Pa_const	Sub state of Processing; the power transfer from VCU's side A to the power line shall be active and PA remains constant.	o
Pb_const	Sub state of Processing; the power transfer from VCU's side B to the power line shall be active and Pb remains constant.	o
-Pa_const	Sub state of Processing; the power transfer from the power line to VCU's side A shall be active and Pa remains constant.	o
-Pb_const	Sub state of Processing; the power transfer from the power line to VCU's side B shall be active and Pb remains constant.	o
Ra_const	Sub state of Processing; the power transfer shall be active in a way, that Ra remains constant.	o
Rb_const	Sub state of Processing; the power transfer shall be active in a way, that Rb remains constant.	o
MPPT	Sub state of Processing; a maximum power point tracker shall set the output voltage to that value, where the maximum output of a power source such as e.g. a photo voltaic module is reached.	o
Stop_Processing	The power transfer between side A and B is stopped. The VCU's process interface is disabled.	-
Error	The VCU application is in an error condition. There is no power transferred from one side to the other. See also Clause 7 of IEC TS 61851-3-4:2021.	-
Final	Pseudo state, indicating the deactivation of the FSA; e.g. by leaving the EMS FSA **Running** state.	-

NOTE 1 For VCUs according to Figure BB.1, BB.2, BB.3, BB.4 and BB.6 of IEC TS 61851-3-2:2023the sub states of processing "m" shall be supported, sub states of processing "o" may be supported.

NOTE 2 For VCUs according to Figure BB.5 of IEC TS 61851-3-2:2023 the sub states of processing m) and o) may be supported.

5.4 Transitions in the FSA for VCUs

The FSA for VCU shall support the transitions as given in Table 2.

Table 2 – Transitions, events and actions

Transition	Event(s)	Action(s)
1	Power on	Update VCU status word
2	Trigger Apply processing in control word remotely	Apply processing at VCU's process interface; update status word
3	Transition as soon as processing is active	Processing is enabled in principle; Update status word
6	Switch off processing command in control word remotely or local command[a]	Disable processing at VCU's process interface; update status word
7	Transition as soon as processing at VCU's process interface is disabled	Update status word
10	Transition in case an Error is detected[b].	Update status word; execute manufacturer-specific counter measures.
11	Enter processing method **Ua_const** in control word remotely or via local command	Start processing **Ua_const** at VCU's process interface; update status word
12	Enter **Processing_IDLE** in control word remotely or via local command	Stop current processing method but processing remains enabled in principle; update status word
13	State transition in case all occurred errors are removed	The VCU's process interface is disabled and no error is active; update status word
14	Enter processing method **Ub_const** in control word remotely or via local command	Start processing **Ub_const** at VCU's process interface; update status word
15	Enter processing method **Ia_const** in control word remotely or via local command	Start processing **Ia_const** at VCU's process interface; update status word
16	Enter processing method **Ib_const** in control word remotely or via local command	Start processing **Ib_const** at VCU's process interface; update status word
17	Enter processing method **-Ia_const** in control word remotely or via local command	Start processing **-Ia_const** at VCU's process interface; update status word
18	Enter processing method **-Ib_const** in control word remotely or via local command	Start processing **-Ib_const** at VCU's process interface; update status word
19	Enter processing method **MPPT** in control word remotely or via local command	Start processing **MPPT** at VCU's process interface; update status word
21	Enter processing method **Pa_const** in control word remotely or via local command	Start processing **Pa_const** at VCU's process interface; update status word
22	Enter processing method **Pb_const** in control word remotely or via local command	Start processing **Pb_const** at VCU's process interface; update status word
23	Enter processing method **-Pa_const** in control word remotely or via local command	Start processing **-Pa_const** at VCU's process interface; update status word
24	Enter processing method **-Pb_const** in control word remotely or via local command	Start processing **-Pb_const** at VCU's process interface; update status word
25	Enter processing method **Ra_const** in control word remotely or via local command	Start processing **Ra_const** at VCU's process interface; update status word
26	Enter processing method **Rb_const** in control word remotely or via local command	Start processing **Rb_const** at VCU's process interface; update status word
255	Local shut down	Abort running operation and leave state machine

Transition numbers are shown in Figure 1.

[a] Leaving the EMS FSA Operating state may trigger this local command as well.

[b] Leaving the EMS FSA Operating state may be considered as an error.

6 Object dictionary

6.1 General

Clause 6 defines the application objects of a VCU unit. As the AC/DC converter functionality is an important functionality in the application field of EVs, the objects for this functionality are described separately from the objects related to the other converter functionalities.

6.2 Additional definitions to general application objects

6.2.1 General

Subclause 6.2 provides additional definitions to the general application objects that are specified in IEC TS 61851-3-5:2021.

6.2.2 Object 6001_h: Control word

The bit field "VD specific FSA control" shall control the virtual device specific FSA for VCUs; as specified in Table 3.

Table 3 – Value definition for VD specific FSA control

Value	Description
00_h	No action
02_h	Prepare processing
06_h	Switch off processing
$0B_h$	Enter processing method Ua_const
$0C_h$	Enter Processing idle
$0E_h$	Enter processing method Ub_const
$0F_h$	Enter processing method Ia_const
10_h	Enter processing method Ib_const
11_h	Enter processing method -Ia_const
12_h	Enter processing method -Ib_const
13_h	Enter processing method MPPT
15_h	Enter processing method Pa_const
16_h	Enter processing method Pb_const
17_h	Enter processing method -Pa_const
18_h	Enter processing method -Pb_const
19_h	Enter processing method Ra_const
$1A_h$	Enter processing method Rb_const
All other values shall be reserved.	

6.2.3 Object 6002_h: Status word

The bit field "Virtual device FSA state" shall indicate the current state of the virtual device in the virtual device specific FSA for VCUs; as specified in Table 4.

Table 4 – Value definition for virtual device FSA state

Value	FSA state
00_h	VD specific FSA not active
01_h	**IDLE**
02_h	**Apply_Processing**
03_h	**Processing_ IDLE**
06_h	**Stop_Processing**
$0A_h$	**Error**
$0B_h$	Processing sub state **Ua_const**
$0E_h$	Processing sub state **Ub_const**
$0F_h$	Processing sub state **Ia_const**
10_h	Processing sub state **Ib_const**
11_h	Processing sub state **-Ia_const**
12_h	Processing sub state **-Ib_const**
13_h	Processing sub state **Pa_const**
14_h	Processing sub state **Pb_const**
15_h	Processing sub state **-Pa_const**
16_h	Processing sub state **-Pb_const**
17_h	Processing sub state **MPPT**
18_h	Processing sub state **Ra_const**
19_h	Processing sub state **Rb_const**
All other values shall be reserved.	

6.3 Produced application objects by AC-DC converter functionality (mandatory)

6.3.1 General

Subclause 6.3 defines the application objects produced by the AC-DC converter functionality, which is a subset of the VCU functionality. The application object range for the AC-DC converter functionality is from 6096_h to $60E0_h$.

6.3.2 Object $60A0_h$: AC-DC converter capability

This object shall provide basic information about the capability of the AC-DC converter. Figure 2 illustrates the value structure and Table 5 shall provide the value definition. Table 6 specifies the object description and Table 7 specifies the entry description.

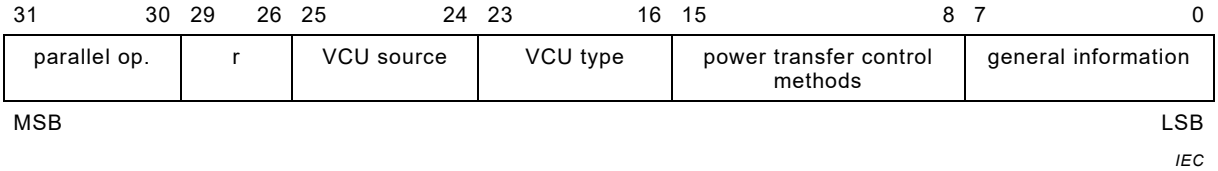

Figure 2 – Value structure

Table 5 – Value definition

Name	Bit	Value	Description
general information	0	0_b	EV VCU not supported
		1_b	EV VCU supported
	1	0_b	EV supply device VCU not supported
		1_b	EV supply device VCU supported
	2	0_b	Isolated VCU (only for EV VCU) not supported
		1_b	Isolated VCU (only for EV VCU) supported
	3	0_b	Non-isolated VCU (only for EV VCU) not supported
		1_b	Non-isolated VCU (only for EV VCU) supported
	4	0_b	Maximum power point tracker not supported
		1_b	Maximum power point tracker supported
	5	0_b	Not capable to create AC grid
		1_b	Capable to create AC grid
	6	0_b	2-point topology on side B
		1_b	3-point topology on side B
	7	0_b	Reserved (always 0)
		1_b	Reserved (always 0)
power transfer control methods	8	0_b	Reserved (always 0)
		1_b	Reserved (always 0)
	9	0_b	Reserved (always 0)
		1_b	Reserved (always 0)
	10	0_b	Reserved (always 0)
		1_b	Reserved (always 0)
	11	0_b	Reserved (always 0)
		1_b	Reserved (always 0)
	12	0_b	Reserved (always 0)
		1_b	Reserved (always 0)
	13	0_b	Reserved (always 0)
		1_b	Reserved (always 0)
	14	Reserved (always 0)	
	15	Reserved (always 0)	
VCU type	16	0_b	Pulse VCU not supported
		1_b	Pulse VCU supported
	17	0_b	Wireless power transfer (WPT) not supported
		1_b	Wireless power transfer (WPT) supported
	18	0_b	Power Factor Correction (PFC) VCU not supported
		1_b	Power Factor Correction (PFC) VCU supported
	19	0_b	USB-based VCU not supported

Name	Bit	Value	Description
		1_b	USB-based VCU supported
	20 to 23	0_b	Reserved
		1_b	
VCU source	24	0_b	AC not supported
		1_b	AC supported
	25	0_b	Solar panel not supported
		1_b	Solar panel supported
	26 to 29	0_b	Reserved
		1_b	
Parallel operation	30 to 31	00_b	No parallel operation supported
		01_b	Droop control supported (voltage difference of the battery systems is considered during power transfer)
		10_b	Single changing master switch control supported (consecutive power transfer from/to the battery systems)
		11_b	Wired/Wireless switch control (power transfer not decided by the VCU)

Table 6 – Object description

Attribute	Value
Index	$60A0_h$
Name	AC-DC converter capability
Object code	ARRAY
Data type	UNSIGNED32
Category	Mandatory

Table 7 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No

Attribute	Value
Sub-index	01_h
Description	AC-DC converter capability VDN 1
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	See value definition
Default value	No
Sub-index	02_h
Description	AC-DC converter capability VDN 2
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	See value definition
Default value	No
to	
Sub-index	$7F_h$
Description	AC-DC converter capability VDN 127
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	See value definition
Default value	No
Sub-index	80_h
Description	AC-DC converter capability external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	AC-DC converter capability external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.4 Produced application objects by AC-DC converter (optional)

6.4.1 General

Subclause 6.4 defines the application objects produced by the AC-DC converter functionality, which is a subset of the VCU functionality. This function is typically implemented in EVs, for example for VCU applications. The application object range for the AC-DC converter is from 6096_h to $60E0_h$.

6.4.2 Object $60A1_h$: AC-DC converter minimum AC voltage

This object shall provide the minimum AC voltage of the AC-DC converter and describes the external power source, outside the EMS. The values shall be given in multiples of 1 mV. Table 8 specifies the object description and Table 9 specifies the entry description.

Table 8 – Object description

Attribute	Value
Index	$60A1_h$
Name	AC-DC converter minimum AC voltage
Object code	ARRAY
Data type	INTEGER32
Category	Optional

Table 9 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	AC-DC converter VDN 1 minimum AC voltage
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No

Attribute	Value
Sub-index	02_h
Description	AC-DC converter VDN 2 minimum AC voltage
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
to	
Sub-index	$7F_h$
Description	AC-DC converter VDN127 minimum AC voltage
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
Sub-index	80_h
Description	AC-DC converter minimum AC voltage external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	AC-DC converter minimum AC voltage external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.4.3 Object $60A2_h$: AC-DC converter maximum AC voltage

This object shall provide the maximum AC voltage of the AC-DC converter and describes the external power source, outside the EMS. The values shall be given in multiples of 1 mV. Table 10 specifies the object description and Table 11 specifies the entry description.

Table 10 – Object description

Attribute	Value
Index	$60A2_h$
Name	AC-DC converter maximum AC voltage
Object code	ARRAY
Data type	INTEGER32
Category	Optional

Table 11 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	AC-DC converter VDN 1 maximum AC voltage
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
Sub-index	02_h
Description	AC-DC converter VDN 2 maximum AC voltage
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
to	
Sub-index	$7F_h$
Description	AC-DC converter VDN127 maximum AC voltage
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No

Attribute	Value
Sub-index	80_h
Description	AC-DC converter maximum AC voltage 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	AC-DC converter maximum AC voltage 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.4.4 Object $60A3_h$: AC-DC converter maximum AC current

This object shall provide the maximum AC current limit of the AC-DC converter and describes the external power source, outside the EMS. The values shall be given in multiples of 1 mA. Table 12 specifies the object description and Table 13 specifies the entry description.

Table 12 – Object description

Attribute	Value
Index	$60A3_h$
Name	AC-DC converter maximum AC current
Object code	ARRAY
Data type	INTEGER32
Category	Optional

Table 13 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	01_h to FE_h
Default value	No

Attribute	Value
Sub-index	01_h
Description	AC-DC converter VDN 1 maximum AC current
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
Sub-index	02_h
Description	AC-DC converter VDN 2 maximum AC current
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
to	
Sub-index	$7F_h$
Description	AC-DC converter 8 maximum AC current
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
Sub-index	80_h
Description	AC-DC converter maximum AC current external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	AC-DC converter maximum AC current external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.4.5 Object $60A4_h$: AC-DC converter maximum AC power

This object shall provide the maximum AC power limit of the device, required for the external power source, outside the EMS. The values shall be given in multiples of 1 mW. Table 14 specifies the object description and Table 15 specifies the entry description.

Table 14 – Object description

Attribute	Value
Index	$60A4_h$
Name	AC-DC converter maximum AC power
Object code	ARRAY
Data type	INTEGER32
Category	Optional

Table 15 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	AC-DC converter VDN 1 maximum AC power
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
Sub-index	02_h
Description	AC-DC converter VDN 2 maximum AC power
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
to	

Attribute	Value
Sub-index	$7F_h$
Description	AC-DC converter VDN 127 maximum AC power
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
Sub-index	80_h
Description	AC-DC converter maximum AC power external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	AC-DC converter maximum AC power external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.4.6 Object $60AA_h$: AC-DC converter power transfer time

This object shall provide the statistical value of the sum of power transfer time over the AC-DC converter lifetime. The values shall be given in multiples of 1 min. Table 16 specifies the object description and Table 17 specifies the entry description.

Table 16 – Object description

Attribute	Value
Index	$60AA_h$
Name	AC-DC converter power transfer time
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 17 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	AC-DC converter VDN 1 power transfer time
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	UNSIGNED32
Default value	No
Sub-index	02_h
Description	AC-DC converter VDN 2 power transfer time
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	UNSIGNED32
Default value	No
to	
Sub-index	08_h
Description	AC-DC converter VDN 127 power transfer time
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	UNSIGNED32
Default value	No
Sub-index	80_h
Description	AC-DC converter charging time external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	

Attribute	Value
Sub-index	FE_h
Description	AC-DC converter charging time external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.4.7 Object $60AB_h$: AC-DC converter discharging power transfer time

This object shall provide the statistical value of the sum of discharging time over the AC-DC converter lifetime. The values shall be given in multiples of 1 min. Table 18 specifies the object description and Table 19 specifies the entry description.

Table 18 – Object description

Attribute	Value
Index	$60AB_h$
Name	AC-DC converter discharging time
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 19 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	AC-DC converter VDN 1 discharging time
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	UNSIGNED32
Default value	No

Attribute	Value
Sub-index	02_h
Description	AC-DC converter VDN 2 discharging time
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	UNSIGNED32
Default value	No
to	
Sub-index	$7F_h$
Description	AC-DC converter VDN 127 discharging time
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	UNSIGNED32
Default value	No
Sub-index	80_h
Description	AC-DC converter discharging time external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	AC-DC converter discharging time external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.4.8 Object $60AC_h$: AC-DC converter power transfer Ah counter

This object shall provide the statistical sum of the counter over the AC-DC converter lifetime. The values shall be given in multiples of 1 Ah. Table 20 specifies the object description and Table 21 specifies the entry description.

Table 20 – Object description

Attribute	Value
Index	$60AC_h$
Name	AC-DC converter power transfer Ah counter
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 21 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	AC-DC converter VDN 1 power transfer Ah counter
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	02_h
Description	AC-DC converter VDN 2 power transfer Ah counter
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	UNSIGNED32
Default value	No
to	
Sub-index	$7F_h$
Description	AC-DC converter VDN 127 power transfer Ah counter
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	UNSIGNED32
Default value	No

Attribute	Value
Sub-index	80_h
Description	AC-DC converter charging Ah counter external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	AC-DC converter charging Ah counter external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.4.9 Object $60AD_h$: AC-DC converter discharging Ah counter

This object shall provide the statistical sum of the counter over the AC-DC converter lifetime. The values shall be given in multiples of 1 Ah. Table 22 specifies the object description and Table 23 specifies the entry description.

Table 22 – Object description

Attribute	Value
Index	$60AD_h$
Name	AC-DC converter discharging Ah counter
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 23 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No

Attribute	Value
Sub-index	01_h
Description	AC-DC converter VDN 1 discharging Ah counter
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	UNSIGNED32
Default value	No
Sub-index	02_h
Description	AC-DC converter VDN 2 discharging Ah counter
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	UNSIGNED32
Default value	No
to	
Sub-index	$7F_h$
Description	AC-DC converter VDN 127 discharging Ah counter
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	UNSIGNED32
Default value	No
Sub-index	80_h
Description	AC-DC converter discharging Ah counter external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	AC-DC converter discharging Ah counter external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.4.10 Object $60AE_h$: AC-DC converter power transfer Wh counter

This object shall provide the statistical sum of the counter over the AC-DC converter lifetime. The values shall be given in multiples of 1 Wh; measured at DC-side. Table 24 specifies the object description and Table 25 specifies the entry description.

Table 24 – Object description

Attribute	Value
Index	$60AE_h$
Name	AC-DC converter counter power transfer Wh
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 25 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	AC-DC converter VDN1 power transfer Wh counter
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	UNSIGNED32
Default value	No
Sub-index	02_h
Description	AC-DC converter VDN 2 power transfer Wh counter
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	UNSIGNED32
Default value	No
to	

Attribute	Value
Sub-index	$7F_h$
Description	AC-DC converter VDN 127 power transfer Wh counter
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	UNSIGNED32
Default value	No
Sub-index	80_h
Description	AC-DC converter charging Wh counter external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	AC-DC converter charging Wh counter external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.4.11 Object $60AF_h$: AC-DC converter discharging Wh counter

This object shall provide the statistical sum of the counter over the AC-DC converter lifetime. The values shall be given in multiples of 1 Wh. Table 26 specifies the object description and Table 27 specifies the entry description.

Table 26 – Object description

Attribute	Value
Index	$60AF_h$
Name	AC-DC converter discharging Wh counter
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 27 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	AC-DC converter VDN 1 discharging Wh counter
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	UNSIGNED32
Default value	No
Sub-index	02_h
Description	AC-DC converter VDN 2 discharging Wh counter
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	UNSIGNED32
Default value	No
to	
Sub-index	$7F_h$
Description	AC-DC converter VDN127 discharging Wh counter
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	UNSIGNED32
Default value	No
Sub-index	80_h
Description	AC-DC converter charging Wh counter external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	

Attribute	Value
Sub-index	FE_h
Description	AC-DC converter charging Wh counter external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.4.12 Object $60B0_h$: AC-DC converter actual AC voltage

This object shall provide the AC voltage value in case the power transfer is measured. The values shall be given in multiples of 1 mV. Table 28 specifies the object description and Table 29 specifies the entry description.

Table 28 – Object description

Attribute	Value
Index	$60B0_h$
Name	AC-DC converter actual AC voltage
Object code	ARRAY
Data type	INTEGER32
Category	Optional

Table 29 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	AC-DC converter VDN 1 actual AC voltage
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No

Attribute	Value
Sub-index	02_h
Description	AC-DC converter VDN 2 actual AC voltage
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
to	
Sub-index	$7F_h$
Description	AC-DC converter VDN127 actual AC voltage
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
Sub-index	80_h
Description	AC-DC converter actual AC voltage external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	AC-DC converter actual AC voltage external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.4.13 Object $60B1_h$: AC-DC converter actual AC current

This object shall provide the AC current value in case the power transfer is measured. The values shall be given in multiples of 1 mA. Table 30 specifies the object description and Table 31 specifies the entry description.

NOTE A positive value indicates a current flow from the AC-DC converter to the EMS. A negative value indicates a current flow from the EMS to the AC-DC converter.

Table 30 – Object description

Attribute	Value
Index	$60B1_h$
Name	AC-DC converter actual AC current
Object code	ARRAY
Data type	INTEGER32
Category	Optional

Table 31 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	AC-DC converter VDN 1 actual AC current
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
Sub-index	02_h
Description	AC-DC converter VDN 2 actual AC current
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
to	
Sub-index	$7F_h$
Description	AC-DC converter VDN127 actual AC current
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No

Attribute	Value
Sub-index	80_h
Description	AC-DC converter capability external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	AC-DC converter capability external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.4.14 Object $60B2_h$: AC-DC converter actual AC power

This object shall provide the AC power value in case the power transfer is measured. The values shall be given in multiples of 1 mW. Table 32 specifies the object description and Table 33 specifies the entry description.

Table 32 – Object description

Attribute	Value
Index	$60B2_h$
Name	AC-DC converter actual AC power
Object code	ARRAY
Data type	INTEGER32
Category	Optional

Table 33 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No

Attribute	Value
Sub-index	01_h
Description	AC-DC converter VDN 1 actual AC power
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
Sub-index	02_h
Description	AC-DC converter VDN 2 actual AC power
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
to	
Sub-index	$7F_h$
Description	AC-DC converter VDN 127 actual AC power
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
Sub-index	80_h
Description	AC-DC converter actual AC power external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	AC-DC converter actual AC power external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.4.15 Object $60B3_h$: AC-DC converter power transfer count number

This object shall provide the statistical sum of the count numbers over the AC-DC converter lifetime. The value shall be dimensionless. Table 34 specifies the object description and Table 35 specifies the entry description.

Table 34 – Object description

Attribute	Value
Index	$60B3_h$
Name	AC-DC converter power transfer count number
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 35 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	AC-DC converter VDN 1 power transfer count number
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	UNSIGNED32
Default value	No
Sub-index	02_h
Description	AC-DC converter VDN 2 power transfer count number
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	UNSIGNED32
Default value	No
to	

Attribute	Value
Sub-index	08_h
Description	AC-DC converter VDN 127 power transfer count number
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	UNSIGNED32
Default value	No
Sub-index	80_h
Description	AC-DC converter charging count number external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	AC-DC converter charging count number external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.4.16 Object $60B4_h$: AC-DC converter discharging count number

This object shall provide the statistical sum of the count numbers over the AC-DC converter lifetime. The value shall be dimensionless. Table 36 specifies the object description and Table 37 specifies the entry description.

Table 36 – Object description

Attribute	Value
Index	$60B4_h$
Name	AC-DC converter discharging count number
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 37 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	AC-DC converter VDN 1 discharging count number
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	UNSIGNED32
Default value	No
Sub-index	02_h
Description	AC-DC converter VDN 2 discharging count number
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	UNSIGNED32
Default value	No
to	
Sub-index	$7F_h$
Description	AC-DC converter VDN127 discharging count number
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	UNSIGNED32
Default value	No
Sub-index	80_h
Description	AC-DC converter discharging count number external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	

Attribute	Value
Sub-index	FE_h
Description	AC-DC converter discharging count number external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.4.17 Object $60B5_h$: AC-DC converter temperature switch off counter

This object shall provide the switch-off counts of the AC-DC converter in case temperature limits exceed. The value shall be dimensionless. Table 38 specifies the object description and Table 39 specifies the entry description.

Table 38 – Object description

Attribute	Value
Index	$60B5_h$
Name	AC-DC converter temperature switch off counter
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 39 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	AC-DC converter VDN 1 temperature switch off counter
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	UNSIGNED32
Default value	No

Attribute	Value
Sub-index	02_h
Description	AC-DC converter VDN 2 temperature switch off counter
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	UNSIGNED32
Default value	No
to	
Sub-index	08_h
Description	AC-DC converter VDN 127 temperature switch off counter
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	UNSIGNED32
Default value	No
Sub-index	80_h
Description	AC-DC converter temperature switch off counter external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	AC-DC converter temperature switch off counter external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.4.18 Object $60B6_h$: AC-DC converter short cuts switch off counter

This object shall provide the switch-off counts of the AC-DC converter in case of shortcuts. The value shall be dimensionless. Table 40 specifies the object description and Table 41 specifies the entry description.

Table 40 – Object description

Attribute	Value
Index	$60B6_h$
Name	AC-DC converter short cuts switch off counter
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 41 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	AC-DC converter VDN 1 short cuts switch off counter
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	UNSIGNED32
Default value	No
Sub-index	02_h
Description	AC-DC converter VDN 2 short cuts switch off counter
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	UNSIGNED32
Default value	No
to	
Sub-index	$7F_h$
Description	AC-DC converter VDN127 short cuts switch off counter
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	UNSIGNED32
Default value	No

Attribute	Value
Sub-index	80_h
Description	AC-DC converter short cuts switch off counter external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	AC-DC converter short cuts switch off counter external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.4.19 Object $60B7_h$: AC-DC converter minimum DC voltage

This object shall provide the minimum DC voltage of the AC-DC converter. The values shall be given in multiples of 1 mV. Table 42 specifies the object description and Table 43 specifies the entry description.

NOTE This object enables the control of additional DC/DC converter capability. The DC parameter given in this object describes the external power source, outside of the EMS.

Table 42 – Object description

Attribute	Value
Index	$60B7_h$
Name	AC-DC converter minimum DC voltage
Object code	ARRAY
Data type	INTEGER32
Category	Optional

Table 43 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	01_h to FE_h
Default value	No

Attribute	Value
Sub-index	01_h
Description	AC-DC converter VDN 1 minimum DC voltage
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
Sub-index	02_h
Description	AC-DC converter VDN 2 minimum DC voltage
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
to	
Sub-index	$7F_h$
Description	AC-DC converter VDN 127 minimum DC voltage
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
Sub-index	80_h
Description	AC-DC converter minimum DC voltage external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	AC-DC converter minimum DC voltage external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.4.20 Object $60B8_h$: AC-DC converter maximum DC voltage

This object shall provide the maximum DC voltage of the AC-DC converter. The values shall be given in multiples of 1 mV. Table 44 specifies the object description and Table 45 specifies the entry description.

NOTE This object enables the control of additional DC/DC converter capability. The DC parameter given in this object describes the external power source, outside of the EMS.

Table 44 – Object description

Attribute	Value
Index	$60B8_h$
Name	AC-DC converter maximum DC voltage
Object code	ARRAY
Data type	INTEGER32
Category	Optional

Table 45 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	AC-DC converter VDN 1 maximum DC voltage
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
Sub-index	02_h
Description	AC-DC converter VDN 2 maximum DC voltage
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
to	

Attribute	Value
Sub-index	08_h
Description	AC-DC converter VDN127 maximum DC voltage
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
Sub-index	80_h
Description	AC-DC converter maximum DC voltage external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	AC-DC converter maximum DC voltage external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.4.21 Object $60B9_h$: AC-DC converter maximum DC current

This object shall provide the maximum DC current limit of the AC-DC converter. The values shall be given in multiples of 1 mA. Table 46 specifies the object description and Table 47 specifies the entry description.

NOTE This object enables the control of additional DC/DC converter capability. The DC parameter given in this object describes the external power source, outside of the EMS.

Table 46 – Object description

Attribute	Value
Index	$60B9_h$
Name	AC-DC converter maximum DC current
Object code	ARRAY
Data type	INTEGER32
Category	Optional

Table 47 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	AC-DC converter VDN 1 maximum DC current
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
Sub-index	02_h
Description	AC-DC converter VDN 2 maximum DC current
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
to	
Sub-index	$7F_h$
Description	AC-DC converter VDN 127 maximum DC current
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
Sub-index	80_h
Description	AC-DC converter maximum DC current external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	

Attribute	Value
Sub-index	FE_h
Description	AC-DC converter maximum DC current external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.4.22 Object $60BA_h$: AC-DC converter maximum DC power

This object shall provide the maximum DC power limit of the device. The values shall be given in multiples of 1 mW. Table 48 specifies the object description and Table 49 specifies the entry description.

NOTE This object enables the control of additional DC/DC converter capability. The DC parameter given in this object describes the external power source, outside of the EMS.

Table 48 – Object description

Attribute	Value
Index	$60BA_h$
Name	AC-DC converter maximum DC power
Object code	ARRAY
Data type	INTEGER32
Category	Optional

Table 49 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	AC-DC converter VDN 1 maximum DC power
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No

Attribute	Value
Sub-index	02_h
Description	AC-DC converter VDN 2 maximum DC power
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
to	
Sub-index	$7F_h$
Description	AC-DC converter VDN 127 maximum DC power
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
Sub-index	80_h
Description	AC-DC converter maximum DC power external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	AC-DC converter maximum DC power external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5 Produced application objects by voltage converter unit (optional)

6.5.1 General

Subclause 6.5 defines application objects produced by the VCU. The VCU is assumed as a device that is capable to transfer AC or DC voltages from a "side A" to AC or DC voltages on a "side B" and from a "side B" to "side A".

6.5.2 Object $60A5_h$: VCU position and class

This object shall provide information about the position of the VCU in the system and about the device class to which the VCU belongs at the connected power lines. The object structure is specified in Figure 3. Byte 0 shall provide the power transfer direction. Byte 1 shall provide the involved power lines on "side A" and side B of the VCU. Bytes 2 and 3 contain the device class for each of the referenced power lines from byte 1. For the device class the same value definition as for Object 6000_h bit field device class.

In the description of the value definition for the bit field "power transfer direction", a "1" in DC1 or in AC1 denotes the "side A" of the converter while the "2" in DC2 or AC2 denotes the "side B" of the inverter. Because of the possibility of bidirectional power transfer, it shall be resigned to use the terms input and output sides. Bit fields "power line number side A/side B" contain the position of the VCU as power lines are concerned. The EMSC may allocate two sorts of lists of power lines, one for up to 16 AC and one for up to 16 DC power lines. These power line numbers are configured to appoint the position of the device in the system and to define the membership of the component to a certain power line. Bit fields "device class side A/side B" define the device class of the "side A" and "side B". Table 50 provides the value definition. Table 51 and Table 52 provide the object description and the entry description.

NOTE DC to AC power transfer is not covered by this document.

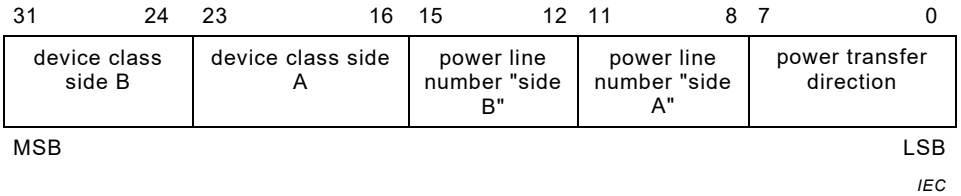

Figure 3 – Object structure

Table 50 – Value definition

Name	Byte	Bit	Value	Description
power transfer direction	0	0	0	DC1 to DC2 not supported
			1	DC1 to DC2 supported
		1	0	DC2 to DC1 not supported
			1	DC2 to DC1 supported
		2	0	DC1 to AC1 not supported
			1	DC1 to AC1 supported
		3	0	AC1 to DC1 not supported
			1	AC1 to DC1 supported
		4	0	AC1 to AC2 not supported
			1	AC1 to AC2 supported
		5	0	AC2 to AC1 not supported
			1	AC2 to AC1 supported
		6 to 7	0	Reserved
power line number DC	1 low nibble	0 to 3	0-15	power line number
power line number AC	1 high nibble	0 to 3	0-15	power line number
device class DC	2	0 to 3	0 to 255	see IEC TS 61851-3-5:2021 Object 6000h bit field "device class" [24:31]
device class AC	3	0 to 3	0 to 255	

Table 51 – Object description

Attribute	Value
Index	$60A5_h$
Name	VCU position and class
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 52 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	VCU VDN 1
Category	Mandatory
Access	ro
PDO mapping	No
Value range	See value definition
Default value	No
Sub-index	02_h
Description	VCU VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	See value definition
Default value	No
to	
Sub-index	$7F_h$
Description	VCU VDN127
Category	Optional
Access	ro
PDO mapping	No
Value range	See value definition
Default value	No

Attribute	Value
Sub-index	80_h
Description	VCU external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	VCU external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.3 Object $60D0_h$ 3P topology DC1 positive voltage

This object shall provide the positive voltage for the DC1 side in case of a three-point topology on the DC side. The data type shall be INTEGER32. The value shall be given in multiples of 1 V, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mV.

Table 53 and Table 54 provide object description and entry description.

Table 53 – Object description

Attribute	Value
Index	$60D0_h$
Name	3P topology DC1 positive voltage
Object code	ARRAY
Data type	INTEGER32
Category	Optional

Table 54 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No

Attribute	Value
Sub-index	01_h
Description	positive voltage VDN 1
Category	Optional
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No
Sub-index	02_h
Description	positive voltage VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No
to	
Sub-index	08_h
Description	positive voltage VDN127
Category	Optional
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No
Sub-index	80_h
Description	positive voltage external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	positive voltage external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.4 Object $60D1_h$ 3P topology DC1 negative voltage

This object shall provide the negative voltage for the DC1 side in case of a three point topology on the DC side. The data type shall be INTEGER32. The value shall be given in multiples of 1 V, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mV.

Table 55 and Table 56 provide the object description and the entry description.

Table 55 – Object description

Attribute	Value
Index	$60D1_h$
Name	3P topology DC1 negative voltage
Object code	ARRAY
Data type	INTEGER32
Category	Optional

Table 56 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	negative voltage VDN 1
Category	Mandatory
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No
Sub-index	02_h
Description	negative voltage VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No
to	

Attribute	Value
Sub-index	$7F_h$
Description	negative voltage VDN 127
Category	Optional
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No
Sub-index	80_h
Description	negative voltage external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	negative voltage external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.5 Object $60D2_h$ 3P topology DC2 positive voltage

This object shall provide the positive voltage for the DC2 side in case of a three point topology on the DC side. The data type shall be INTEGER32. The value shall be given in multiples of 1 V, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mV.

Table 57 and Table 58 provide the object description and the entry description.

Table 57 – Object description

Attribute	Value
Index	$60D2_h$
Name	3P topology DC2 positive voltage
Object code	ARRAY
Data type	INTEGER32
Category	Optional

Table 58 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	positive voltage VDN 1
Category	Mandatory
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No
Sub-index	02_h
Description	positive voltage VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No
to	
Sub-index	$7F_h$
Description	positive voltage VDN 127
Category	Optional
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No
Sub-index	80_h
Description	positive voltage external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	

Attribute	Value
Sub-index	FE_h
Description	positive voltage external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.6 Object $60D3_h$ 3P topology DC2 negative voltage

This object shall provide the negative voltage for the DC2 side in case of a three point topology on the DC side. The data type shall be INTEGER32. The value shall be given in multiples of 1 V, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mV.

Table 59 and Table 60 provide the object description and the entry description.

Table 59 – Object description

Attribute	Value
Index	$60D3_h$
Name	3P topology DC2 negative voltage
Object code	ARRAY
Data type	INTEGER32
Category	Optional

Table 60 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	negative voltage VDN 1
Category	Mandatory
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No

Attribute	Value
Sub-index	02_h
Description	negative voltage VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No
to	
Sub-index	$7F_h$
Description	negative voltage VDN 127
Category	Optional
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No
Sub-index	80_h
Description	negative voltage external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	negative voltage external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.7 Object $60D4_h$ Overload capability DC1

This object shall provide the overload capability for the DC1 side. The object code shall be ARRAY and the data type UNSIGNED32. Overload values shall be given relative to the nominal power of the device. Overloads shall be given in multiples of 0,01 % and overload times shall be given in multiples of 1 second. Figure 4 provides the object structure. Table 61 and Table 62 provide the object description and the entry description.

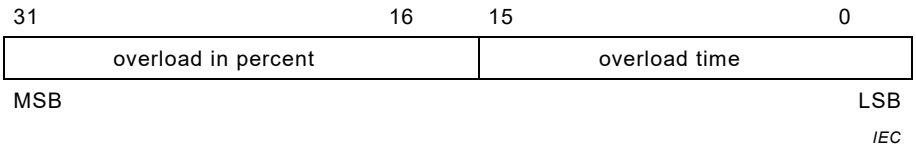

Figure 4 – Object structure

Table 61 – Object description

Attribute	Value
Index	$60D4_h$
Name	Overload capability DC1
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 62 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Overload and time VDN 1
Category	Mandatory
Access	ro
PDO mapping	No
Value range	See object structure
Default value	No
Sub-index	02_h
Description	Overload and time VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	See object structure
Default value	No
to	
Sub-index	$7F_h$
Description	Overload and time VDN 127
Category	Optional
Access	ro
PDO mapping	No
Value range	See object structure
Default value	No

Attribute	Value
Sub-index	80_h
Description	Overload and time external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Overload and time external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.8 Object $60D5_h$ Overload capability DC2

This object shall provide the overload capability for the DC2 side. The object code shall be ARRAY and the data type UNSIGNED32. Overload values shall be given relative to the nominal power of the device. Overloads shall be given in multiples of 0,01 % and overload times shall be given in seconds. Figure 5 provides the object structure. Table 63 and Table 64 provide the object description and the entry description.

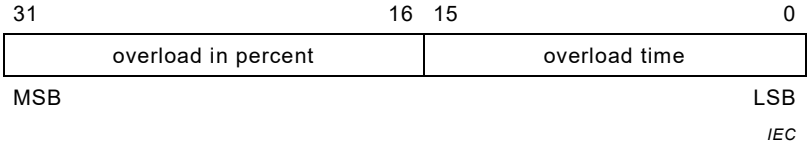

Figure 5 – Object structure

Table 63 – Object description

Attribute	Value
Index	$60D5_h$
Name	Overload capability DC2
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 64 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Overload and time VDN 1
Category	Mandatory
Access	ro
PDO mapping	No
Value range	See object structure
Default value	No
Sub-index	02_h
Description	Overload and time VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	See object structure
Default value	No
to	
Sub-index	08_h
Description	Overload and time VDN 127
Category	Optional
Access	ro
PDO mapping	No
Value range	See object structure
Default value	No
Sub-index	80_h
Description	Overload and time external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	

Attribute	Value
Sub-index	FE_h
Description	Overload and time external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.9 Object $60D6_h$ Overload capability AC1

This object shall provide the overload capability for the AC1 side. The object code shall be ARRAY and the data type UNSIGNED32. Overload values shall be given relative to the nominal power of the device. Overloads shall be given in multiples of 0,01 percent and overload times shall be given in seconds. Figure 6 provides the object structure. Table 65 and Table 66 provide the object description and the entry description.

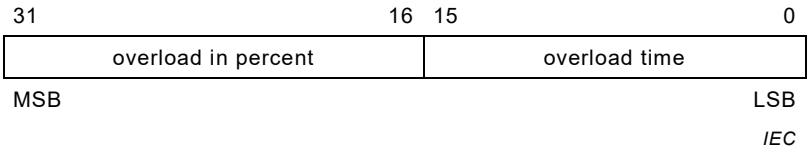

Figure 6 – Object structure

Table 65 – Object description

Attribute	Value
Index	$60D6_h$
Name	Overload capability AC1
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 66 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No

Attribute	Value
Sub-index	01_h
Description	Overload and time VDN 1
Category	Mandatory
Access	ro
PDO mapping	No
Value range	See object structure
Default value	No
Sub-index	02_h
Description	Overload and time VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	See object structure
Default value	No
to	
Sub-index	$7F_h$
Description	Overload and time VDN 127
Category	Optional
Access	ro
PDO mapping	No
Value range	See object structure
Default value	No
Sub-index	80_h
Description	Overload and time external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Overload and time external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.10 Object $60D7_h$ Overload capability AC2

This object shall provide the overload capability for the AC2 side. The object code shall be ARRAY and the data type UNSIGNED32. Overload values shall be given relative to the nominal power of the device. Overloads shall be given in multiples of 0,01 % and overload times shall be given in seconds. Figure 7 provides the object structure. Table 67 and Table 68 provide the object description and the entry description.

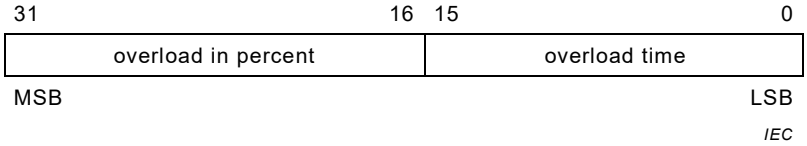

Figure 7 – Object structure

Table 67 – Object description

Attribute	Value
Index	$60D7_h$
Name	Overload capability AC2
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 68 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Overload and time VDN 1
Category	Mandatory
Access	ro
PDO mapping	No
Value range	See object structure
Default value	No

Attribute	Value
Sub-index	02_h
Description	Overload and time VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	See object structure
Default value	No
to	
Sub-index	$7F_h$
Description	Overload and time VDN 127
Category	Optional
Access	ro
PDO mapping	No
Value range	See object structure
Default value	No
Sub-index	80_h
Description	Overload and time external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Overload and time external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.11 Object $60D8_h$ VCU frequency thresholds AC1

This object shall provide the minimum and maximum frequencies for the AC1. The data type shall be UNSIGNED32. The value shall be given in multiples of 0,01 Hz. Figure 8 provides the object structure. Table 69 and Table 70 provide the object description and the entry description.

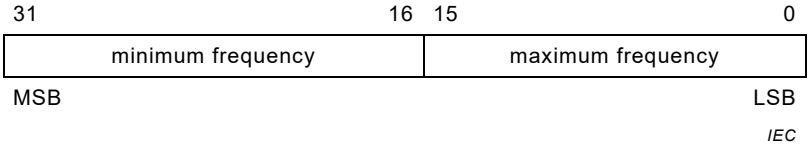

Figure 8 – Object structure

Table 69 – Object description

Attribute	Value
Index	$60D8_h$
Name	VCU frequency thresholds AC1
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 70 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to $7F_h$
Default value	No
Sub-index	01_h
Description	frequency thresholds VDN 1
Category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	02_h
Description	frequency thresholds VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
to	
Sub-index	08_h
Description	frequency thresholds VDN 127
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

Attribute	Value
Sub-index	80_h
Description	Frequency thresholds external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Frequency thresholds external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.12 Object $60D9_h$ VCU frequency thresholds AC2

This object shall provide the minimum and maximum frequencies for the AC1. The data type shall be UNSIGNED32. The value shall be given in multiples of 0,01 Hz. Figure 9 provides the object structure. Table 71 and Table 72 provide the object description and the entry description.

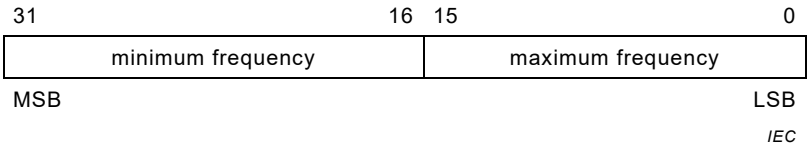

Figure 9 – Object structure

Table 71 – Object description

Attribute	Value
Index	$60D9_h$
Name	VCU frequency thresholds AC2
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 72 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	frequency thresholds VDN 1
Category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	02_h
Description	frequency thresholds VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
to	
Sub-index	$7F_h$
Description	frequency thresholds VDN127
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	80_h
Description	Frequency thresholds external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	

Attribute	Value
Sub-index	FE_h
Description	Frequency thresholds external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.13 Object $60DA_h$ Maximum L1 apparent power AC1

This object shall provide the maximum apparent power for the AC1 side. The data type shall be UNSIGNED32. The value shall be given in multiples of 1 VA, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mVA.

Table 73 and Table 74 provide the object description and the entry description.

Table 73 – Object description

Attribute	Value
Index	$60DA_h$
Name	Maximum L1 apparent power AC1
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 74 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Maximum apparent power VDN 1
Category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

Attribute	Value
Sub-index	02_h
Description	Maximum apparent power VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
to	
Sub-index	$7F_h$
Description	Maximum apparent power VDN 127
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	80_h
Description	Maximum apparent power external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Maximum apparent power external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.14 Object $60DB_h$ Maximum L2 apparent power AC1

This object shall provide the maximum apparent power for the AC1 side. The data type shall be UNSIGNED32. The value shall be given in multiples of 1 VA, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mVA.

Table 75 and Table 76 provide the object description and the entry description.

Table 75 – Object description

Attribute	Value
Index	$60DB_h$
Name	Maximum L2 apparent power AC1
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 76 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Maximum apparent power VDN 1
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	02_h
Description	Maximum apparent power VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
to	
Sub-index	$7F_h$
Description	Maximum apparent power VDN127
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

Attribute	Value
Sub-index	80_h
Description	Maximum apparent power external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Maximum apparent power external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.15 Object $60DC_h$ Maximum L3 apparent power AC1

This object shall provide the maximum apparent power for the AC1 side. The data type shall be UNSIGNED32. The value shall be given in multiples of 1 VA, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mVA.

Table 77 and Table 78 provide the object description and the entry description.

Table 77 – Object description

Attribute	Value
Index	$60DC_h$
Name	Maximum L3 apparent power AC1
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 78 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No

Attribute	Value
Sub-index	01_h
Description	Maximum apparent power VDN 1
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	02_h
Description	Maximum apparent power VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
to	
Sub-index	$7F_h$
Description	Maximum apparent power VDN 127
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	80_h
Description	Maximum apparent power external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Maximum apparent power external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.16 Object $60DD_h$ Maximum L1 apparent power AC2

This object shall provide the maximum apparent power for the AC2 side. The data type shall be UNSIGNED32. The value shall be given in multiples of 1 VA, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mVA.

Table 79 and Table 80 provide the object description and the entry description.

Table 79 – Object description

Attribute	Value
Index	$60DA_h$
Name	Maximum L1 apparent power AC2
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 80 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Maximum apparent power 1
Category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	02_h
Description	Maximum apparent power VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
to	

Attribute	Value
Sub-index	$7F_h$
Description	Maximum apparent power VDN 127
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	80_h
Description	Maximum apparent power external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Maximum apparent power external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.17 Object $60DE_h$ Maximum L2 apparent power AC2

This object shall provide the maximum apparent power for the AC2 side. The data type shall be UNSIGNED32. The value shall be given in multiples of 1 VA, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mVA.

Table 81 and Table 82 provide the object description and the entry description.

Table 81 – Object description

Attribute	Value
Index	$60DB_h$
Name	Maximum L2 apparent power AC2
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 82 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Maximum apparent power VDN 1
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	02_h
Description	Maximum apparent power VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
to	
Sub-index	$7F_h$
Description	Maximum apparent power VDN127
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	80_h
Description	Maximum apparent power external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	

Attribute	Value
Sub-index	FE_h
Description	Maximum apparent power external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.18 Object $60DF_h$ Maximum L3 apparent power AC2

This object shall provide the maximum apparent power for the AC2 side. The data type shall be UNSIGNED32. The value shall be given in multiples of 1 VA, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mVA.

Table 83 and Table 84 provide the object description and the entry description.

Table 83 – Object description

Attribute	Value
Index	$60DC_h$
Name	Maximum L3 apparent power AC2
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 84 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Maximum apparent power VDN 1
Category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

Attribute	Value
Sub-index	02_h
Description	Maximum apparent power VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
to	
Sub-index	$7F_h$
Description	Maximum apparent power VDN 127
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	80_h
Description	Maximum apparent power external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Maximum apparent power external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.19 Object $60E1_h$ Maximum L1 real power AC1

This object shall provide the maximum real power for the AC1 side. The data type shall be UNSIGNED32. The value shall be given in multiples of 1 W, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mW.

Table 85 and Table 86 provide the object description and the entry description.

Table 85 – Object description

Attribute	Value
Index	$60DA_h$
Name	Maximum L1 real power AC1
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 86 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Maximum real power VDN 1
Category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	02_h
Description	Maximum real power VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
to	
Sub-index	08_h
Description	Maximum real power VDN 127
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

Attribute	Value
Sub-index	80_h
Description	Maximum real power external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Maximum real power external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.20 Object $60E2_h$ Maximum L2 real power AC1

This object shall provide the maximum real power for the AC1 side. The data type shall be UNSIGNED32. The value shall be given in multiples of 1 W, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mW.

Table 87 and Table 88 provide the object description and the entry description.

Table 87 – Object description

Attribute	Value
Index	$60E2_h$
Name	Maximum L2 real power AC1
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 88 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No

Attribute	Value
Sub-index	01_h
Description	Maximum real power VDN 1
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	02_h
Description	Maximum real power VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
to	
Sub-index	$7F_h$
Description	Maximum real power VDN 127
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	80_h
Description	Maximum real power external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Maximum real power external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.21 Object $60E3_h$ Maximum L3 real power AC1

This object shall provide the maximum apparent power for the AC1 side. The data type shall be UNSIGNED32. The value shall be given in multiples of 1 W, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mW.

Table 89 and Table 90 provide the object description and the entry description.

Table 89 – Object description

Attribute	Value
Index	$60E3_h$
Name	Maximum L3 real power AC1
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 90 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Maximum real power VDN 1
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	02_h
Description	Maximum real power VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
to	

Attribute	Value
Sub-index	$7F_h$
Description	Maximum real power VDN 127
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	80_h
Description	Maximum real power external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Maximum real power external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.22 Object $60E4_h$ Maximum L1 real power AC2

This object shall provide the maximum real power for the AC2 side. The data type shall be UNSIGNED32. The value shall be given in multiples of 1 W, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mW.

Table 91 and Table 92 provide the object description and the entry description.

Table 91 – Object description

Attribute	Value
Index	$60E4_h$
Name	Maximum L1 real power AC2
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 92 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Maximum real power VDN 1
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	02_h
Description	Maximum real power VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
to	
Sub-index	$7F_h$
Description	Maximum real power VDN 127
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	80_h
Description	Maximum real power external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	

Attribute	Value
Sub-index	FE_h
Description	Maximum real power external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.23 Object $60E5_h$ Maximum L2 real power AC2

This object shall provide the maximum real power for the AC2 side. The data type shall be UNSIGNED32. The value shall be given in multiples of 1 W, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mW.

Table 93 and Table 94 provide the object description and the entry description.

Table 93 – Object description

Attribute	Value
Index	$60E5_h$
Name	Maximum L2 real power AC2
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 94 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Maximum real power VDN 1
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

Attribute	Value
Sub-index	02_h
Description	Maximum real power VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
to	
Sub-index	$7F_h$
Description	Maximum real power VDN 127
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	80_h
Description	Maximum real power external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Maximum real power external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.24 Object $60E6_h$ Maximum L3 real power AC2

This object shall provide the maximum real power for the AC2 side. The data type shall be UNSIGNED32. The value shall be given in multiples of 1 W, multiplied with the prefix given in IEC TS 61851-3-5:2021 Object 6053_h.

NOTE The recommended resolution is multiples of 1 mW.

Table 95 and Table 96 provide the object description and the entry description.

Table 95 – Object description

Attribute	Value
Index	$60E6_h$
Name	Maximum L3 real power AC2
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 96 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Maximum real power VDN 1
Category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	02_h
Description	Maximum real power VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
to	
Sub-index	$7F_h$
Description	Maximum real power VDN 127
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

Attribute	Value
Sub-index	80_h
Description	Maximum real power external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Maximum real power external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.25 Object $60E7_h$ Maximum L1 reactive power AC1

This object shall provide the maximum reactive power for the AC1 side. The data type shall be UNSIGNED32. The value shall be given in multiples of 1 var, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mvar.

Table 97 and Table 98 provide the object description and the entry description.

Table 97 – Object description

Attribute	Value
Index	$60E7_h$
Name	Maximum L1 reactive power AC1
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 98 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No

Attribute	Value
Sub-index	01_h
Description	Maximum reactive power VDN 1
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	02_h
Description	Maximum reactive power VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
to	
Sub-index	$7F_h$
Description	Maximum reactive power VDN127
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	80_h
Description	Maximum reactive power external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Maximum reactive power external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.26 Object $60E8_h$ Maximum L2 reactive power AC1

This object shall provide the maximum reactive power for the AC1 side. The data type shall be UNSIGNED32. The value shall be given in multiples of 1 var, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mvar.

Table 99 and Table 100 provide the object description and the entry description.

Table 99 – Object description

Attribute	Value
Index	$60E8_h$
Name	Maximum L2 reactive power AC1
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 100 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Maximum reactive power VDN 1
Category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	02_h
Description	Maximum reactive power VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
to	

Attribute	Value
Sub-index	$7F_h$
Description	Maximum reactive power VDN 127
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	80_h
Description	Maximum reactive power external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Maximum reactive power external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.27 Object $60E9_h$ Maximum L3 reactive power AC1

This object shall provide the maximum apparent power for the AC1 side. The data type shall be UNSIGNED32. The value shall be given in multiples of 1 var, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mvar.

Table 101 and Table 102 provide the object description and the entry description.

Table 101 – Object description

Attribute	Value
Index	$60E9_h$
Name	Maximum L3 reactive power AC1
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 102 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Maximum reactive power VDN 1
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	02_h
Description	Maximum reactive power VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
to	
Sub-index	$7F_h$
Description	Maximum reactive power VDN 127
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	80_h
Description	Maximum reactive power external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	

Attribute	Value
Sub-index	FE_h
Description	Maximum reactive power external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.28 Object $60EA_h$ Maximum L1 reactive power AC2

This object shall provide the maximum reactive power for the AC2 side. The data type shall be UNSIGNED32. The value shall be given in multiples of 1 var, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mvar.

Table 103 and Table 104 provide the object description and the entry description.

Table 103 – Object description

Attribute	Value
Index	$60EA_h$
Name	Maximum L1 reactive power AC2
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 104 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Maximum reactive power VDN 1
Category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

Attribute	Value
Sub-index	02_h
Description	Maximum reactive power VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
to	
Sub-index	$7F_h$
Description	Maximum reactive power VDN 127
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	80_h
Description	Maximum reactive power external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Maximum reactive power external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.29 Object $60EB_h$ Maximum L2 reactive power AC2

This object shall provide the maximum reactive power for the AC2 side. The data type shall be UNSIGNED32. The value shall be given in multiples of 1 var, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mvar.

Table 105 and Table 106 provide the object description and the entry description.

Table 105 – Object description

Attribute	Value
Index	$60EB_h$
Name	Maximum L2 reactive power AC2
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 106 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Maximum reactive power VDN 1
Category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	02_h
Description	Maximum reactive power VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
to	
Sub-index	$7F_h$
Description	Maximum reactive power VDN 127
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

Attribute	Value
Sub-index	80_h
Description	Maximum reactive power external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Maximum reactive power external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.30 Object $60EC_h$ Maximum L3 reactive power AC2

This object shall provide the maximum reactive power for the AC2 side. The data type shall be UNSIGNED32. The value shall be given in multiples of 1 var, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mvar.

Table 107 and Table 108 provide the object description and the entry description.

Table 107 – Object description

Attribute	Value
Index	$60EC_h$
Name	Maximum L3 reactive power AC2
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 108 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No

Attribute	Value
Sub-index	01_h
Description	Maximum reactive power VDN 1
Category	Mandatory
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	02_h
Description	Maximum reactive power VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
to	
Sub-index	$7F_h$
Description	Maximum reactive power VDN 127
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
Sub-index	80_h
Description	Maximum reactive power external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Maximum reactive power external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.31 Object $60ED_h$ Maximum L1 current AC1

This object shall provide the maximum L1 current for the AC1 side. The data type shall be INTEGER32. The value shall be given in multiples of 1 A, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mA.

Table 109 and Table 110 provide the object description and the entry description.

Table 109 – Object description

Attribute	Value
Index	$60ED_h$
Name	Maximum L1 current AC1
Object code	ARRAY
Data type	INTEGER32
Category	Optional

Table 110 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Maximum current VDN 1
Category	Mandatory
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No
Sub-index	02_h
Description	Maximum current VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No
to	

Attribute	Value
Sub-index	$7F_h$
Description	Maximum current VDN127
Category	Optional
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No
Sub-index	80_h
Description	Maximum current external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Maximum current external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.32 Object $60EE_h$ Maximum L2 current AC1

This object shall provide the maximum L2 current for the AC1 side. The data type shall be INTEGER32. The value shall be given in multiples of 1 A, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mA.

Table 111 and Table 112 provide the object description and the entry description.

Table 111 – Object description

Attribute	Value
Index	$60EE_h$
Name	Maximum L2 current AC1
Object code	ARRAY
Data type	INTEGER32
Category	Optional

Table 112 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Maximum current VDN 1
Category	Mandatory
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No
Sub-index	02_h
Description	Maximum current VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No
to	
Sub-index	$7F_h$
Description	Maximum current VDN 127
Category	Optional
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No
Sub-index	80_h
Description	Maximum current external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	

Attribute	Value
Sub-index	FE_h
Description	Maximum current external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.33 Object $60EF_h$ Maximum L3 current AC1

This object shall provide the maximum L3 current for the AC1 side. The data type shall be INTEGER32. The value shall be given in multiples of 1 A, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mA.

Table 113 and Table 114 provide the object description and the entry description.

Table 113 – Object description

Attribute	Value
Index	$60EF_h$
Name	Maximum L3 current AC1
Object code	ARRAY
Data type	INTEGER32
Category	Optional

Table 114 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Maximum current VDN 1
Category	Mandatory
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No

Attribute	Value
Sub-index	02_h
Description	Maximum current VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No
to	
Sub-index	$7F_h$
Description	Maximum current VDN127
Category	Optional
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No
Sub-index	80_h
Description	Maximum current external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Maximum current external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.34 Object $609A_h$ Maximum L1 current AC2

This object shall provide the maximum L1 current for the AC2 side. The data type shall be INTEGER32. The value shall be given in multiples of 1 A, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mA.

Table 115 and Table 116 provide the object description and the entry description.

Table 115 – Object description

Attribute	Value
Index	$609A_h$
Name	Maximum L1 current AC2
Object code	ARRAY
Data type	INTEGER32
Category	Optional

Table 116 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Maximum current VDN 1
Category	Mandatory
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No
Sub-index	02_h
Description	Maximum current VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No
to	
Sub-index	$7F_h$
Description	Maximum current VDN127
Category	Optional
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No

Attribute	Value
Sub-index	80_h
Description	Maximum current external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Maximum current external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.35 Object $609B_h$ Maximum L2 current AC2

This object shall provide the maximum L2 current for the AC2 side. The data type shall be INTEGER32. The value shall be given in multiples of 1 A, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mA.

Table 117 and Table 118 provide the object description and the entry description.

Table 117 – Object description

Attribute	Value
Index	$609B_h$
Name	Maximum L2 current AC2
Object code	ARRAY
Data type	INTEGER32
Category	Optional

Table 118 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No

Attribute	Value
Sub-index	01_h
Description	Maximum current VDN 1
Category	Mandatory
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No
Sub-index	02_h
Description	Maximum current VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No
to	
Sub-index	$7F_h$
Description	Maximum current VDN 127
Category	Optional
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No
Sub-index	80_h
Description	Maximum current external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Maximum current external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.36 Object $609C_h$ Maximum L3 current AC2

This object shall provide the maximum L3 current for the AC2 side. The data type shall be INTEGER32. The value shall be given in multiples of 1 A, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mA.

Table 119 and Table 120 provide the object description and the entry description.

Table 119 – Object description

Attribute	Value
Index	$609C_h$
Name	Maximum L3 current AC2
Object code	ARRAY
Data type	INTEGER32
Category	Optional

Table 120 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Maximum current VDN 1
Category	Mandatory
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No
Sub-index	02_h
Description	Maximum current VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No
to	

Attribute	Value
Sub-index	$7F_h$
Description	Maximum current VDN127
Category	Optional
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No
Sub-index	80_h
Description	Maximum current external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Maximum current external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.37 Object $609D_h$ Maximum N current AC1

This object shall provide the maximum neutral line current for the AC1 side. The data type shall be INTEGER32. The value shall be given in multiples of 1 A, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mA.

Table 121 and Table 122 provide the object description and the entry description.

Table 121 – Object description

Attribute	Value
Index	$609D_h$
Name	Maximum neutral line current AC1
Object code	ARRAY
Data type	INTEGER32
Category	Optional

Table 122 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Maximum neutral line current VDN 1
Category	Mandatory
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No
Sub-index	02_h
Description	Maximum neutral line current VDN 2
Category	Optional
Access	Ro
PDO mapping	No
Value range	INTEGER32
Default value	No
to	
Sub-index	$7F_h$
Description	Maximum neutral line current VDN 127
Category	Optional
Access	Ro
PDO mapping	No
Value range	INTEGER32
Default value	No
Sub-index	80_h
Description	Maximum neutral line current external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	

Attribute	Value
Sub-index	FE_h
Description	Maximum neutral line current external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.38 Object $609E_h$ Maximum N current AC2

This object shall provide the maximum neutral line current for the AC2 side. The data type shall be INTEGER32. The value shall be given in multiples of 1 A, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mA.

Table 123 and Table 124 provide the object description and the entry description.

Table 123 – Object description

Attribute	Value
Index	$609E_h$
Name	Maximum neutral line current AC2
Object code	ARRAY
Data type	INTEGER32
Category	Optional

Table 124 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Maximum neutral line current VDN 1
Category	Mandatory
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No

Attribute	Value
Sub-index	02_h
Description	Maximum neutral line current VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No
to	
Sub-index	$7F_h$
Description	Maximum neutral line current VDN 127
Category	Optional
Access	ro
PDO mapping	No
Value range	INTEGER32
Default value	No
Sub-index	80_h
Description	Maximum neutral line current external data 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Maximum neutral line current external data 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.5.39 Object $603F_h$: DC-DC converter actual current side B

This object shall provide the device actual current that is measured at the device on side B. The positive current value shall indicate the current flow from the device to the EMS. The negative current value shall indicate the current flow from the EMS to the device. The values shall be given in multiples of 1 mA. Table 125 specifies the object description and Table 126 specifies the entry description.

NOTE The actual current of DC-DC converter's side A is given in IEC TS 61851-3-5:2021, Object $603E_h$.

Table 125 – Object description

Attribute	Value
Index	$603F_h$
Name	DC-DC converter actual current side B
Object code	ARRAY
Data type	INTEGER32
Category	Optional

Table 126 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Current VDN 1
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
Sub-index	02_h
Description	Current VDN 2
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
to	
Sub-index	$7F_h$
Description	Current VDN 127
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No

Attribute	Value
Sub-index	80_h
Description	Other device current 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	INTEGER32
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Other device current 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	INTEGER32
Default value	Manufacturer-specific

6.5.40 Object 6041_h: DC-DC converter actual voltage side B

This object shall provide the actual voltage that is measured at the device side B. The values shall be given in multiples of 1 mV. Table 127 specifies the object description and Table 128 specifies the entry description.

NOTE The actual voltage measured at the DC-DC converter's side A is provided in Object 6040_h.

Table 127 – Object description

Attribute	Value
Index	6041_h
Name	DC-DC converter actual voltage side B
Object code	ARRAY
Data type	INTEGER32
Category	Optional

Table 128 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No

Attribute	Value
Sub-index	01_h
Description	Voltage VDN 1
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
Sub-index	02_h
Description	Voltage VDN 2
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
to	
Sub-index	$7F_h$
Description	Voltage VDN 127
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	INTEGER32
Default value	No
Sub-index	80_h
Description	Other device voltage 1
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	INTEGER32
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Other device voltage 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	INTEGER32
Default value	Manufacturer-specific

6.6 Consumed application objects by AC-DC converter (optional)

6.6.1 General

Subclause 6.6 defines the application objects consumed by the AC-DC converter functionality, which is a subset of the VCU functionality.

6.6.2 Object $60BE_h$: AC-DC converter set maximum AC power

This object shall indicate the maximum AC power limitation value. This allows application to limit power of the device. The values shall be given in multiples of 1 mW. Table 129 specifies the object description and Table 130 specifies the entry description.

Table 129 – Object description

Attribute	Value
Index	$60BE_h$
Name	AC-DC converter set maximum AC power
Object code	ARRAY
Data type	INTEGER32
Category	Optional

Table 130 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to $7F_h$
Default value	No
Sub-index	01_h
Description	AC-DC converter VDN 1 set maximum AC 1 power
Entry category	Mandatory
Access	rw
PDO mapping	Optional
Value range	INTEGER32
Default value	Manufacturer-specific

Attribute	Value
Sub-index	02_h
Description	AC-DC converter VDN 2 set maximum AC 1 power
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	INTEGER32
Default value	Manufacturer-specific
to	
Sub-index	$7F_h$
Description	AC-DC converter VDN 127 set maximum AC 1 power
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	INTEGER32
Default value	Manufacturer-specific

6.7 Consumed application objects for power transfer

6.7.1 General

Subclause 6.7 provides parameters that are required to learn from a VCU's point of view the attributes of the battery systems that shall be connected to an EMS, in use cases, for example 8.3 of IEC TS 61851-3-4:2021.

6.7.2 Object $60F0_h$: Connected battery systems data - Instance

This object shall provide the global instance number of the battery systems to be connected to a power system as well as the virtual instance number of the battery system within the CANopen device. Value definition and object structure shall comply with those of Object 6000_h.

For informative reasons, Figure 10 illustrates the object structure and Table 131 provides the value definition (see also Table 8 of IEC TS 61851-3-5:2021). Table 132 specifies the object description, and Table 133 specifies the entry description.

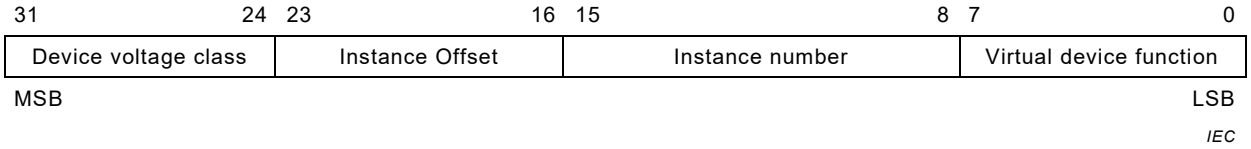

Figure 10 – Object structure supported virtual devices (informative)

Table 131 – Value definition for bit fields (informative)

Name	Value [hex]	Description
Virtual device function	00 to 01	Reserved
	02	GAO
	03	Reserved
	04	EMSC
	05	Voltage converter unit

Name	Value [hex]	Description
	06	Battery system
	07	Motor control unit [a]
	08	Load monitoring unit [a]
	09	HMI control unit [a]
	0A	Security unit
	0B	Sensor unit [a]
	0C	Gateway unit [a]
	0D	Generator unit [a]
	0E	Load unit [a]
	0F to 7F	Reserved
	80	Manufacturer-specific VD
	81 to FF	Reserved
Instance number	00	Reserved
	01 to 7F	Local instance number
	80 to FF	Reserved
Instance offset	00	Default
	01 to 7F	Instance offset
	80 to FF	Reserved
Device voltage class	00	Device does not consume energy form the EMS and is only powered by an AUX voltage (passive device)
	01	Device operating at 12 V_{DC} to 48 V_{DC} nominal voltage
	02	Device operating at more than 48 V_{DC} to 96 V_{DC} nominal voltage
	03	Device operating at more than 96 V_{DC} to 200 V_{DC} nominal voltage
	04	Device operating at more than 200 V_{DC} to 400 VDC nominal voltage
	05	Device operating at more than 400 VDC nominal voltage
	06 to 7F	Reserved
	80	Device operating at 85 to 127 V_{AC}, single phase
	81	Device operating at 200 to 265 V_{AC}, single phase
	82 to BF	Reserved
	C0	Device operating at 85 to 127 V_{AC}, three phase, (Y-connection)
	C1	Device operating at 200 to 265 V_{AC}, three phase, (Y-connection)
	C2	Device operating at 85 to 127 V_{AC}, three phase, (Δ-connection)
	C3	Device operating at 200 to 265 V_{AC}, three phase, (Δ-connection)
	C4 to FD	Reserved
	FE	Device class provided in 60A5h
	FF	Reserved

[a] This virtual device is not specified in this document. For details, refer to IEC TS 61851-3-4.

Table 132 – Object description

Attribute	Value
INDEX	$60F0_h$
Name	Connected battery system data Instance
Object code	ARRAY
Data type	UNSIGNED32
Category	Mandatory

Table 133 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	Ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Battery system 1
Entry category	Mandatory
Access	rw, ro
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
Sub-index	02_h
Description	Battery system 2
Entry category	Optional
Access	rw, ro
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Battery system 254
Entry category	Optional
Access	rw, ro
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.7.3 Object $60F1_h$: Connected battery system data - Node-ID

This object shall provide the node-ID of the battery system to be connected to an EMS. The value shall be dimensionless. Table 134 provides the value definition. Table 135 specifies the object description, and Table 136 specifies the entry description.

Table 134 – Value definition

Value [hex]	Description
00	Reserved
01 to 7F	CANopen node-ID of the battery system to be connected to a DC power circuit
80 to FE	Reserved
FF	No battery system assigned

Table 135 – Object description

Attribute	Value
INDEX	$60F1_h$
Name	Connected battery system data – Node-ID
Object code	ARRAY
Data type	UNSIGNED8
Category	Mandatory

Table 136 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	Ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Battery system 1
Entry category	Mandatory
Access	ro, rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

Attribute	Value
Sub-index	02_h
Description	Battery system 2
Entry category	Optional
Access	ro, rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Battery system 254
Entry category	Optional
Access	ro, rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.7.4 Object $60F2_h$: Connected battery system data - Device alarm capability (optional)

This object shall provide the supported device alarm capability of the battery system to be connected to an EMS. Value definition and object structure shall comply with those of object $600A_h$. For informative reasons, Figure 11 illustrates the value structure and Table 137 provides the value definition. Table 138 specifies the object description and Table 139 specifies the entry description.

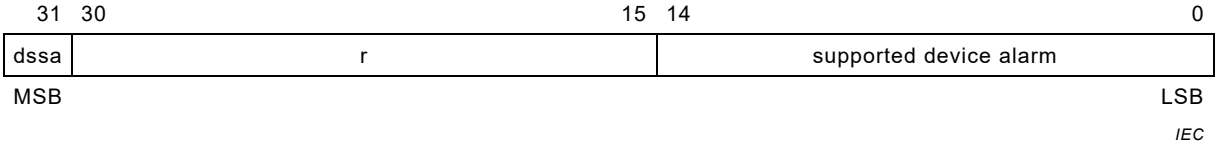

Figure 11 – Object structure (informative)

Table 137 – Value definition (informative)

Name	Bit	Value	Description
supported device alarm	0	0_b	Over voltage alarm not supported
		1_b	Over voltage alarm supported
	1	0_b	Under voltage alarm not supported
		1_b	Under voltage alarm supported
	2	0_b	Output over current alarm not supported
		1_b	Output over current alarm supported
	3	0_b	Input over current alarm not supported
		1_b	Input over current alarm supported
	4	0_b	Electronic over temperature alarm not supported
		1_b	Electronic over temperature alarm supported

Name	Bit	Value	Description
	5	0_b	Battery cells over temperature alarm not supported
		1_b	Battery cells over temperature alarm supported
	6	0_b	Communication error alarm not supported
		1_b	Communication error alarm supported
	7	0_b	Battery system compatibility error alarm not supported
		1_b	Battery system compatibility error alarm supported
	8	0_b	Electronic power stage defect alarm not supported
		1_b	Electronic power stage defect alarm supported
	9	0_b	Fuse blown alarm not supported
		1_b	Fuse blown alarm supported
	10	0_b	Cell damaged alarm not supported
		1_b	Cell damaged alarm supported
	11	0_b	Connected to a power system over temperature alarm not supported
		1_b	Connected to a power system over temperature alarm supported
	12	0_b	Discharge over temperature alarm not supported
		1_b	Discharge over temperature alarm supported
	13	0_b	Sensor damaged alarm not supported
		1_b	Sensor damaged alarm supported
	14	0_b	Wire broken alarm not supported
		1_b	Wire broken alarm supported
	15	0_b	Isolation damaged alarm not supported
		1_b	Isolation damaged alarm supported
R	16 to 30	0_b	Reserved (always 0)
		1_b	
dssa: device specific supported alarm	31	0_b	Alarm not supported
		1_b	Alarm supported

Table 138 – Object description

Attribute	Value
Index	$60F2_h$
Name	Connected battery system data - Supported device alarm
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 139 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Battery system 1
Entry category	Mandatory
Access	ro, rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
Sub-index	02_h
Description	Battery system 2
Entry category	Optional
Access	ro, rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Battery system 254
Entry category	Optional
Access	ro, rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.7.5 Object $60F3_h$: Connected battery system data - Type of battery cells

This object shall provide the battery cells type of the battery system to be connected to a power system. The value definition shall comply with those provided in battery systems object 6100_h. Table 140 specifies the object description and Table 141 specifies the entry description.

NOTE The battery system is specified in IEC TS 61851-3-7:2021.

Table 140 – Object description

Attribute	Value
Index	$60F3_h$
Name	Connected battery system data - Type of battery cells
Object code	ARRAY
Data type	UNSIGNED16
Category	Mandatory

Table 141 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Battery system 1
Entry category	Mandatory
Access	ro, rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
Sub-index	02_h
Description	Battery system 2
Entry category	Optional
Access	ro, rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Battery system 254
Entry category	Optional
Access	ro, rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

6.7.6 Object $60F4_h$: Connected battery system data - Battery system rated Wh capacity

This object shall provide the rated battery Wh capacity of the battery systems to be connected to a power system. The values shall comply with battery system's Object 6102_h and shall be given in multiples of 1 mWh. The value 0 shall indicate that the entry is not supported. Table 142 specifies the object description and Table 143 specifies the entry description.

NOTE The battery system is specified in IEC TS 61851-3-7:2021.

Table 142 – Object description

Attribute	Value
Index	$60F4_h$
Name	Connected battery system data - Battery system rated Wh capacity
Object code	ARRAY
Data type	UNSIGNED32
Category	Mandatory

Table 143 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Battery system 1
Entry category	Mandatory
Access	ro,rw
PDO mapping	Optional
Value range	UNSIGNED32
Default value	Manufacturer-specific
Sub-index	02_h
Description	Battery system 2
Entry category	Optional
Access	ro, rw
PDO mapping	Optional
Value range	UNSIGNED32
Default value	Manufacturer-specific
to	

Attribute	Value
Sub-index	FE_h
Description	Battery system 254
Entry category	Optional
Access	ro, rw
PDO mapping	Optional
Value range	UNSIGNED32
Default value	Manufacturer-specific

6.7.7 Object $60F5_h$: Connected battery system maximum voltage

This object shall provide the maximum voltage suitable for the connected to a power system battery system. The values shall comply with IEC TS 61851-3-5:2021, Object 6026_h and shall be given in multiples of 1 mV. Table 144 specifies the object description and Table 145 specifies the entry description.

Table 144 – Object description

Attribute	Value
Index	$60F5_h$
Name	Connected battery system maximum voltage
Object code	ARRAY
Data type	INTEGER32
Category	Conditional; mandatory for active devices

Table 145 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Battery system 1
Entry category	Mandatory
Access	ro,rw
PDO mapping	Optional
Value range	INTEGER32
Default value	Manufacturer-specific

Attribute	Value
Sub-index	02_h
Description	Battery system 2
Entry category	Optional
Access	ro, rw
PDO mapping	Optional
Value range	INTEGER32
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Battery system 254
Entry category	Optional
Access	ro, rw
PDO mapping	Optional
Value range	INTEGER32
Default value	Manufacturer-specific

6.7.8 Object $60F6_h$: Connected battery system minimum voltage

This object shall provide the minimum voltage suitable for power transfer the battery system. The values shall comply with IEC TS 61851-3-5:2021, Object 6027_h, and shall be given in multiples of 1 mV. Table 146 specifies the object description and Table 147 specifies the entry description.

Table 146 – Object description

Attribute	Value
Index	$60F6_h$
Name	Connected battery system minimum voltage
Object code	ARRAY
Data type	INTEGER32
Category	Conditional; mandatory for active devices

Table 147 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No

Attribute	Value
Sub-index	01_h
Description	Battery system 1
Entry category	Mandatory
Access	ro,rw
PDO mapping	Optional
Value range	INTEGER32
Default value	Manufacturer-specific
Sub-index	02_h
Description	Battery system 2
Entry category	Optional
Access	ro, rw
PDO mapping	Optional
Value range	INTEGER32
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Battery system 254
Entry category	Optional
Access	ro, rw
PDO mapping	Optional
Value range	INTEGER32
Default value	Manufacturer-specific

6.7.9 Object $60F7_h$: Connected battery system maximum input current during charge

This object shall provide maximum continuous input current during charge that is safely delivered to the device from the EMS. The values shall comply to IEC TS 61851-3-5:2021, Object 6024_h, and shall be given in multiples of 1 mA. Table 148 specifies the object description and Table 149 specifies the entry description.

Table 148 – Object description

Attribute	Value
Index	$60F7_h$
Name	Connected battery system maximum continuous input current during charge
Object code	ARRAY
Data type	INTEGER32
Category	Conditional; mandatory for active devices

Table 149 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Battery system 1
Entry category	Mandatory
Access	ro,rw
PDO mapping	Optional
Value range	INTEGER32
Default value	Manufacturer-specific
Sub-index	02_h
Description	Battery system 2
Entry category	Optional
Access	ro, rw
PDO mapping	Optional
Value range	INTEGER32
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Battery system 254
Entry category	Optional
Access	ro, rw
PDO mapping	Optional
Value range	INTEGER32
Default value	Manufacturer-specific

6.7.10 Object $60F8_h$: Requested battery system charge limit

This object shall provide the charge limit of the battery system to be connected to a power system. The requested Wh capacity of the battery shall be given in multiples of 0,01 % from full charge battery Wh capacity (see Object 6162_h). The value definition is provided in Table 150. Table 151 specifies the object description. Table 152 specifies the entry description.

Table 150 – Value definition

Value [hex]	Description
0000 to 2710	Battery system Wh capacity from 0,00 % to 100,00 %
2711 to FFFF	Reserved

Table 151 – Object description

Attribute	Value
Index	$60F8_h$
Name	Relative battery system Wh capacity
Object code	ARRAY
Data type	UNSIGNED16
Category	Mandatory

Table 152 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Battery system 1
Entry category	Mandatory
Access	ro,rw
PDO mapping	Optional
Value range	UNSIGNED16
Default value	Manufacturer-specific
Sub-index	02_h
Description	Battery system 2
Entry category	Optional
Access	ro, rw
PDO mapping	Optional
Value range	UNSIGNED16
Default value	Manufacturer-specific
to	

Attribute	Value
Sub-index	FE_h
Description	Battery system 254
Entry category	Optional
Access	ro, rw
PDO mapping	Optional
Value range	UNSIGNED16
Default value	Manufacturer-specific

6.7.11 Object $60F9_h$: Connected battery system data - maximum charge temperature (optional)

This object shall provide the allowed maximum temperature during the power transfer process of a battery. The values shall comply with battery system's Object 6120_h and be given in multiples of 0,1 °C. Table 153 specifies the object description and Table 154 specifies the entry description.

NOTE The battery system is specified in IEC TS 61851-3-7:2021.

Table 153 – Object description

Attribute	Value
Index	$60F9_h$
Name	Connected battery system data - maximum charge temperature
Object code	ARRAY
Data type	INTEGER16
Category	Optional

Table 154 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	01_h to FE_h
Default value	No

Attribute	Value
Sub-index	01_h
Description	Battery system 1
Entry category	Mandatory
Access	ro,rw
PDO mapping	Optional
Value range	INTEGER16
Default value	Manufacturer-specific
Sub-index	02_h
Description	Battery system 2
Entry category	Optional
Access	ro, rw
PDO mapping	Optional
Value range	INTEGER16
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Battery system 254
Entry category	Optional
Access	ro, rw
PDO mapping	Optional
Value range	INTEGER16
Default value	Manufacturer-specific

6.7.12 Object $60FA_h$: Connected battery system data - Battery system minimum charge temperature (optional)

This object shall provide the allowed minimum temperature during power transfer the battery system. The values shall comply with battery system's Object 6121_h and shall be given in multiples of 0,1 °C. Table 155 specifies the object description and Table 156 specifies the entry description.

NOTE The battery system is specified in IEC TS 61851-3-7:2021.

Table 155 – Object description

Attribute	Value
Index	$60FA_h$
Name	Connected battery system data - Battery system minimum charge temperature
Object code	ARRAY
Data type	INTEGER16
Category	Optional

Table 156 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Battery system 1
Entry category	Mandatory
Access	ro,rw
PDO mapping	Optional
Value range	INTEGER16
Default value	Manufacturer-specific
Sub-index	02_h
Description	Battery system 2
Entry category	Optional
Access	ro, rw
PDO mapping	Optional
Value range	INTEGER16
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Battery system 254
Entry category	Optional
Access	ro, rw
PDO mapping	Optional
Value range	INTEGER16
Default value	Manufacturer-specific

6.7.13 Object $60FB_h$: Connected battery system data - Device alarm status (optional)

This object shall provide the device alarm status of the battery system to be connected to a power system according to IEC TS 61851-3-5:2021, Object 6009_h, in the battery system's object dictionary. Table 157 specifies the object description and Table 158 specifies the entry description.

Table 157 – Object description

Attribute	Value
Index	$60FB_h$
Name	Device alarm status
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 158 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Battery system 1
Entry category	Mandatory
Access	ro,rw
PDO mapping	Optional
Value range	UNSIGNED32
Default value	Manufacturer-specific
Sub-index	02_h
Description	Battery system 2
Entry category	Optional
Access	ro, rw
PDO mapping	Optional
Value range	UNSIGNED32
Default value	Manufacturer-specific
to	
Sub-index	FE_h
Description	Battery system 254
Entry category	Optional
Access	ro, rw
PDO mapping	Optional
Value range	UNSIGNED32
Default value	Manufacturer-specific

6.7.14 Object $60FC_h$: Connected battery system data - Control word

This object shall indicate the requested battery activity at the battery system under charge. The value definition is provided in IEC TS 61851-3-5:2021, Object 6001_h. Table 159 specifies the object description and Table 160 specifies the entry description.

Table 159 – Object description

Attribute	Value
Index	$60FC_h$
Name	Connected battery system data - Control word
Object code	ARRAY
Data type	UNSIGNED16
Category	Mandatory

Table 160 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Battery system 1
Entry category	Mandatory
Access	ro,rw
PDO mapping	Optional
Value range	UNSIGNED16
Default value	Manufacturer-specific
Sub-index	02_h
Description	Battery system 2
Entry category	Optional
Access	ro, rw
PDO mapping	Optional
Value range	UNSIGNED16
Default value	Manufacturer-specific
to	

Attribute	Value
Sub-index	FE_h
Description	Battery system 254
Entry category	Optional
Access	ro, rw
PDO mapping	Optional
Value range	UNSIGNED16
Default value	Manufacturer-specific

7 Consumed application objects by VCU in stationary applications (optional)

7.1 General

VCUs implemented in stationary EMS applications consume the objects specified in Clause 7. For EVs, these objects are typically not required and therefore optional.

7.2 Object $60BF_h$: Frequency setpoint AC1

This object shall provide the frequency setpoint for the AC1 side. The data type shall be UNSIGNED32. The value shall be given in multiples of 0,01 Hz. Table 161 and Table 162 provide the object description and the entry description.

Table 161 – Object description

Attribute	Value
Index	$60BF_h$
Name	Frequency setpoint AC1
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 162 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to $7F_h$
Default value	No

Attribute	Value
Sub-index	01_h
Description	Frequency setpoint VDN 1
Category	Mandatory
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer-specific
Sub-index	02_h
Description	Frequency setpoint VDN 2
Category	Optional
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer-specific
to	
Sub-index	$7F_h$
Description	Frequency setpoint VDN 127
Category	Optional
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer-specific

7.3 Object $60C0_h$: Frequency setpoint AC2

This object shall provide the frequency setpoint for the AC2 side. The data type shall be UNSIGNED32. The value shall be given in multiples of 0,01 Hz. Table 163 and Table 164 provide the object description and the entry description.

Table 163 – Object description

Attribute	Value
Index	$60C0_h$
Name	Frequency setpoint AC2
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 164 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to $7F_h$
Default value	No
Sub-index	01_h
Description	Frequency setpoint VDN 1
Category	Mandatory
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer-specific
Sub-index	02_h
Description	Frequency setpoint VDN 2
Category	Optional
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer-specific
to	
Sub-index	$7F_h$
Description	Frequency setpoint VDN 127
Category	Optional
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer-specific

7.4 Object $60C4_h$: Current setpoint AC1

This object shall provide the current setpoint for the AC1 side. The data type shall be INTEGER32. The value shall be given in multiples of 1 A, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mA.

Table 165 and Table 166 provide the object description and the entry description.

Table 165 – Object description

Attribute	Value
Index	$60C4_h$
Name	Current setpoint AC1
Object code	ARRAY
Data type	INTEGER32
Category	Optional

Table 166 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to $7F_h$
Default value	No
Sub-index	01_h
Description	Current setpoint VDN 1
Category	Mandatory
Access	rw
PDO mapping	No
Value range	INTEGER32
Default value	Manufacturer-specific
Sub-index	02_h
Description	Current setpoint 2
Category	Optional
Access	rw
PDO mapping	No
Value range	INTEGER32
Default value	Manufacturer-specific
to	
Sub-index	08_h
Description	Current setpoint 8
Category	Optional
Access	rw
PDO mapping	No
Value range	INTEGER32
Default value	Manufacturer-specific

7.5 Object $60C1_h$: Current setpoint AC2

This object shall provide the current setpoint for the AC2 side. The data type shall be INTEGER32. The value shall be given in multiples of 1 A, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mA.

Table 167 and Table 168 provide the object description and the entry description.

Table 167 – Object description

Attribute	Value
Index	$60C1_h$
Name	Current setpoint AC2
Object code	ARRAY
Data type	INTEGER32
Category	Optional

Table 168 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to $7F_h$
Default value	No
Sub-index	01_h
Description	Current setpoint VDN1
Category	Optional
Access	rw
PDO mapping	No
Value range	INTEGER32
Default value	Manufacturer-specific
Sub-index	02_h
Description	Current setpoint VDN 2
Category	Optional
Access	rw
PDO mapping	No
Value range	INTEGER32
Default value	Manufacturer-specific
to	

Attribute	Value
Sub-index	$7F_h$
Description	Current setpoint VDN 127
Category	Optional
Access	rw
PDO mapping	No
Value range	INTEGER32
Default value	Manufacturer-specific

7.6 Object $60C2_h$: Voltage setpoint AC1

This object shall provide the voltage setpoint for the AC1 side. The data type shall be UNSIGNED32. The value shall be given in multiples of 1 V, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mV.

Table 169 and Table 170 provide the object description and the entry description.

Table 169 – Object description

Attribute	Value
Index	$60C2_h$
Name	Voltage setpoint AC1
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 170 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to $7F_h$
Default value	No
Sub-index	01_h
Description	Voltage setpoint VDN 1
Category	Optional
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer-specific

Attribute	Value
Sub-index	02_h
Description	Voltage setpoint VDN 2
Category	Optional
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer-specific
to	
Sub-index	$7F_h$
Description	Voltage setpoint VDN 127
Category	Optional
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer-specific

7.7 Object $60C3_h$: Voltage setpoint AC2

This object shall provide the voltage setpoint for the AC1 side. The data type shall be UNSIGNED32. The value shall be given in multiples of 1 V, multiplied with the prefix given in IEC TS 61851-3-5:2021, Object 6053_h.

NOTE The recommended resolution is multiples of 1 mV.

Table 171 and Table 172 provide the object description and the entry description.

Table 171 – Object description

Attribute	Value
Index	$60C3_h$
Name	Voltage setpoint AC2
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

Table 172 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to $7F_h$
Default value	No

Attribute	Value
Sub-index	01_h
Description	Voltage setpoint VDN 1
Category	Optional
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer-specific
Sub-index	02_h
Description	Voltage setpoint VDN 2
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No
to	
Sub-index	$7F_h$
Description	Voltage setpoint VDN 127
Category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

7.8 Object $60A8_h$: Reactive power control

This object shall provide the command for the reactive power control. Each sub-index corresponds to one power line. Table 173 provides the value definitions. Table 174 specifies the object description and Table 175 specifies the entry description.

Table 173 – Value definition for reactive power control

Value	Description
00	No power limitation
01	Only power limitation
02	Reactive power control via remote command (German: Funk-Rundsteuerungsempfänger)
03	Power factor cos φ via remote command (German: Funk-Rundsteuerungsempfänger)
04	Constant reactive power, given in % of Q/P_N
05	Constant power factor cos φ
06	Variable power factor cos φ (P/P_N); by means of characteristic curve
07	Variable reactive power $Q(U)$; by means of characteristic curve
08 to FF	Reserved

Table 174 – Object description

Attribute	Value
Index	$60A8_h$
Name	Reactive power control
Object code	ARRAY
Data type	UNSIGNED8
Category	Optional

Table 175 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Category	Mandatory
Access	ro
PDO mapping	No
Value range	01_h to $7F_h$
Default value	No
Sub-index	01_h
Description	Reactive power control VDN 1
Category	Optional
Access	rw
PDO mapping	No
Value range	See value definition
Default value	Manufacturer-specific
Sub-index	02_h
Description	Reactive power control VDN 2
Category	Optional
Access	rw
PDO mapping	No
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	08_h
Description	Reactive power control VDN 127
Category	Optional
Access	rw
PDO mapping	No
Value range	See value definition
Default value	Manufacturer-specific

7.9 Object $60A9_h$: Power limitation setpoint

This object shall provide the command for the reactive power control by power limitation. The value shall be given in multiples of 1 % of P/P_N. Each sub-index corresponds to one power line. Table 176 and Table 177 specify the object description and the entry description.

Table 176 – Object description

Attribute	Value
Index	$60A9_h$
Name	Power limitation setpoint
Object code	ARRAY
Data type	UNSIGNED8
Category	Optional

Table 177 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	01_h to $7F_h$
Default value	No
Sub-index	01_h
Description	Command power line VDN 1
Entry category	Mandatory
Access	rw
PDO mapping	Optional
Value range	00_h to 64_h
Default value	Manufacturer-specific
Sub-index	02_h
Description	Command power line VDN 2
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	00_h to 64_h
Default value	Manufacturer-specific
to	

Attribute	Value
Sub-index	$7F_h$
Description	Command power line VDN 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	00_h to 64_h
Default value	Manufacturer-specific

7.10 Object $60AA_h$: Constant reactive power setpoint

This object shall provide the command for the reactive power control by constant reactive power. Figure 12 and Table 178 provides the value definition. Table 179 and Table 180 specify the object description and the entry description.

NOTE Either 7.10 or 7.11 is used.

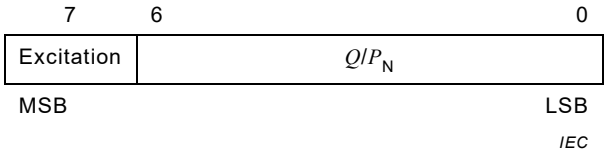

Figure 12 – Object structure constant reactive power setpoint

Table 178 – Value definition for constant reactive power setpoint

Bit field	Value [hex]	Description
Excitation	0	Over-excitation
	1	Under-excitation
Q/P_N	0 to 64	Q/P_N in multiples of 1 %
All other values are reserved.		

Table 179 – Object description

Attribute	Value
Index	$60AA_h$
Name	Constant reactive power setpoint
Object code	ARRAY
Data type	UNSIGNED8
Category	Optional

Table 180 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	01_h to $7F_h$
Default value	No
Sub-index	01_h
Description	Command power line VDN 1
Entry category	Mandatory
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
Sub-index	02_h
Description	Command power line VDN 2
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	$7F_h$
Description	Command power line VDN127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

7.11 Object $60AB_h$: Constant power factor cos φ setpoint

This object shall provide the command for the reactive power control by constant power factor cos φ. Figure 13 and Table 181 provides the value definition. Table 182 specifies the object description and Table 183 specifies the entry description.

NOTE Either 7.10 or 7.11 is used.

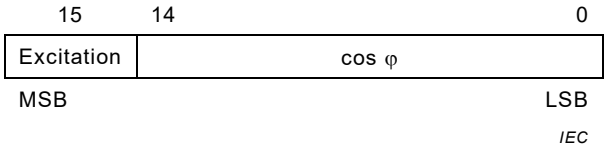

Figure 13 – Object structure constant reactive power setpoint

Table 181 – Value definition for constant reactive power setpoint

Bit field	Value [hex]	Description
Excitation	0	Over-excitation
	1	Under-excitation
cos φ	0 to 7FFF	cos φ in multiples of 0,001
All other values are reserved.		

Table 182 – Object description

Attribute	Value
Index	$60AB_h$
Name	Constant power factor cos φ setpoint
Object code	ARRAY
Data type	UNSIGNED16
Category	Optional

Table 183 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	01_h to FE_h
Default value	No
Sub-index	01_h
Description	Command power line VDN 1
Entry category	Mandatory
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

Attribute	Value
Sub-index	02_h
Description	Command power line VDN 2
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	$7F_h$
Description	Command power line VDN 127
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

7.12 Object $60AC_h$: Characteristic curve cos φ (P_N)

This object shall provide the fitting point's characteristic curve φ (P_N) for the reactive power control.

NOTE Either 7.12 or 7.13 is used.

One characteristic fitting point consists of three parameters, provided in three consecutive sub-indices:

– fitting point control (sub-index 01_h);

– power factor (sub-index 02_h);

– power P/P_N (sub-index 03_h).

The power P/P_N shall be given in multiples of 1 %.

The fitting point shall be given as specified in Figure 14 and Table 184. The power factor shall be given as specified in Figure 15 and Table 185. The value definition for fitting point control is specified in Table 186 which specifies the object description and Table 187 which specifies the entry description.

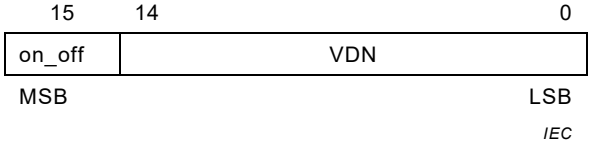

Figure 14 – Object structure fitting point

Table 184 – Value definition fitting point control

Bit field	Value [hex]	Description
on_off	0	Fitting point disabled
	1	Fitting point enabled
VDN	0000_h	Fitting point applies to all supported VDs VCU of this CANopen device
	0001_h to $007F_h$	Fitting point applies only to this VD
	0080_h to $7FFF_h$	Reserved

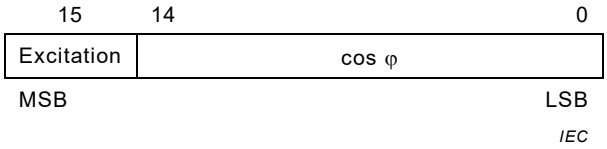

Figure 15 – Object structure power factor

Table 185 – Value definition for constant reactive power setpoint

Bit field	Value [hex]	Description
Excitation	0	Over-excitation
	1	Under-excitation
cos φ	0 to 7FFF	cos φ in multiples of 0,001
All other values are reserved.		

Table 186 – Object description

Attribute	Value
Index	$60AC_h$
Name	Characteristic curve cos φ
Object code	ARRAY
Data type	UNSIGNED16
Category	Optional

Table 187 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	03_h to FD_h
Default value	No
Sub-index	01_h
Description	Control fitting point 1

Attribute	Value
Entry category	Mandatory
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
Sub-index	02_h
Description	Power factor fitting point 1
Entry category	Mandatory
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
Sub-index	03_h
Description	Power P/P_N fitting point 1
Entry category	Mandatory
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
Sub-index	04_h
Description	Control fitting point 2
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
Sub-index	05_h
Description	Power factor fitting point 2
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
Sub-index	06_h
Description	Power P/P_N fitting point 2
Entry category	Optional
Access	rw
PDO mapping	Optional

Attribute	Value
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	FB_h
Description	Control fitting point 84
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
Sub-index	FC_h
Description	Power factor fitting point 84
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
Sub-index	FD_h
Description	Power P/P_N fitting point 84
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

7.13 Object $60AD_h$: Characteristic curve $Q(U)$

This object shall provide the fitting points for the characteristic curve $Q(U)$ for the reactive power control.

NOTE Either 7.12 or 7.13 is used.

One characteristic fitting point consists of four parameters, provided in three consecutive sub-indices:

– voltage setpoint (sub-index 01_h);

– amplification factor k_{QU} (sub-index 02_h);

– time (sub-index 03_h);

– fitting point control (VDN).

The voltage values shall be given in multiples of 1 V. The amplification factor shall be given in multiples of 1. The time shall be given in multiples of 1 s. The object structure of the fitting point control is provided in Figure 16 and the value definition is provided in Table 188. Table 189 and Table 190 provide the object description and the entry description.

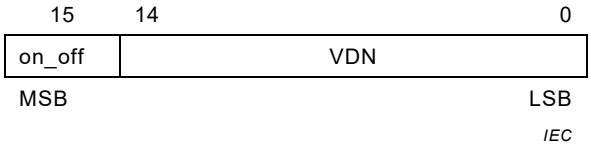

Figure 16 – Object structure fitting point control

Table 188 – Value definition fitting point control

Bit field	Value [hex]	Description
on_off	0	Fitting point disabled
	1	Fitting point enabled
VDN	0000_h	Fitting point applies to all supported VDs VCU of this CANopen device
	0001_h to $007F_h$	Fitting point applies only to this VD
	0080_h to $7FFF_h$	Reserved

Table 189 – Object description

Attribute	Value
Index	$60AD_h$
Name	Characteristic curve Q(U)
Object code	ARRAY
Data type	UNSIGNED16
Category	Optional

Table 190 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	04_h to FC_h
Default value	No
Sub-index	01_h
Description	Voltage setpoint fitting point 1
Entry category	Mandatory
Access	Rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

Attribute	Value
Sub-index	02_h
Description	Amplification factor fitting point 1
Entry category	Mandatory
Access	Rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
Sub-index	03_h
Description	Time fitting point 1
Entry category	Mandatory
Access	Rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
Sub-index	04_h
Description	Fitting point control fitting point 1
Entry category	Optional
Access	Rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
Sub-index	05_h
Description	Voltage setpoint fitting point 2
Entry category	Optional
Access	Rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
Sub-index	06_h
Description	Amplification factor fitting point 2
Entry category	Optional
Access	Rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

Attribute	Value
Sub-index	07_h
Description	Time fitting point 2
Entry category	Mandatory
Access	Rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
Sub-index	08_h
Description	Fitting point control fitting point 2
Entry category	Optional
Access	Rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
to	
Sub-index	$F9_h$
Description	Voltage setpoint fitting point 63
Entry category	Optional
Access	Rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
Sub-index	FA_h
Description	Amplification factor fitting point 63
Entry category	Optional
Access	Rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific
Sub-index	FB_h
Description	Time fitting point 63
Entry category	Mandatory
Access	Rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

Attribute	Value
Sub-index	FC_h
Description	Fitting point control fitting point 63
Entry category	Optional
Access	Rw
PDO mapping	Optional
Value range	See value definition
Default value	Manufacturer-specific

Bibliography

IEC TS 61851-3-7:2023, *Electric vehicles conductive charging system – Part 3-7: DC EV supply equipment where protection relies on double or reinforced insulation – Battery system communication*

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