



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**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 43.120

ISBN 978-2-8322-5752-4

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	10
INTRODUCTION.....	12
1 Scope.....	13
2 Normative references	13
3 Terms and definitions	13
4 Symbols and abbreviated terms.....	13
5 Operating principles	14
5.1 General.....	14
5.2 Voltage converter unit specific FSA.....	14
5.3 State definitions	15
5.4 Transitions in the FSA for VCUs	17
6 Object dictionary.....	18
6.1 General.....	18
6.2 Additional definitions to general application objects	18
6.2.1 General	18
6.2.2 Object 6001 _h : Control word	18
6.2.3 Object 6002 _h : Status word.....	18
6.3 Produced application objects by AC-DC converter functionality (mandatory)	19
6.3.1 General	19
6.3.2 Object 60A0 _h : AC-DC converter capability.....	19
6.4 Produced application objects by AC-DC converter (optional).....	23
6.4.1 General	23
6.4.2 Object 60A1 _h : AC-DC converter minimum AC voltage	23
6.4.3 Object 60A2 _h : AC-DC converter maximum AC voltage.....	24
6.4.4 Object 60A3 _h : AC-DC converter maximum AC current.....	26
6.4.5 Object 60A4 _h : AC-DC converter maximum AC power	28
6.4.6 Object 60AA _h : AC-DC converter power transfer time	29
6.4.7 Object 60AB _h : AC-DC converter discharging power transfer time	31
6.4.8 Object 60AC _h : AC-DC converter power transfer Ah counter.....	32
6.4.9 Object 60AD _h : AC-DC converter discharging Ah counter	34
6.4.10 Object 60AE _h : AC-DC converter power transfer Wh counter	36
6.4.11 Object 60AF _h : AC-DC converter discharging Wh counter.....	37
6.4.12 Object 60B0 _h : AC-DC converter actual AC voltage	39
6.4.13 Object 60B1 _h : AC-DC converter actual AC current	40
6.4.14 Object 60B2 _h : AC-DC converter actual AC power	42
6.4.15 Object 60B3 _h : AC-DC converter power transfer count number	44
6.4.16 Object 60B4 _h : AC-DC converter discharging count number	45
6.4.17 Object 60B5 _h : AC-DC converter temperature switch off counter	47
6.4.18 Object 60B6 _h : AC-DC converter short cuts switch off counter	48
6.4.19 Object 60B7 _h : AC-DC converter minimum DC voltage	50
6.4.20 Object 60B8 _h : AC-DC converter maximum DC voltage	52

6.4.21	Object 60B9 _h : AC-DC converter maximum DC current.....	53
6.4.22	Object 60BA _h : AC-DC converter maximum DC power.....	55
6.5	Produced application objects by voltage converter unit (optional).....	56
6.5.1	General	56
6.5.2	Object 60A5 _h : VCU position and class.....	56
6.5.3	Object 60D0 _h 3P topology DC1 positive voltage	59
6.5.4	Object 60D1 _h 3P topology DC1 negative voltage	61
6.5.5	Object 60D2 _h 3P topology DC2 positive voltage	62
6.5.6	Object 60D3 _h 3P topology DC2 negative voltage	64
6.5.7	Object 60D4 _h Overload capability DC1	65
6.5.8	Object 60D5 _h Overload capability DC2	67
6.5.9	Object 60D6 _h Overload capability AC1	69
6.5.10	Object 60D7 _h Overload capability AC2	71
6.5.11	Object 60D8 _h VCU frequency thresholds AC1	72
6.5.12	Object 60D9 _h VCU frequency thresholds AC2	74
6.5.13	Object 60DA _h Maximum L1 apparent power AC1	76
6.5.14	Object 60DB _h Maximum L2 apparent power AC1	77
6.5.15	Object 60DC _h Maximum L3 apparent power AC1.....	79
6.5.16	Object 60DD _h Maximum L1 apparent power AC2.....	81
6.5.17	Object 60DE _h Maximum L2 apparent power AC2.....	82
6.5.18	Object 60DF _h Maximum L3 apparent power AC2.....	84
6.5.19	Object 60E1 _h Maximum L1 real power AC1	85
6.5.20	Object 60E2 _h Maximum L2 real power AC1	87
6.5.21	Object 60E3 _h Maximum L3 real power AC1	89
6.5.22	Object 60E4 _h Maximum L1 real power AC2	90
6.5.23	Object 60E5 _h Maximum L2 real power AC2	92
6.5.24	Object 60E6 _h Maximum L3 real power AC2	93
6.5.25	Object 60E7 _h Maximum L1 reactive power AC1.....	95
6.5.26	Object 60E8 _h Maximum L2 reactive power AC1.....	97
6.5.27	Object 60E9 _h Maximum L3 reactive power AC1.....	98
6.5.28	Object 60EA _h Maximum L1 reactive power AC2	100
6.5.29	Object 60EB _h Maximum L2 reactive power AC2	101
6.5.30	Object 60EC _h Maximum L3 reactive power AC2	103
6.5.31	Object 60ED _h Maximum L1 current AC1	105
6.5.32	Object 60EE _h Maximum L2 current AC1	106
6.5.33	Object 60EF _h Maximum L3 current AC1	108
6.5.34	Object 609A _h Maximum L1 current AC2.....	109
6.5.35	Object 609B _h Maximum L2 current AC2.....	111
6.5.36	Object 609C _h Maximum L3 current AC2	113
6.5.37	Object 609D _h Maximum N current AC1.....	114
6.5.38	Object 609E _h Maximum N current AC2.....	116

6.5.39	Object 603F _h : DC-DC converter actual current side B	117
6.5.40	Object 6041 _h : DC-DC converter actual voltage side B	119
6.6	Consumed application objects by AC-DC converter (optional).....	121
6.6.1	General	121
6.6.2	Object 60BE _h : AC-DC converter set maximum AC power	121
6.7	Consumed application objects for power transfer	122
6.7.1	General	122
6.7.2	Object 60F0 _h : Connected battery systems data - Instance.....	122
6.7.3	Object 60F1 _h : Connected battery system data - Node-ID.....	125
6.7.4	Object 60F2 _h : Connected battery system data - Device alarm capability (optional)	126
6.7.5	Object 60F3 _h : Connected battery system data - Type of battery cells	128
6.7.6	Object 60F4 _h : Connected battery system data - Battery system rated Wh capacity.....	130
6.7.7	Object 60F5 _h : Connected battery system maximum voltage	131
6.7.8	Object 60F6 _h : Connected battery system minimum voltage	132
6.7.9	Object 60F7 _h : Connected battery system maximum input current during charge	133
6.7.10	Object 60F8 _h : Requested battery system charge limit.....	134
6.7.11	Object 60F9 _h : Connected battery system data - maximum charge temperature (optional)	136
6.7.12	Object 60FA _h : Connected battery system data - Battery system minimum charge temperature (optional).....	137
6.7.13	Object 60FB _h : Connected battery system data - Device alarm status (optional).....	138
6.7.14	Object 60FC _h : Connected battery system data - Control word	140
7	Consumed application objects by VCU in stationary applications (optional)	141
7.1	General.....	141
7.2	Object 60BF _h : Frequency setpoint AC1.....	141
7.3	Object 60C0 _h : Frequency setpoint AC2.....	142
7.4	Object 60C4 _h : Current setpoint AC1	143
7.5	Object 60C1 _h : Current setpoint AC2	145
7.6	Object 60C2 _h : Voltage setpoint AC1	146
7.7	Object 60C3 _h : Voltage setpoint AC2	147
7.8	Object 60A8 _h : Reactive power control	148
7.9	Object 60A9 _h : Power limitation setpoint.....	150
7.10	Object 60AA _h : Constant reactive power setpoint.....	151
7.11	Object 60AB _h : Constant power factor cos φ setpoint.....	152
7.12	Object 60AC _h : Characteristic curve cos φ (P_N).....	154
7.13	Object 60AD _h : Characteristic curve $Q(U)$	157
	Bibliography.....	162
	Figure 1 – FSA for voltage converter unit.....	15
	Figure 2 – Value structure.....	19

Figure 3 – Object structure	57
Figure 4 – Object structure	65
Figure 5 – Object structure	67
Figure 6 – Object structure	69
Figure 7 – Object structure	71
Figure 8 – Object structure	72
Figure 9 – Object structure	74
Figure 10 – Object structure supported virtual devices (informative)	122
Figure 11 – Object structure (informative)	126
Figure 12 – Object structure constant reactive power setpoint	151
Figure 13 – Object structure constant reactive power setpoint	153
Figure 14 – Object structure fitting point	154
Figure 15 – Object structure power factor	155
Figure 16 – Object structure fitting point control	158
Table 1 – States behaviour	16
Table 2 – Transitions, events and actions	17
Table 3 – Value definition for VD specific FSA control	18
Table 4 – Value definition for virtual device FSA state	19
Table 5 – Value definition	20
Table 6 – Object description	21
Table 7 – Entry description	21
Table 8 – Object description	23
Table 9 – Entry description	23
Table 10 – Object description	25
Table 11 – Entry description	25
Table 12 – Object description	26
Table 13 – Entry description	26
Table 14 – Object description	28
Table 15 – Entry description	28
Table 16 – Object description	29
Table 17 – Entry description	30
Table 18 – Object description	31
Table 19 – Entry description	31
Table 20 – Object description	33
Table 21 – Entry description	33
Table 22 – Object description	34
Table 23 – Entry description	34
Table 24 – Object description	36
Table 25 – Entry description	36
Table 26 – Object description	37
Table 27 – Entry description	38
Table 28 – Object description	39

Table 29 – Entry description	39
Table 30 – Object description	41
Table 31 – Entry description	41
Table 32 – Object description	42
Table 33 – Entry description	42
Table 34 – Object description	44
Table 35 – Entry description	44
Table 36 – Object description	45
Table 37 – Entry description	46
Table 38 – Object description	47
Table 39 – Entry description	47
Table 40 – Object description	49
Table 41 – Entry description	49
Table 42 – Object description	50
Table 43 – Entry description	50
Table 44 – Object description	52
Table 45 – Entry description	52
Table 46 – Object description	53
Table 47 – Entry description	54
Table 48 – Object description	55
Table 49 – Entry description	55
Table 50 – Value definition	57
Table 51 – Object description	58
Table 52 – Entry description	58
Table 53 – Object description	59
Table 54 – Entry description	59
Table 55 – Object description	61
Table 56 – Entry description	61
Table 57 – Object description	62
Table 58 – Entry description	63
Table 59 – Object description	64
Table 60 – Entry description	64
Table 61 – Object description	66
Table 62 – Entry description	66
Table 63 – Object description	67
Table 64 – Entry description	68
Table 65 – Object description	69
Table 66 – Entry description	69
Table 67 – Object description	71
Table 68 – Entry description	71
Table 69 – Object description	73
Table 70 – Entry description	73
Table 71 – Object description	74

Table 72 – Entry description 75

Table 73 – Object description 76

Table 74 – Entry description 76

Table 75 – Object description 78

Table 76 – Entry description 78

Table 77 – Object description 79

Table 78 – Entry description 79

Table 79 – Object description 81

Table 80 – Entry description 81

Table 81 – Object description 82

Table 82 – Entry description 83

Table 83 – Object description 84

Table 84 – Entry description 84

Table 85 – Object description 86

Table 86 – Entry description 86

Table 87 – Object description 87

Table 88 – Entry description 87

Table 89 – Object description 89

Table 90 – Entry description 89

Table 91 – Object description 90

Table 92 – Entry description 91

Table 93 – Object description 92

Table 94 – Entry description 92

Table 95 – Object description 94

Table 96 – Entry description 94

Table 97 – Object description 95

Table 98 – Entry description 95

Table 99 – Object description 97

Table 100 – Entry description 97

Table 101 – Object description..... 98

Table 102 – Entry description 99

Table 103 – Object description..... 100

Table 104 – Entry description 100

Table 105 – Object description..... 102

Table 106 – Entry description 102

Table 107 – Object description..... 103

Table 108 – Entry description 103

Table 109 – Object description..... 105

Table 110 – Entry description 105

Table 111 – Object description..... 106

Table 112 – Entry description 107

Table 113 – Object description..... 108

Table 114 – Entry description 108

Table 115 – Object description.....	110
Table 116 – Entry description	110
Table 117 – Object description.....	111
Table 118 – Entry description	111
Table 119 – Object description.....	113
Table 120 – Entry description	113
Table 121 – Object description.....	114
Table 122 – Entry description	115
Table 123 – Object description.....	116
Table 124 – Entry description	116
Table 125 – Object description.....	118
Table 126 – Entry description	118
Table 127 – Object description.....	119
Table 128 – Entry description	119
Table 129 – Object description.....	121
Table 130 – Entry description	121
Table 131 – Value definition for bit fields (informative).....	122
Table 132 – Object description.....	124
Table 133 – Entry description	124
Table 134 – Value definition.....	125
Table 135 – Object description.....	125
Table 136 – Entry description	125
Table 137 – Value definition (informative)	126
Table 138 – Object description.....	127
Table 139 – Entry description	128
Table 140 – Object description.....	129
Table 141 – Entry description	129
Table 142 – Object description.....	130
Table 143 – Entry description	130
Table 144 – Object description.....	131
Table 145 – Entry description	131
Table 146 – Object description.....	132
Table 147 – Entry description	132
Table 148 – Object description.....	133
Table 149 – Entry description	134
Table 150 – Value definition.....	135
Table 151 – Object description.....	135
Table 152 – Entry description	135
Table 153 – Object description.....	136
Table 154 – Entry description	136
Table 155 – Object description.....	137
Table 156 – Entry description	138
Table 157 – Object description.....	139

Table 158 – Entry description 139

Table 159 – Object description..... 140

Table 160 – Entry description 140

Table 161 – Object description..... 141

Table 162 – Entry description 141

Table 163 – Object description..... 142

Table 164 – Entry description 143

Table 165 – Object description..... 144

Table 166 – Entry description 144

Table 167 – Object description..... 145

Table 168 – Entry description 145

Table 169 – Object description..... 146

Table 170 – Entry description 146

Table 171 – Object description..... 147

Table 172 – Entry description 147

Table 173 – Value definition for reactive power control 148

Table 174 – Object description..... 149

Table 175 – Entry description 149

Table 176 – Object description..... 150

Table 177 – Entry description 150

Table 178 – Value definition for constant reactive power setpoint 151

Table 179 – Object description..... 151

Table 180 – Entry description 152

Table 181 – Value definition for constant reactive power setpoint 153

Table 182 – Object description..... 153

Table 183 – Entry description 153

Table 184 – Value definition fitting point control 155

Table 185 – Value definition for constant reactive power setpoint 155

Table 186 – Object description..... 155

Table 187 – Entry description 155

Table 188 – Value definition fitting point control 158

Table 189 – Object description..... 158

Table 190 – Entry description 158

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRIC VEHICLES CONDUCTIVE CHARGING SYSTEM –**Part 3-6: DC EV supply equipment where protection relies on double or reinforced insulation – Voltage converter unit communication**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

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*