SLOVENSKI STANDARD
oSIST prEN IEC 61139-2:2021

01-november-2021

Industrijska omrežja - Enožični digitalni komunikacijski vmesnik za male senzorje in dajalnike - 2. del: Funkcijska varnost podaljškov

Industrial networks - Single-drop digital communication interface - Part 2: Functional safety extensions

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Ta slovenski standard je istoveten z: prEN IEC 61139-2:2021

oSIST prEN IEC 61139-2:2021
https://standards.iteh.ai/catalog/standards/sist/c5441fa2-8f26-4bcf-9b71-159d4015150e/osist-pren-iec-61139-2-2021

ICS:

25.040.40	Merjenje in krmiljenje industrijskih postopkov	Industrial process measurement and control
35.110	Omreževanje	Networking

oSIST prEN IEC 61139-2:2021 **en,fr,de**

2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

oSIST prEN IEC 61139-2:2021

iTeh STANDARD PREVIEW
(standards.iteh.ai)

oSIST prEN IEC 61139-2:2021
https://standards.iteh.ai/catalog/standards/sist/c5441fa2-8f26-4bcf-9b71-159d4015150e/osist-pren-iec-61139-2-2021

oSIST prEN IEC 61139-2:2021

65C/1113/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER: **IEC 61139-2 ED1**	
DATE OF CIRCULATION: **2021-09-03**	CLOSING DATE FOR VOTING: **2021-11-26**
SUPERSEDES DOCUMENTS: **65C/1081/CD, 65C/1094A/CC**	

IEC SC 65C : INDUSTRIAL NETWORKS	
SECRETARIAT: France	SECRETARY: Ms Valérie DEMASSIEUX
OF INTEREST TO THE FOLLOWING COMMITTEES: SC 65A,SC 65B	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.

FUNCTIONS CONCERNED:

☐ EMC ☐ ENVIRONMENT ☐ QUALITY ASSURANCE ☐ SAFETY

☒ SUBMITTED FOR CENELEC PARALLEL VOTING ☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING

Attention IEC-CENELEC parallel voting

The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting.

The CENELEC members are invited to vote through the CENELEC online voting system.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
oSIST prEN IEC 61139-2:2021
https://standards.iteh.ai/catalog/standards/sist/c5441fa2-8f26-4bcf-9b71-[illegible]/osist-pren-iec-61139-2-2021

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

TITLE:

Industrial networks – Single-drop digital communication interface – Part 2: Functional safety extensions

PROPOSED STABILITY DATE: 2025

NOTE FROM TC/SC OFFICERS:

NC comments on this CDV will be resolved during the next SC65C/PT61139-2 meeting currently scheduled as a series of web meetings on November 23rd-25th, 2021. Corresponding meeting notice will be provided in due time by the convenor.

Copyright © 2021 International Electrotechnical Commission, IEC. All rights reserved. It is permitted to download this electronic file, to make a copy and to print out the content for the sole purpose of preparing National Committee positions. You may not copy or "mirror" the file or printed version of the document, or any part of it, for any other purpose without permission in writing from IEC.

oSIST prEN IEC 61139-2:2021

CONTENTS

FOREWORD 12
INTRODUCTION 14
1 Scope 16
2 Normative references 16
3 Terms, definitions, symbols, abbreviated terms, and conventions 17
3.1 Common terms and definitions 17
3.2 SDCI-FS Safety: Additional terms and definitions 20
3.3 Symbols and abbreviated terms 21
3.4 Conventions 23
3.4.1 Behavioral descriptions 23
3.4.2 Memory and transmission octet order 23
4 Overview of SDCI-FS 24
4.1 Purpose of the technology and feature levels 24
4.1.1 Base SDCI-FS technology 24
4.1.2 From "analog" and "switching" to communication 24
4.1.3 Minimized paradigm shift from FS-DI to FS-Master 25
4.1.4 Following the SDCI paradigm (SIO vs. OSSDe) 26
4.1.5 Port class B 28
4.1.6 "USB-Master" with safety parameterization 28
4.1.7 Interoperability matrix of safety devices 29
4.2 Positioning within the automation hierarchy 29
4.3 Wiring, connectors, and power supply 30
4.4 Relationship to SDCI 30
4.5 Communication features and interfaces 31
4.6 Parameterization 31
4.7 Role of FS-Master and FS-Gateway 31
4.8 Mapping to upper-level systems 32
4.9 Structure of the document 32
5 Extensions to the Physical Layer (PL) 32
5.1 Overview 32
5.2 Extensions to PL services 33
5.2.1 PL_SetMode 33
5.2.2 PL_Ready 33
5.3 Transmitter/receiver 33
5.3.1 Assumptions for the expansion to OSSDe 33
5.3.2 OSSDe specifics 34
5.3.3 Start-up of an FS-Device (Ready pulse) 36
5.3.4 Electric characteristics of a receiver in FS-Device and FS-Master 37
5.4 Electric and dynamic characteristics of an FS-Device 38
5.5 Electric and dynamic characteristics of an FS-Master port (OSSDe) 40
5.6 FS-Master port FS-DI interface 41
5.7 Wake-up coordination 41
5.8 Fast start-up 42
5.9 Power supply 42
5.10 Medium 42

iTeh STANDARD PREVIEW
(standards.iteh.ai)
oSIST prEN IEC 61139-2:2021
https://standards.iteh.ai/catalog/standards/sist/c5441fa2-8126-4bcf-9b71-159d4b151506/osist-pren-iec-61139-2-2021

oSIST prEN IEC 61139-2:2021

5.10.1 Constraints 42
5.10.2 Connectors 42
5.10.3 Cable characteristics 42
6 Extensions to SIO 43
7 Extensions to the data link layer (DL) 43
7.1 Overview 43
7.2 State machine of the FS-Master DL-mode handler 43
7.3 State machine of the FS-Device DL-mode handler 44
8 Extensions to the Master Configuration Manager (CM) 46
9 Extensions of the FS-Device 47
9.1 Principle architecture and models 47
9.1.1 FS-Device architecture 47
9.1.2 FS-Device model 47
9.2 Parameter Manager (PM) 48
9.3 Process Data Exchange (PDE) 48
9.4 Data Storage (DS) 48
9.4.1 General considerations and extensions including safety 48
9.4.2 Backup levels 49
10 Extensions of the FS-Master 49
10.1 Principle architecture 49
10.2 SMI service extensions 50
10.2.1 Overview 50
10.2.2 SMI_FSMasterAccess 52
10.2.3 SMI_SPDUIn 53
10.2.4 SMI_SPDUOut 53
10.3 ArgBlock extensions 53
10.3.1 Overview 53
10.3.2 FSMasterAccess 54
10.3.3 FSCPAuthenticity 54
10.3.4 FSPortConfigList 54
10.3.5 FSPortStatusList 56
10.3.6 SPDUIn 58
10.3.7 SPDUOut 58
10.4 Safety Layer Manager (SLM) 58
10.4.1 Purpose 58
10.4.2 FS_PortModes 58
10.4.3 FSP parameter 59
10.5 Process Data Exchange (PDE) 61
10.6 Data Storage (DS) 63
11 Safety communication layer (SCL) 63
11.1 Functional requirements 63
11.2 Communication errors and safety measures 63
11.3 SCL services 64
11.3.1 Positioning of safety communication layers (SCL) 64
11.3.2 FS-Master SCL services 65
11.3.3 FS-Device SCL services 66
11.4 SCL protocol 68
11.4.1 Protocol phases to consider 68

iTeh STANDARD PREVIEW
(standards.iteh.ai)
oSIST prEN IEC 61139-2:2021
https://standards.iteh.ai/catalog/standards/sist/c5441fa2-8f26-4bcf-9b71-159d4015150e/osist-pren-iec-61139-2-2021

oSIST prEN IEC 61139-2:2021

11.4.2 FS-Device faults 69
11.4.3 Safety PDU (SPDU) 69
11.4.4 FS-Input and FS-Output data 69
11.4.5 Port number 69
11.4.6 Status and control 69
11.4.7 CRC signature 70
11.4.8 Data types for SDCI-FS 71
11.5 SCL behavior 72
11.5.1 General 72
11.5.2 SCL state machine of the FS-Master 73
11.5.3 SCL state machine of the FS-Device 75
11.5.4 Sequence charts for several use cases 78
11.5.5 Monitoring of safety times 84
11.5.6 Reaction in the event of a malfunction 85
11.5.7 Start-up (communication) 87
11.6 SCL management 87
11.6.1 Parameter overview (FSP and FST) 87
11.6.2 Parameterization approaches 88
11.7 Integrity measures 89
11.7.1 IODD integrity 89
11.7.2 Tool integrity 89
11.7.3 Transmission integrity 89
11.7.4 Verification record 89
11.7.5 Authentication 90
11.7.6 Storage integrity 90
11.7.7 FS I/O data structure integrity 91
11.7.8 Technology parameter (FST) based on IODD 91
11.7.9 Technology parameter (FST) based on existing Dedicated Tool (IOPD) 92
11.8 Creation of FSP and FST parameters 93
11.9 Integration of Dedicated Tools (IOPD) 94
11.9.1 IOPD interface 94
11.9.2 Standard interfaces 94
11.9.3 Backward channel 95
11.10 Validation 95
11.11 Passivation 95
11.11.1 Motivation and means 95
11.11.2 Port selective (FS-Master) 96
11.11.3 Signal selective (FS-Terminal) 96
11.11.4 Qualifier settings in case of communication 96
11.11.5 Qualifier handling in case of OSSDe 96
11.12 SCL diagnosis 98
12 Functional safe processing (FS-P) 98
12.1 Recommendations for efficient I/O mappings 98
12.2 Embedded FS controller 98
Annex A (normative, safety-related) Extensions to parameters 99
A.1 Indices and parameters for SDCI-FS 99
A.2 Parameters in detail 100
A.2.1 FSP_Authenticity 100
A.2.2 FSP_Port 100

iTeh STANDARD PREVIEW
(standards.iteh.ai)
oSIST prEN IEC 61139-2:2021
https://standards.iteh.ai/catalog/standards/sist/c5441fa2-8f26-4bcf-9b71-15a4b615f5b8/osist-pren-iec-61139-2-2021

oSIST prEN IEC 61139-2:2021

A.2.3 FSP_AuthentCRC 100
A.2.4 FSP_ProtVersion 101
A.2.5 FSP_ProtMode 101
A.2.6 FSP_Watchdog 101
A.2.7 FSP_IO_StructCRC 101
A.2.8 FSP_TechParCRC 102
A.2.9 FSP_ProtParCRC 103
A.2.10 FSP_VerifyRecord 103
A.2.11 FSP_TimeToReady 103
A.2.12 FSP_WCDT 103
A.2.13 FSP_OFDT 103
A.2.14 FSP_ParamDescCRC 103
Annex B (normative, non-safety related) Extensions to EventCodes 105
B.1 Additional FS-Device EventCodes 105
B.2 Additional Port EventCodes 105
Annex C (normative, safety related) Extensions to Data Types 107
C.1 Data types for SDCI-FS 107
C.2 BooleanT (bit) 107
C.3 IntegerT (16) 108
C.4 IntegerT (32) 108
C.5 Safety Code 109
Annex D (normative, safety related) CRC generator polynomials 110
D.1 Overview of CRC generator polynomials 110
D.2 Residual error probabilities 110
D.3 Implementation considerations 112
D.3.1 Overview 112
D.3.2 Bit shift algorithm (16 bit) 112
D.3.3 Lookup table (16 bit) 112
D.3.4 Bit shift algorithm (32 bit) 113
D.3.5 Lookup table (32 bit) 114
D.3.6 Seed values 115
Annex E (normative, safety related) IODD extensions 116
E.1 General 116
E.2 Schema 116
E.3 IODD constraints 116
E.3.1 General rules 116
E.3.2 Description of the IODD structure 116
E.3.3 Behavior of "Reset" SystemCommands in SDCI-FS 123
E.3.4 Profile Characteristic 123
E.3.5 ProcessDataInput and ProcessDataOutput 123
E.4 IODD conventions 124
E.4.1 Naming 124
E.4.2 Process Data (PD) 124
E.4.3 IODD conventions for user interface 124
E.4.4 Master Tool features 124
E.5 Securing 125
E.5.1 General 125
E.5.2 DefaultValues for FSP 125

iTeh STANDARD PREVIEW
(standards.iteh.ai)
oSIST prEN IEC 61139-2:2021
https://standards.iteh.ai/catalog/standards/sist/c5441fa2-8f26-4bcf-9b71-159d4015150e/osist-pren-iec-61139-2-2021

oSIST prEN IEC 61139-2:2021

E.5.3 FSP_Authenticity 126
E.5.4 FSP_Protocol 126
E.5.5 FSP_IO_Description 126
E.5.6 Sample serialization for FSP_ParamDescCRC 126
E.5.7 FST and FSP parameters and Data Storage 127
E.5.8 Sample IODD of an FS-Device 128
Annex F (normative, non-safety related) Device Tool Interface (DTI) for SDCI 138
F.1 Purpose of DTI 138
F.2 Base model 138
F.3 Invocation interface 139
F.3.1 Overview 139
F.3.2 Detection of Device Tool 139
F.3.3 Program Interface Description – PID 142
F.3.4 Temporary Parameter File – TPF 145
F.3.5 Temporary Backchannel File – TBF 150
F.3.6 Temporary Acknowledgment File – TAF 151
F.3.7 Invocation behavior 152
F.4 Device data objects (DDO) 152
F.4.1 General 152
F.4.2 Structure of DDO package 153
F.5 Communication Interface 153
F.5.1 General 153
F.5.2 Principle of DTI communications 154
F.5.3 Gateways 155
F.5.4 Configuration of the Communication Server 156
F.5.5 Definition of the Communication Interface 156
F.5.6 Sequence for establishing a communication relation 156
F.5.7 Usage of the Communication Server in stand-alone mode 157
F.5.8 SDCI specifics 158
F.5.9 Changing communication settings 158
F.6 Reaction on incorrect Tool behavior 158
F.7 Compatibility 159
F.7.1 Schema validation 159
F.7.2 Version policy 159
F.8 Scalability 159
F.8.1 Scalability of a Device Tool 159
F.8.2 Scalability of a Master Tool 160
F.8.3 Interactions at conformance class combinations 160
F.9 Schema definitions 161
F.9.1 General 161
F.9.2 Schema of the PID 161
F.9.3 Schema of the TPF 162
F.9.4 Schema of the TBF 165
F.9.5 Schema of the TAF 166
F.9.6 Schema of DTI primitives 166
Annex G (normative) Main scenarios of SDCI-FS 168
G.1 Overview 168
G.2 Sequence chart of commissioning 169
G.3 Sequence chart of replacement 170

iTeh STANDARD PREVIEW
(standards.iteh.ai)
oSIST prEN IEC 61139-2:2021
https://standards.iteh.ai/catalog/standards/sist/e5441fa2-8f26-4bcf-9b71-5c2e0f1f1c39/osist-pren-iec-61139-2-2021

oSIST prEN IEC 61139-2:2021

G.4 Sequence chart of misconnection 170
Annex H (normative) System requirements 171
H.1 Indicators 171
H.1.1 General 171
H.1.2 OSSDe 171
H.1.3 Safety communication 171
H.1.4 Acknowledgment request 171
H.2 Installation guidelines, electrical safety, and security 171
H.3 Safety function response time 172
H.4 Duration of demands 172
H.5 Maintenance and repair 172
H.6 Safety manual 172
Annex I (informative) Information for test and assessment of the SDCI-FS system of IEC 61131-9:— 173
Bibliography 174

Figure 1 – Positioning of SDCI-FS in functional safety automation 14
Figure 2 – Relationship of this document to standards 15
Figure 3 – Memory and transmission octet order 23
Figure 4 – SDCI-FS communication layer model 24
Figure 5 – Port interface extensions for SDCI-FS 25
Figure 6 – Migration to SDCI-FS 25
Figure 7 – Minimized paradigm shift from FS-DI to FS-Master 26
Figure 8 – FS-Master types and feature levels 26
Figure 9 – Original pin layout of SDCI (port class A) 27
Figure 10 – Optimized OSSDe commissioning with FS-Master 28
Figure 11 – Level "d" of an FS-Master (Class B) 28
Figure 12 – Off-site configuration and parameterization 29
Figure 13 – SDCI-FS within the automation hierarchy 30
Figure 14 – The SDCI physical layer of an FS-Master (class A) 32
Figure 15 – The physical layer of an FS-Device (class A) 33
Figure 16 – Cross compatibility OSSD and OSSDe 33
Figure 17 – Principle OSSDe function 34
Figure 18 – Test pulses to detect cross connection faults 35
Figure 19 – OSSD timings 36
Figure 20 – Typical start-up of an OSSD sensor 36
Figure 21 – Start-up of an FS-Device 37
Figure 22 – Switching thresholds for FS-Device and FS-Master receivers 37
Figure 23 – Reference schematics (one OSSDe channel) 38
Figure 24 – Voltage level definitions 38
Figure 25 – Charge capability at power-up 41
Figure 26 – OSSDe input filter conflict resolution 41
Figure 27 – Start-up of an FS-Device 41
Figure 28 – Required fast start-up timings 42
Figure 29 – State machine of the FS-Master DL-mode handler 43

iTeh STANDARD PREVIEW
(standards.iteh.ai)
oSIST prEN IEC 61139-2:2021
https://standards.iteh.ai/catalog/standards/sist/c5441fa2-8f26-4bcf-9b71-1594015150e/osist-pren-iec-61139-2-2021

oSIST prEN IEC 61139-2:2021

Figure 30 – State machine of the FS-Device DL-mode handler 45
Figure 31 – Extension to the Configuration Manager (VerifyRecord) 46
Figure 32 – Principle architecture of the FS-Device 47
Figure 33 – The FS-Device model 48
Figure 34 – Principle architecture of the FS-Master 50
Figure 35 – SMI service extensions 51
Figure 36 – FSP parameter use cases 59
Figure 37 – PDE Splitter 62
Figure 38 – PDE Composer 63
Figure 39 – Positioning of the SDCI-FS Safety Communication Layer (SCL) 65
Figure 40 – FS-Master Safety Communication Layer services 65
Figure 41 – FS-Device Safety Communication Layer services 67
Figure 42 – Protocol phases to consider 68
Figure 43 – Safety PDUs of FS-Master and FS-Device 69
Figure 44 – The 1 % share rule of IEC 61784-3:2021 71
Figure 45 – SCL state machine of the FS-Master 73
Figure 46 – SCL state machine of the FS-Device 75
Figure 47 – FS-Master and FS-Device both with power ON 78
Figure 48 – FS-Master power OFF → ON 79
Figure 49 – FS-Device with delayed SCL start 80
Figure 50 – FS-Device with power OFF and ON 81
Figure 51 – FS-Master detects CRC signature error 82
Figure 52 – FS-Device detects CRC signature error 83
Figure 53 – Monitoring of the SCL cycle time 84
Figure 54 – Parameter types and assignments 88
Figure 55 – FSCP-Host-centric system 89
Figure 56 – Structure of the FSP_VerifyRecord 90
Figure 57 – Start-up of SDCI-FS 91
Figure 58 – Securing of FST parameters via dedicated tool 92
Figure 59 – Modification of FST parameters via Device Tool 92
Figure 60 – Creation of FSP and FST parameters 93
Figure 61 – Example of a communication hierarchy 94
Figure 62 – Motivation for Port selective passivation 95
Figure 63 – Qualifier handler (communication) 96
Figure 64 – Qualifier handler (OSSDe) 97
Figure 65 – Qualifier behavior per FS-Master port 97
Figure 66 – Mapping efficiency issues 98
Figure A.1 – Instance of an FS I/O data description 102
Figure A.2 – Example FS I/O data structure with non-safety data 102
Figure A.3 – Securing of safety parameters 104
Figure C.1 – Example of a BooleanT data structure 108
Figure C.2 – Safety Code of an output message 109
Figure C.3 – Safety Code of an input message 109

iTeh STANDARD PREVIEW
(standards.iteh.ai)
oSIST prEN IEC 61139-2:2021
https://standards.iteh.ai/catalog/standards/sist/c5441fa2-8126-4bcf-9b71-
oSIST prEN IEC 61139-2:2021

oSIST prEN IEC 61139-2:2021

Figure D.1 – CRC-16 generator polynomial 111
Figure D.2 – CRC-32 generator polynomial 111
Figure D.3 – Bit shift algorithm in "C" language (16 bit) 112
Figure D.4 – CRC-16 signature calculation using a lookup table 112
Figure D.5 – Bit shift algorithm in "C" language (32 bit) 114
Figure D.6 – CRC-32 signature calculation using a lookup table 114
Figure E.1 – Algorithm to build the FSP parameter CRC signatures 125
Figure F.1 – Principle of DTI invocation interface 139
Figure F.2 – Structure of the registry 140
Figure F.3 – Example of a DTI registry 140
Figure F.4 – Detection of a Device Tool in registry 142
Figure F.5 – Menu for Device Tool invocation 143
Figure F.6 – Purpose of Device data objects (DDO) 153
Figure F.7 – Communication routes between Device Tool and Device 154
Figure F.8 – Routing across networks and SDCI 155
Figure F.9 – Communication Server 155
Figure F.10 – Sequence chart for establishing communication 156
Figure F.11 – Create Communication Server instance 157
Figure F.12 – Example of a Connect Request XML document for SDCI 158
Figure F.13 – XML schema of the PID file 161
Figure F.14 – XML schema of the TPF 163
Figure F.15 – XML schema of a TBF 165
Figure G.1 – Commissioning with test and armed operation 169
Figure G.2 – FS-Device replacement 170
Figure G.3 – FS-Device misconnection 170

iTeh STANDARD PREVIEW
(standards.iteh.ai)
oSIST prEN IEC 61139-2:2021
https://standards.iteh.ai/catalog/standards/sist/c5441fa2-8f26-4bcf-9b71-

Table 1 – Operational modes of feature level "a" to "c" (port class A) 27
Table 2 – Interoperability matrix of safety devices 29
Table 3 – PL_Ready 33
Table 4 – OSSD states and conditions 34
Table 5 – Cross connection faults 35
Table 6 – Electric characteristics of a receiver 37
Table 7 – Electric and dynamic characteristics of the FS-Device (OSSDe) 38
Table 8 – Electric and dynamic characteristics of the Port interface 40
Table 9 – Cable characteristics 42
Table 10 – State transition tables of the FS-Master DL-mode handler 44
Table 11 – State transition tables of the FS-Device DL-mode handler 45
Table 12 – State transition tables of the Configuration Manager 46
Table 13 – Extension to Data Storage (DS) state machine 49
Table 14 – Data Storage Backup Levels 49
Table 15 – SMI services used for FS-Master 50
Table 16 – SMI_FSMasterAccess 52
Table 17 – ArgBlock types and ArgBlockIDs 53

oSIST prEN IEC 61139-2:2021

Table 18 – FSMasterAccess 54
Table 19 – FSCPAuthenticity 54
Table 20 – FSPortConfigList 54
Table 21 – FSPortStatusList 56
Table 22 – SPDUIn 58
Table 23 – SPDUOut 58
Table 24 – Use case reference table 59
Table 25 – Communication errors and safety measures 64
Table 26 – SCL services of FS-Master 66
Table 27 – SCL services of FS-Device 67
Table 28 – Protocol phases to consider 68
Table 29 – Control and counting (Control&MCnt) 70
Table 30 – Status and counting mirror (Status&DCnt) 70
Table 31 – MCount and DCount_i values 70
Table 32 – FS process I/O data types 71
Table 33 – Rules for the layout of values and qualifiers 72
Table 34 – Order of values and qualifier 72
Table 35 – Definition of terms used in SCL state machine of the FS-Master 73
Table 36 – FS-Master SCL states and transitions 73
Table 37 – Definition of terms used in SCL state machine of the FS-Device 75
Table 38 – FS-Device SCL states and transitions 76
Table 39 – Timing constraints 84
Table 40 – Qualifier bits "GOOD/BAD" 96
Table 41 – State transition table for the qualifier behavior 97
Table A.1 – Indices for SDCI-FS 99
Table A.2 – Coding of protocol version 101
Table A.3 – Coding of protocol mode 101
Table A.4 – Generic FS I/O data structure description 102
Table B.1 – FS-Device SCL specific EventCodes 105
Table B.2 – FS-Master SCL specific EventCodes 105
Table C.1 – Data types for SDCI-FS 107
Table C.2 – BooleanT for SDCI-FS 107
Table C.3 – Example of BooleanT within a RecordT 107
Table C.4 – IntegerT(16) 108
Table C.5 – IntegerT(16) coding 108
Table C.6 – IntegerT(32) 108
Table C.7 – IntegerT(32) coding 109
Table D.1 – CRC generator polynomials for SDCI-FS 110
Table D.2 – Definition of variables used in Figure D.3 112
Table D.3 – Definition of variables used in Figure D.4 112
Table D.4 – Lookup table for CRC-16 signature calculation 113
Table D.5 – Definition of variables used in Figure D.5 114
Table D.6 – Definition of variables used in Figure D.4 114

iTeh STANDARD PREVIEW
(standards.iteh.ai)
oSIST prEN IEC 61139-2:2021
https://standards.iteh.ai/catalog/standards/sist/c5441fa2-8f26-4bcf-9b71-42b7461515de/osist-pren-iec-61139-2-2021

oSIST prEN IEC 61139-2:2021

Table D.7 – Lookup table for CRC-32 signature calculation 114
Table E.8 – Specific behavior of FS-Device "Reset" SystemCommands 123
Table E.9 – User actions to replace DefaultValues 125
Table E.10 – RecordItems of FSP_Protocol where allowed values shall be serialized 126
Table E.11 – Sample serialization for FSP_ParamDescCRC 126
Table F.1 – Description of PID file elements 143
Table F.2 – Elements of a TPF 146
Table F.3 – Elements of the TBF 150
Table F.4 – Elements of the TAF 151
Table F.5 – Invocation cases and behaviors 152
Table F.6 – Communication Schema mapping 158
Table F.7 – Reaction on incorrect Tool behavior 158
Table F.8 – DTI conformance classes 160
Table F.9 – DTI feature levels of Device Tools 160
Table F.10 – Interactions at conformance class combinations 160
Table G.1 – Main scenarios of SDCI-FS 168

iTeh STANDARD PREVIEW
(standards.iteh.ai)
oSIST prEN IEC 61139-2:2021
https://standards.iteh.ai/catalog/standards/sist/c5441fa2-8f26-4bcf-9b71-159d4015150e/osist-pren-iec-61139-2-2021

oSIST prEN IEC 61139-2:2021

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

INDUSTRIAL NETWORKS – SINGLE-DROP DIGITAL COMMUNICATION INTERFACE –

Part 2: Functional safety extensions

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 61139-2 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee TC65: Industrial-process measurement, control and automation. It is an International Standard.

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

Draft	Report on voting
65C/XX/FDIS	65C/XX/RVD

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

The language used for the development of this International Standard is English.

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

iTeh STANDARD PREVIEW
(standards.iteh.ai)
oSIST prEN IEC 61139-2:2021
https://standards.iteh.ai/catalog/standards/sist/e5441fa2-8f26-4bcb-9b7f-150d6f6d4f0c/osist-pren-iec-61139-2-2021

oSIST prEN IEC 61139-2:2021

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.

IMPORTANT – The 'color inside' logo on the cover page of this publication indicates that it contains colors which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a color printer.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
oSIST prEN IEC 61139-2:2021
https://standards.iteh.ai/catalog/standards/sist/c5441fa2-8f26-4bcf-9b71-159d4015150e/osist-pren-iec-61139-2-2021