

INTERNATIONAL STANDARD



Industrial communication networks – Installation of communication networks in industrial premises



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CONTENTS

FOREWORD.....	12
INTRODUCTION.....	14
INTRODUCTION to Amendment 1	18
INTRODUCTION to Amendment 2	18
1 Scope.....	19
2 Normative references	19
3 Terms, definitions, and abbreviated terms	24
3.1 Terms and definitions.....	24
3.2 Abbreviated terms.....	30
3.3 Conventions for installation profiles	38
4 Installation planning.....	38
4.1 General.....	38
4.1.1 Objective	38
4.1.2 Cabling in industrial premises.....	38
4.1.3 The planning process	41
4.1.4 Specific requirements for CPs.....	42
4.1.5 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3	42
4.2 Planning requirements	42
4.2.1 Safety.....	42
4.2.2 Security	43
4.2.3 Environmental considerations and EMC	44
4.2.4 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3	45
4.3 Network capabilities.....	45
4.3.1 Network topology.....	45
4.3.2 Network characteristics.....	48
4.4 Selection and use of cabling components	51
4.4.1 Cable selection.....	51
4.4.2 Connector hardware selection.....	55
4.4.3 Connections within a channel/permanent link	57
4.4.4 Terminations.....	63
4.4.5 Device location and connection	63
4.4.6 Coding and labelling	63
4.4.7 Earthing and bonding of equipment and devices and shielded cabling	64
4.4.8 Storage and transportation of cables	75
4.4.9 Routing of cables.....	75
4.4.10 Separation of circuits.....	77
4.4.11 Mechanical protection of cabling components	78
4.4.12 Installation in special areas	79
4.5 Cabling planning documentation	79
4.5.1 Common description	79
4.5.2 Cabling planning documentation for CPs	79
4.5.3 Network certification documentation	80
4.5.4 Cabling planning documentation for generic cabling in accordance with ISO/IEC 11801-3	80
4.6 Verification of cabling planning specification	80

5	Installation implementation	80
5.1	General requirements	80
5.1.1	Common description	80
5.1.2	Installation of CPs	80
5.1.3	Installation of generic cabling in industrial premises	80
5.2	Cable installation	80
5.2.1	General requirements for all cabling types	80
5.2.2	Installation and routing	86
5.2.3	Specific requirements for CPs	88
5.2.4	Specific requirements for wireless installation	88
5.2.5	Specific requirements for generic cabling in accordance with ISO/IEC 11801-3	88
5.3	Connector installation	88
5.3.1	Common description	88
5.3.2	Shielded connectors	89
5.3.3	Unshielded connectors	89
5.3.4	Specific requirements for CPs	89
5.3.5	Specific requirements for wireless installation	89
5.3.6	Specific requirements for generic cabling in accordance with ISO/IEC 11801-3	89
5.4	Terminator installation	90
5.4.1	Common description	90
5.4.2	Specific requirements for CPs	90
5.5	Device installation	90
5.5.1	Common description	90
5.5.2	Specific requirements for CPs	90
5.6	Coding and labelling	90
5.6.1	Common description	90
5.6.2	Specific requirements for CPs	90
5.7	Earthing and bonding of equipment and devices and shield cabling	90
5.7.1	Common description	90
5.7.2	Bonding and earthing of enclosures and pathways	91
5.7.3	Earthing methods	93
5.7.4	Shield earthing methods	95
5.7.5	Specific requirements for CPs	97
5.7.6	Specific requirements for generic cabling in accordance with ISO/IEC 11801-3	97
5.8	As implemented cabling documentation	98
6	Installation verification and installation acceptance test	98
6.1	General	98
6.2	Installation verification	98
6.2.1	General	98
6.2.2	Verification according to cabling planning documentation	99
6.2.3	Verification of earthing and bonding	100
6.2.4	Verification of shield earthing	101
6.2.5	Verification of cabling system	102
6.2.6	Cable selection verification	102
6.2.7	Connector verification	102
6.2.8	Connection verification	103

6.2.9	Terminator verification	105
6.2.10	Coding and labelling verification	105
6.2.11	Verification report	105
6.3	Installation acceptance test	105
6.3.1	General	105
6.3.2	Acceptance test of Ethernet-based cabling	107
6.3.3	Acceptance test of non-Ethernet-based cabling	110
6.3.4	Specific requirements for wireless installation	110
6.3.5	Acceptance test report	111
7	Installation administration	111
7.1	General	111
7.2	Fields covered by the administration	111
7.3	Basic principles for the administration system	111
7.4	Working procedures	112
7.5	Device location labelling	112
7.6	Component cabling labelling	112
7.7	Documentation	113
7.8	Specific requirements for administration	114
8	Installation maintenance and installation troubleshooting	114
8.1	General	114
8.2	Maintenance	114
8.2.1	Scheduled maintenance	114
8.2.2	Condition-based maintenance	116
8.2.3	Corrective maintenance	117
8.3	Troubleshooting	117
8.3.1	General description	117
8.3.2	Evaluation of the problem	117
8.3.3	Typical problems	118
8.3.4	Troubleshooting procedure	120
8.3.5	Simplified troubleshooting procedure	121
8.4	Specific requirements for maintenance and troubleshooting	122
Annex A (informative)	Overview of generic cabling for industrial premises	123
Annex B (informative)	MICE description methodology	124
B.1	General	124
B.2	Overview of MICE	124
B.3	Examples of use of the MICE concept	125
B.3.1	Common description	125
B.3.2	Examples of mitigation	125
B.4	Determining E classification	127
B.5	The MICE table	130
B.6	Communication devices and cabling considerations	131
B.6.1	General	131
B.6.2	Device types	132
B.6.3	EMI resistance needed for E3 industrial applications	133
Annex C (informative)	Network topologies	134
C.1	Common description	134
C.2	Total cable demand	134
C.3	Maximum cable segment length	134

C.4	Maximum network length	134
C.5	Fault tolerance	134
C.5.1	General	134
C.5.2	Use of redundancy	134
C.5.3	Failure analysis for networks with redundancy	134
C.6	Network access for diagnosis convenience	135
C.7	Maintainability and on-line additions	135
Annex D (informative)	Connector tables	136
Annex E (informative)	Power networks with respect to electromagnetic interference – TN-C and TN-S approaches	157
Annex F (informative)	Conductor sizes in electrical cables	159
Annex G (informative)	Installed cabling verification checklists	160
G.1	General	160
G.2	Copper cabling verification checklist	160
G.3	Optical fibre cabling verification checklist	163
Annex H (normative)	Cord sets	165
H.1	General	165
H.2	Constructing cord sets	165
H.2.1	Straight through cord sets with M12-4 D-coding connectors	165
H.2.2	Crossover cord sets with M12-4 D-coding connectors	166
H.2.3	Straight through cord sets with 8-way modular connectors	166
H.2.4	Crossover cord sets with 8-way modular connectors	167
H.2.5	Straight conversion from one connector family to another	168
H.2.6	Crossover conversion from one connector family to another	168
H.2.7	Assignment of PMA signal to MDI and MDI-X in outs	169
H.2.8	Signal and pin assignment for MDI and TIA568A	170
H.2.9	Signal and pin assignment for MDIX and TIA568B	170
H.2.10	Signal and pin assignment for MDIX and TIA568A	171
H.2.11	Straight through cord set with IEC 63171-6 connectors	171
Annex I (informative)	Guidance for terminating cable ends	172
I.1	General	172
I.2	Guidance for terminating shielded twisted pair cable ends for 8-way modular plugs	172
I.3	Guidance for terminating unshielded twisted pair cable ends for 8-way modular plugs	174
I.4	Guidance for M12-4 D-coding connector installation	175
I.5	Guidance for terminating optical fibre cable ends	178
Annex J (informative)	Recommendations for bulkhead connection performance and channel performance with more than 4 connections in the a 4-pair channel	179
J.1	General	179
J.2	Recommendations	179
Annex K (informative)	Fieldbus data transfer testing	180
K.1	Background	180
K.2	Allowable error rates for control systems	180
K.2.1	Bit errors	180
K.2.2	Burst errors	180
K.3	Testing channel performance	181
K.4	Testing cable parameters	181
K.4.1	General	181

K.4.2	Generic cable cabling testing.....	181
K.4.3	Fieldbus cable cabling testing.....	181
K.5	Testing fieldbus data rate performance	182
K.5.1	General	182
K.5.2	Fieldbus test.....	182
K.5.3	Planning for fieldbus data rate testing.....	182
K.5.4	Fieldbus data rate test reporting template.....	183
K.5.5	Values for acceptable fieldbus performance.....	183
Annex L (informative)	Communication network installation work responsibility	184
L.1	General.....	184
L.2	Installation work responsibility	184
L.3	Installation work responsibility table.....	184
Annex M (informative)	Trade names of communication profiles	185
Annex N (informative)	Validation measurements	188
N.1	General.....	188
N.2	DCR measurements.....	188
N.2.1	Purpose of test	188
N.2.2	Assumptions	188
N.2.3	Measurements.....	188
N.2.4	Calculations.....	190
N.2.5	Measurement results	190
Annex O (informative)	End-to-end link	194
O.1	General.....	194
O.2	End-to-end link	194
O.3	E2E link normative description	195
O.4	E2E link measurement	197
Annex P (normative)	Temperature rise of cabling with remote powering.....	198
P.1	General.....	198
P.2	Scope	198
P.3	Temperature de-rating calculation.....	198
Annex Q (normative)	Additional requirements for the installation of Ethernet-based balanced 1-pair networks in industrial premises	200
Q.1	Overview.....	200
Q.2	Installation planning.....	200
Q.2.1	General	200
Q.2.2	Basic balanced 1-pair network characteristics.....	200
Q.2.3	Balanced 1-pair cables	201
Q.2.4	Balanced 1-pair connecting hardware	201
Q.2.5	Balanced 1-pair cabling channels	203
Q.2.6	Remote powering.....	204
Q.2.7	Reuse of legacy cabling.....	205
Q.3	Installation implementation.....	205
Q.3.1	General	205
Q.3.2	Additional installation implementation	205
Q.4	Installation verification and installation acceptance test	205
Q.4.1	General	205
Q.4.2	Additional installation verification and acceptance test.....	205
Bibliography	206

Figure 1 – Industrial network installation life cycle	15
Figure 2 – Standards relationships	17
Figure 3 – Automation island cabling attached to elements of generic cabling	39
Figure 4 – Automation islands	40
Figure 5 – Automation island network external connections	41
Figure 6 – How to meet environmental conditions	45
Figure 7 – How enhancement, isolation and separation work together	45
Figure 8 – Basic physical topologies for passive networks	46
Figure 9 – Basic physical topologies for active networks	47
Figure 10 – Example of combination of basic topologies	47
Figure 53 – Example of mesh topology	47
Figure 11 – Basic reference implementation model	58
Figure 12 – Enhanced reference implementation model	59
Figure 13 – Equalisation and earthing conductor cross-sectional versus maximum length	66
Figure 14 – Selection of the earthing and bonding systems	67
Figure 15 – Placement of equalisation conductors	69
Figure 16 – Impedance of the earthing conductors and equalisation conductors versus noise frequency	70
Figure 17 – Wiring for bonding and earthing in an equipment a mesh configuration	71
Figure 18 – Wiring of the earths in a star earthing configuration	72
Figure 19 – Schematic diagram of a field device with direct earthing	73
Figure 20 – Schematic diagram of a field device with parallel RC circuit earthing	73
Figure 21 – Insert edge protector	82
Figure 22 – Use an uncoiling device and avoid forming loop	83
Figure 23 – Avoid torsion	83
Figure 24 – Maintain minimum bending radius	84
Figure 25 – Do not pull by the individual wires	84
Figure 26 – Use cable clamps with a large (wide) surface	84
Figure 27 – Cable gland with bending protection	85
Figure 28 – Spiral tube	85
Figure 29 – Separate cable pathways	88
Figure 30 – Impedance of the earthing circuit as a function of distance from the metallic pathway	91
Figure 31 – Use of flexible bonding straps at movable metallic pathways	92
Figure 32 – Surface preparation for earthing and bonding electromechanical connections	93
Figure 33 – Example of isolated bus bar	94
Figure 34 – Example of isolator for mounting DIN rails	95
Figure 35 – Parallel RC shield earthing	95
Figure 36 – Direct shield earthing	96
Figure 37 – Examples for shielding application	96
Figure 38 – Voltage offset mitigation	97
Figure 39 – First example of derivatives of shield earthing	97

Figure 40 – Second example of derivatives of shield earthing	97
Figure 41 – Installation verification process	100
Figure 42 – Test of earthing connections	101
Figure 43 – Pin and pair grouping assignments for two eight position IEC 60603-7 subparts and four position IEC 60603-7 series to IEC 61076-2-101 connectors.....	104
Figure 44 – Two pair 8-way modular connector	104
Figure 45 – Transposed pairs, split pairs and reversed pair	104
Figure 46 – Validation process.....	106
Figure 47 – Schematic representation of the channel.....	107
Figure 48 – Schematic representation of the permanent link	107
Figure 49 – Schematic representation of an E2E link	108
Figure 50 – Communication network maintenance	116
Figure 51 – Troubleshooting procedure.....	121
Figure 52 – Fault detection without special tools	122
Figure B.1 – MICE classifications.....	124
Figure B.2 – Example MICE classifications within a facility	125
Figure B.3 – Enhancement, isolation and separation.....	125
Figure B.4 – Example 1 of mitigation.....	126
Figure B.5 – Example 2 of mitigation.....	127
Figure B.6 – Frequency range of electromagnetic disturbance from common industrial devices	127
Figure B.7 – Example of a general guidance for separation versus EFT value.....	129
Figure B.8 – Communication device interface with limited EMI immunity	132
Figure B.9 – Communication device interface with medium EMI immunity	132
Figure B.10 – Communication device interface with the highest EMI immunity (type 2)	133
Figure E.1 – Four-wire power network (TT-C)	157
Figure E.2 – Five wire power network (TN-S).....	158
Figure H.1 – Straight through cord sets with M12-4 D-coding connectors.....	165
Figure H.2 – Straight through cord sets with 8-way modular connectors, 8 poles	166
Figure H.3 – Straight through cord sets with 8-way modular connectors, 4 poles	167
Figure H.4 –M12-8 D-coding connector	169
Figure I.1 – Stripping the cable jacket.....	172
Figure I.2 – Example of wire preparation for type A cables.....	173
Figure I.3 – 8-way modular plug.....	173
Figure I.4 – Inserting the cable into the connector body	174
Figure I.5 – Crimping the connector	174
Figure I.6 – Example of a cable preparation for type A wiring.....	175
Figure I.7 – Connector components	176
Figure I.8 – Cable preparation	176
Figure I.9 – Connector wire gland, nut and shell on the cable	176
Figure I.10 – Conductors preparation.....	176
Figure I.11 – Jacket removal.....	177
Figure I.12 – Shield preparation.....	177
Figure I.13 – Conductors preparation.....	177

Figure I.14 – Installing conductors in connector	177
Figure I.15 – Assembling the body of the connector	178
Figure I.16 – Final assembling	178
Figure N.1 – Loop resistance measurement wire to wire	189
Figure N.2 – Loop resistance measurement wire 1 to shield	189
Figure N.3 – Loop resistance measurement wire 2 to shield	189
Figure N.4 – Resistance measurement for detecting wire shorts	189
Figure N.5 – Resistance measurement between wire 1 and wire 2	190
Figure N.6 – Validation of the cable DCR	191
Figure N.7 – Conclusions for cable open or shorts	192
Figure N.8 – Determination of proper cable terminator value	193
Figure O.1 – Channel according to ISO/IEC 11801	194
Figure O.2 – End-to-end link	195
Figure O.3 – One segment, two Connection E2E link	195
Figure O.4 – Two Segment, three Connection E2E link	196
Figure O.5 – Three Segment, one Connection bulkheads, four Connection E2E link	196
Figure O.6 – Three Segment, two Connection, six Connection E2E link	196
Figure O.7 – Three Segment, four Connection E2E link	196
Figure O.8 – Four Segment, five Connection E2E link	196
Figure O.9 – Five Segment, six Connection E2E link	197
Figure Q.1 – Balanced 1-pair network	200
Figure Q.2 – IP65/IP67 IEC 63171-6 connectors	202
Figure Q.3 – Mating parts of the IEC 63171-6 connectors	202
Figure Q.4 – Balanced 1-pair channel model with 40 m max length	203
Figure Q.5 – Balanced 1-pair channel model with 1 000 m max length	203
Figure Q.6 – Additional mitigation for remote powering over balanced 1-pair network	204
Figure Q.7 – Balanced 1-pair wire mapping	205
Table 1 – Basic network characteristics for balanced cabling not based on Ethernet	49
Table 2 – Network characteristics for balanced cabling based on Ethernet	49
Table 3 – Network characteristics for optical fibre cabling	50
Table 4 – Information relevant to copper cable: fixed cables	52
Table 5 – Information relevant to copper cable: cords	52
Table 6 – Information relevant to optical fibre cables	53
Table 7 – Connectors for balanced cabling CPs based on Ethernet	55
Table 8 – Connectors for copper cabling CPs not based on Ethernet	56
Table 9 – Optical fibre connecting hardware	56
Table 10 – Relationship between FOC and fibre types (CP x/y)	56
Table 11 – Basic reference implementation formulas	58
Table 12 – Enhanced reference implementation formulas	60
Table 13 – Correction factor Z for operating temperature above 20 °C	60
Table 14 – Equalisation and earthing conductor sizing and length	68
Table 15 – Bonding straps cross-section	68

Table 16 – Bonding plates surface protection..... 68

Table 17 – Cable circuit types and minimum distances 78

Table 18 – Parameters for balanced cables 81

Table 19 – Parameters for silica optical fibre cables 81

Table 20 – Parameters for POF optical fibre cables 81

Table 21 – Parameters for hard clad silica optical fibre cables 82

Table 22 – Typical problems in a network with balanced cabling 119

Table 23 – Typical problems in a network with optical fibre cabling 119

Table B.1 – Example 1 of targeted MICE area 126

Table B.2 – Example 2 of targeted MICE area 126

Table B.3 – Relationship between electromagnetic disturbance-generating devices and “E” classification 128

Table B.4 – Coupling mechanism for some interfering devices 129

Table B.5 – MICE definition 130

Table B.6 – EMI resistance of industrial applications 133

Table D.1 – Conventions for colour code used in the connector table 136

Table D.2 – Pin/pair assignment and colour scheme 138

Table D.3 – 8-way modular connector 138

Table D.4 – M12-4 A-coding connector 140

Table D.5 – M12-4 D-coding connector 142

Table D.6 – M12-5 A-coding connector 144

Table D.7 – M12-5 B-coding connector 146

Table D.8 – SubD connector 147

Table D.9 – 7/8-16 UN-2B THD / M18 connector 149

Table D.10 – Open style connector 150

Table D.11 – M12-8 X-coding connector and A-coding connector 152

Table D.12 – BNC connector 153

Table D.13 – TNC connector 154

Table D.14 – Rectangular 8-way/10-way modular connectors 155

Table D.15 – M8-4 A-coding, D-coding, P-coding, X-coding connectors 156

Table F.1 – American wire gauge system and kcmil 159

Table G.1 – Copper cabling verification checklist 161

Table G.2 – Earthing and bonding measurements checklist 162

Table G.3 – Signatures for Table G.1 and Table G.2 checklists 162

Table G.4 – Checklist for special checks for non-Ethernet base CPs 163

Table G.5 – Signatures for Table G.4 checklist 163

Table G.6 – Optical fibre cabling verification checklist 164

Table G.7 – Signatures for Table G.6 checklist 164

Table H.1 – M12-4 D-coding pin/pair assignment 166

Table H.2 – M12-4 D-coding to M12-4 D-coding crossover pin/pair assignment 166

Table H.3 – 8-way modular pin/pair assignment 167

Table H.4 – 8-way modular crossover pin/pair assignment 168

Table H.5 – Connectivity pin assignment 168

Table H.6 – M12-4 to 8-way modular crossover pin pair assignment 169

Table H.7 – Assignment of PMA signal to MDI and MDI-X pin outs 169

Table H.8 – Signal and pin/pair assignment for MDI and TIA 568B..... 170

Table H.9 – Signal and pin/pair assignment for MDI and T568A..... 170

Table H.10 – Signal and pin/pair assignment for MDIX and T568B..... 171

Table H.11 – Signal and pin/pair assignment for MDIX and T568A..... 171

Table J.1 – Transmission requirements for more than 4 connections in a channel..... 179

Table M.1 – Trade names of CPFs and CPs 185

Table P.1 – Parameters used to calculate the temperature derating..... 199

Table Q.1 – Basic balanced 1-pair network characteristics..... 201

Table Q.2 – IEC 63171-6 colour code and signal assignment..... 202

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INDUSTRIAL COMMUNICATION NETWORKS –**Installation of communication networks in industrial premises****FOREWORD**

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IEC 61918 edition 4.2 contains the fourth edition (2018-09) [documents 65C/928/FDIS and 65C/933/RVD], its amendment 1 (2022-03) [documents 65C/1141/FDIS and 65C/1162/RVD] and its amendment 2 (2024-03) [documents 65C/1282/FDIS and 65C/1290/RVD].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendments 1 and 2. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

International Standard IEC 61918 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation.

This fourth edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) the reference to ISO/IEC 24702 has been replaced with reference to the new ISO/IEC 11801-3; this affects Table 2;
- b) some terms and abbreviated terms have been modified in Clause 3;
- c) Subclauses 4.1.2, 4.4.2.5, 4.4.3.4.1 and 5.7 have been updated;
- d) Figure 2 and Figure 3 have been updated; Figure 13, Figure 16, Figure 30 and Figure 49 have been added;
- e) Table 7 has been updated;
- f) Annex D and Annex M have been extended to cover additional communication profile families; Annex H has been extended to cover the M12-8 X-coding connector use;
- g) Annex O has been modified by including references to the new edition of the ISO/IEC 11801 series, ISO/IEC TR 11801-9902 and ISO/IEC 14763-4;
- h) Annex P has been added.

This standard is to be used in conjunction with the IEC 61784-5 series with regard to the installation of communication profiles (CPs).

Those standards of the IEC 61784-5 series which are still specified for use in conjunction with IEC 61918:2013 can also be used in conjunction with this edition, provided that the user takes into account the fact that the reference to ISO/IEC 24702 has been replaced with a reference to ISO/IEC 11801-3:2017.

NOTE This solution applies for the installation profiles that are affected only by this modified reference.

This standard is referenced by ISO/IEC 14763-2, which covers installation of generic cabling outside the automation islands in industrial premises.

This standard was developed in cooperation with ISO/IEC JTC1/SC25 which is responsible for the ISO/IEC 11801 series.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this document and its amendments 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, or
- revised.

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

INTRODUCTION

Process and factory automation rely increasingly on communication networks and fieldbuses that are inherently designed to cope with the specific environmental conditions of the industrial premises. The networks and fieldbuses provide for an effective integration of applications among the several functional units of the plant/factory. One of the benefits of integrating field-generated data with higher-level management systems is to reduce production costs. At the same time, integrated data helps to maintain or even increase the quantity and quality of production. A correct network installation is an important prerequisite for communications availability, reliability, and performance. This requires proper consideration of safety and security conditions and environmental aspects such as mechanical, liquid, particulate, climatic, chemicals and electromagnetic interference.

The specifications of these communication networks are provided in the following documents.

ISO/IEC 11801-3 specifies design of generic telecommunications infrastructures within industrial premises and provides the foundations for some of the transmission performance specifications of this document. ISO/IEC 11801-3 specifies only the raw bandwidth capability of a channel; it does not specify useful data transfer rate for a specific network using that channel or expected errors after taking account of interference during the communication process, as is needed for industrial automation.

The IEC 61158 fieldbus standard and IEC 62026-3 and their companion standard IEC 61784-1 and IEC 61784-2 jointly specify several Communication Profiles (CPs) suitable for industrial automation. These CPs specify a raw bandwidth capability and in addition, they specify bit modulation and encoding rules for their fieldbus. Some profiles also specify target levels for useful data transfer rate, and maximum values for errors caused by interference during the communication process.

This document provides a common point of reference for the installation of the media of most used industrial communication networks for most industrial sites.

This document provides a consistent set of installation rules for industrial automation islands where control applications reside. In addition, it offers support for the definition and installation of the interfaces between automation island networks and generic cabling.

One of the problems it seeks to solve is the situation created when different parts of a large automation site are provided by suppliers that use non-homogeneous installation guidelines having different structures and contents. This lack of consistency greatly increases the potential for errors and mismatch situations liable to compromise the communication system.

This document was developed by harmonising the approaches of several user groups and industrial consortia.

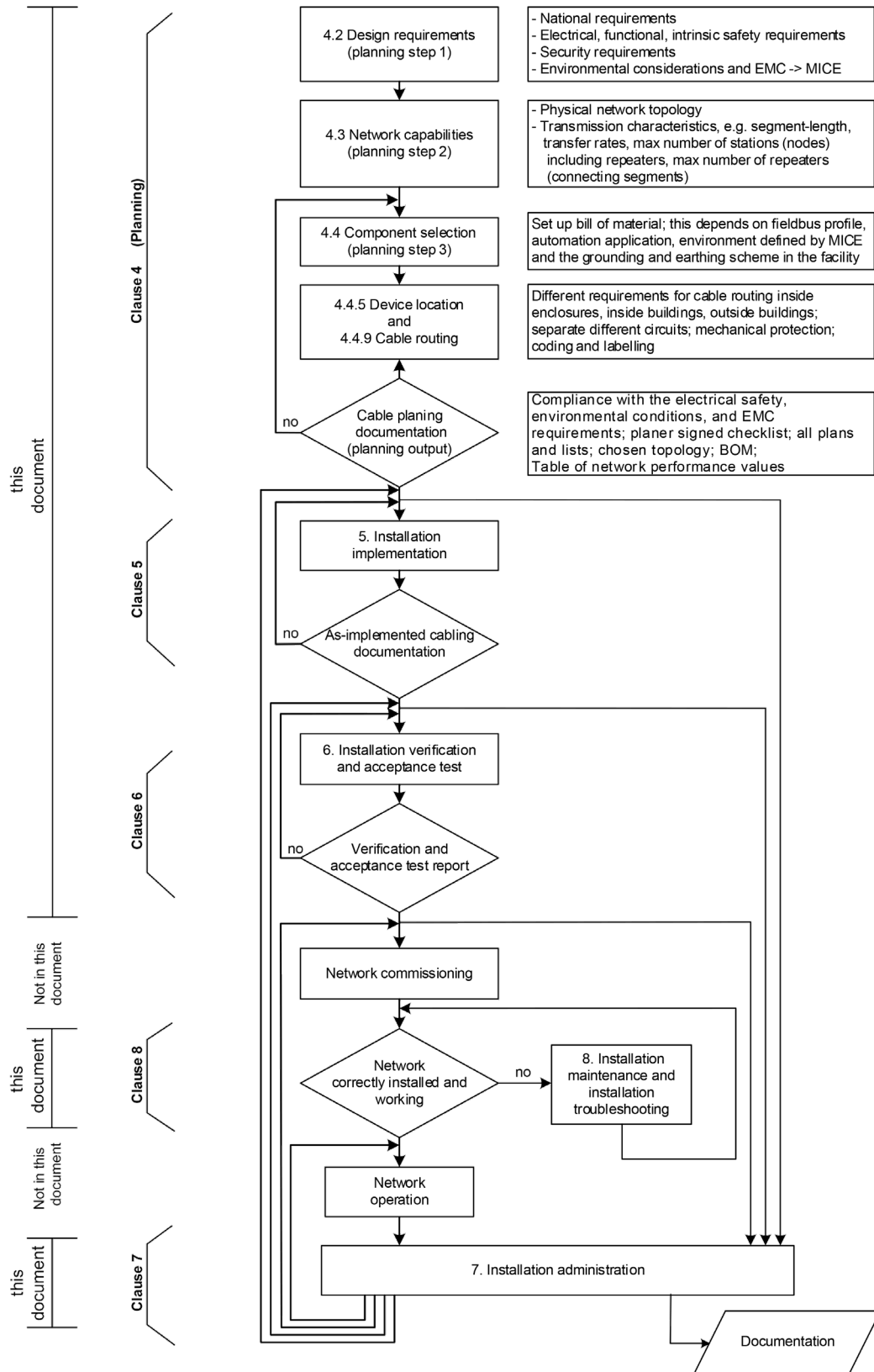
The document covers the life cycle of an installation in the following clauses (see the map of the document in Figure 1):

- Clause 4: Installation planning;
- Clause 5: Installation implementation;
- Clause 6: Installation verification and acceptance test;
- Clause 7: Installation administration;
- Clause 8: Installation maintenance and installation troubleshooting.

The methods described in these clauses are written in such a way as to provide installation guidance for a wide range of technician skills.

IEC 61918 Installation lifecycle

V2.0 /REL



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Figure 1 – Industrial network installation life cycle

The installation of a communication system is supported by this document used in conjunction with the relevant installation profile. The installation profile establishes the technology-specific

requirements in terms of which requirements apply as they are in this document, or which have been extended, modified, or replaced.

For the fieldbuses that are defined in the IEC 61784 (all parts) as communication profiles (CPs) of the communication profile families (CPF), the installation is specified in the installation profiles that are available in the IEC 61784-5-n documents, where n is the CPF number.

IEC 61158-1 describes the relationship between the fieldbus and the CPs and the relevant installation profiles (see Figure 2).

Those documents of IEC 61784-5 (all parts) that are still specified for use in conjunction with IEC 61918:2013 can also be used in conjunction with this edition 2018, provided that the user takes into account the fact that the reference to ISO/IEC 24702 has been replaced with a reference to ISO/IEC 11801-3:2017.

NOTE This solution applies for the Installation profiles that are affected only by this modified reference

For the installation of generic cabling in industrial premises, IEC 61918 is referenced to by ISO/IEC 14763-2 (see Figure 2).

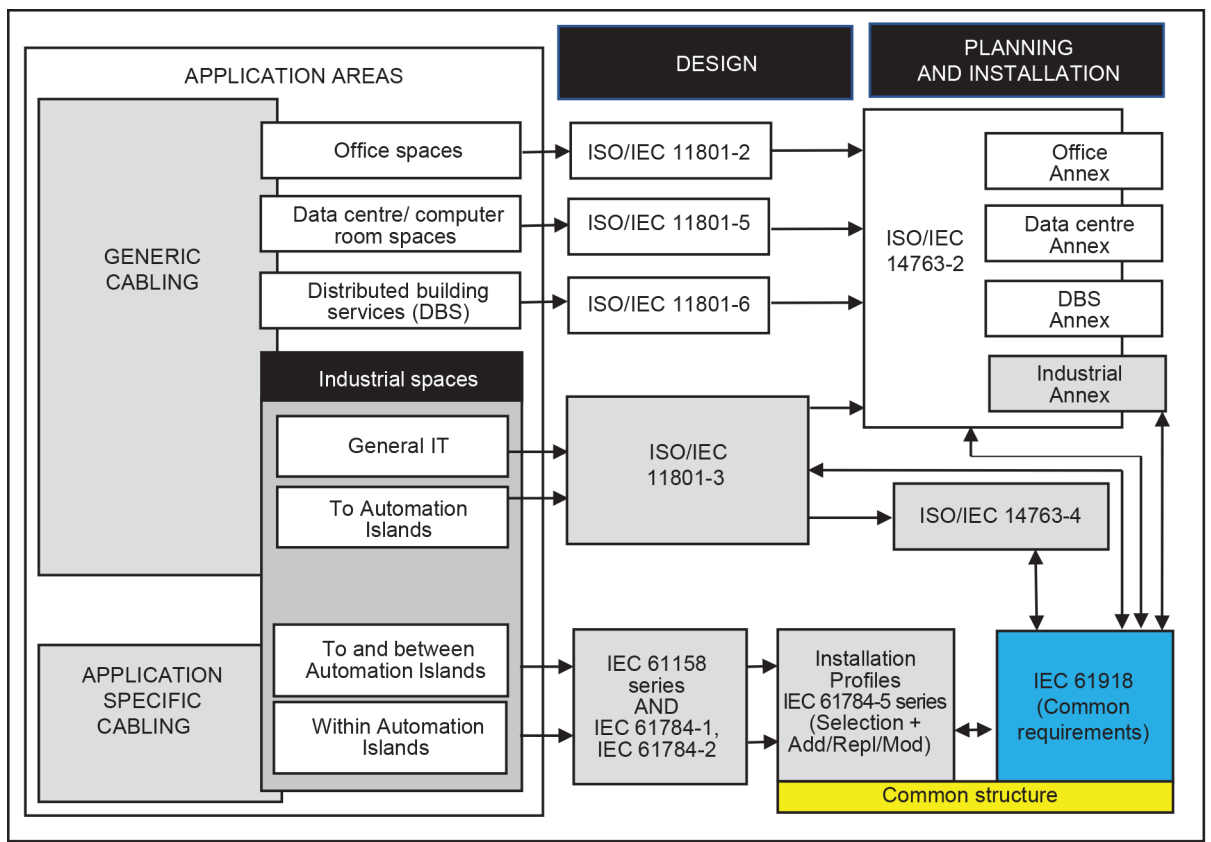
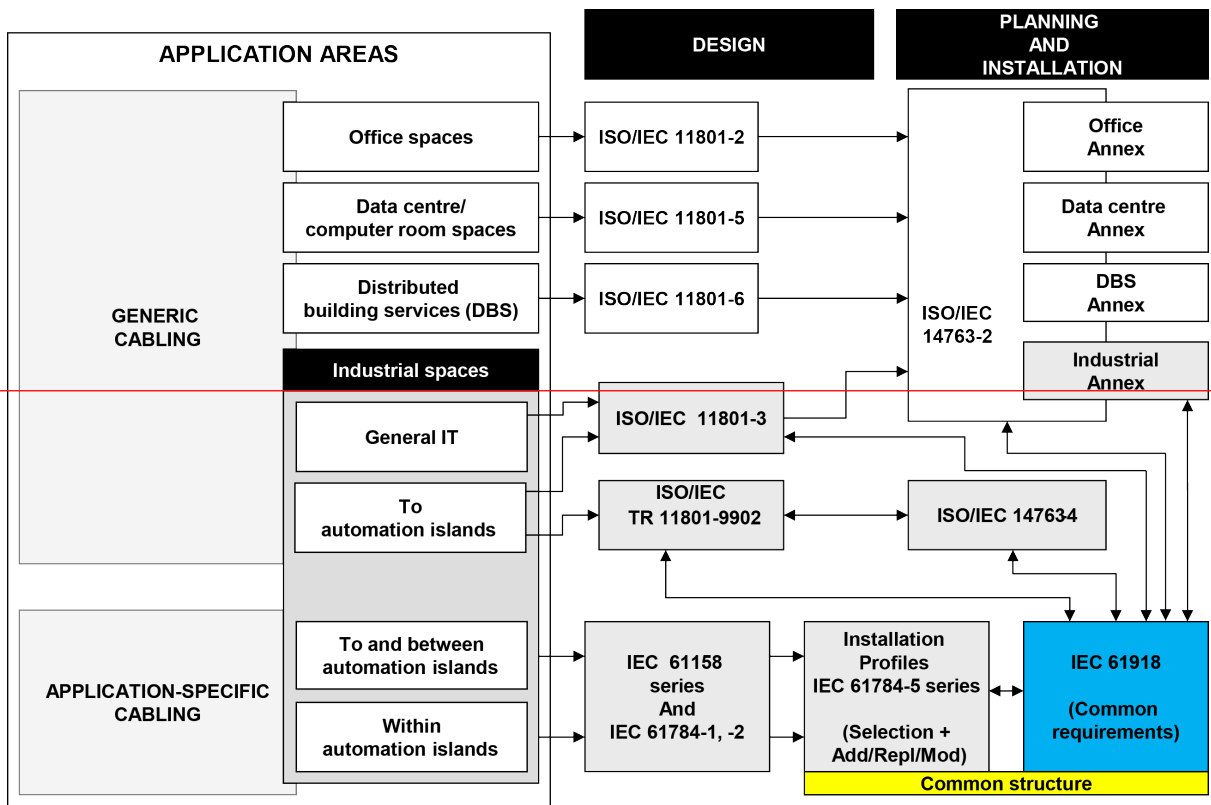


Figure 2 – Standards relationships

One of the advantages of this structure is that the users of a network know which installation requirements are common to most networks and which are specific to a particular network.

Every single plant/factory has its own installation needs in accordance with the specific critical conditions that apply to the specific application. This document and its companion standards described above provide a set of mandatory installation requirements ("shalls") and a number of recommendations ("shoulds"). It is up to the owner of the specific industrial enterprise to explicitly request that the cabling installation be implemented in accordance with these standards and to list all recommendations that shall be considered as mandatory requirements for the specific case.

INTRODUCTION to Amendment 1

This Amendment 1 describes the installation in the critical environment of industrial premises of balanced 1-pair networks that use cabling in connection with Ethernet specified in 1000BASE-T1 type A, which allows bidirectional signal transmission at 1 000 Mbit/s up to 15 m, 1000BASE-T1 type B for 1 000 Mbit/s up to 40 m, 100BASE-T1 for 100 Mbit/s up to 15 m, 10BASE-T1S for 10 Mbit/s up to 15 m, 10BASE-T1L for 10 Mbit/s up to 1 000 m.

These balanced 1-pair networks use the industrial versions of 1 000 Mbit/s and 100 Mbit/s ISO/IEC/IEEE 8802-3:2021, and 10 Mbit/s IEEE Std 802.3cg networks.

INTRODUCTION to Amendment 2

This Amendment 2 describes the result of the maintenance activity of IEC 61918:2018 that takes into account the evolution of the technology, which is being considered during the Installation Profiles revision cycle.

The following technical changes were made in IEC 61918:2018/AMD1:2022 and IEC 61918:2018/AMD2:2024:

- a) Subclauses 4.1.2, 4.1.3, 4.2.1.2, 4.2.2, 4.2.3.2, 4.3.2.1, 4.3.2.3, 4.4.1.2.1, 4.4.2.2, 4.4.2.5, 4.4.3.1, 4.4.3.2.1, 4.4.3.4.1, 4.4.7.1.4, 4.4.7.3.1, 5.1.1, 5.7, 6.1, 6.2.8.3, 6.3.2.1.2 and 8.3.3 have been updated;
- b) Annex O has been modified by replacing the references to ISO/IEC TR 11801-9902 with references to ISO/IEC 11801-3:2017/AMD1:2021;
- c) Table B.3 has been updated;
- d) Clause B.6 has been added;
- e) Annexes D, I, J, K and M have been updated;
- f) Annex Q has been added.

INDUSTRIAL COMMUNICATION NETWORKS –

Installation of communication networks in industrial premises

1 Scope

This document specifies basic requirements for the installation of media for communication networks within and between the automation islands, of industrial sites. This document covers balanced and optical fibre cabling. It also covers the cabling infrastructure for wireless media, but not the wireless media itself. Additional media are covered in IEC 61784-5 (all parts).

This document is a companion standard to the communication networks of the industrial automation islands and especially to the communication networks specified in IEC 61158 (all parts) and IEC 61784 (all parts).

In addition, this document covers the connection between the generic telecommunications cabling specified in ISO/IEC 11801-3 and the specific communication cabling of an automation island, where an automation outlet (AO) replaces the telecommunication outlet (TO) of ISO/IEC 11801-3.

NOTE If the interface used at the AO does not conform to that specified for the TO of ISO/IEC 11801-3, the cabling no longer conforms to ISO/IEC 11801-3 although certain features, including performance, of generic cabling may be retained.

This document provides guidelines that cope with the critical aspects of the industrial automation area (safety, security and environmental aspects such as mechanical, liquid, particulate, climatic, chemicals and electromagnetic interference).

~~This document does not recognise implementations of power distribution with or through Ethernet balanced cabling systems.~~

This document deals with the roles of planner, installer, verifier, and acceptance test personnel, administration and maintenance personnel and specifies the relevant responsibilities and/or gives guidance.

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 60364-1:2005, *Low-voltage electrical installations – Part 1: Fundamental principles, assessment of general characteristics, definitions*

IEC 60364-4-41, *Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock*

IEC 60364-4-44, *Low-voltage electrical installations – Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances*

IEC 60364-5-54, *Low-voltage electrical installations – Part 5-54: Selection and erection of electrical equipment – Earthing arrangements and protective conductors*