

INTERNATIONAL STANDARD

IEC 61784-1

First edition
2003-05

Digital data communications for measurement and control –

Part 1: Profile sets for continuous and discrete manufacturing relative to fieldbus use in industrial control systems

© IEC 2003 – Copyright - all rights reserved

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch

PRICE CODE **XH**

For price, see current catalogue

CONTENTS

FOREWORD	10
INTRODUCTION	12
1 Scope	13
2 Normative references.....	15
3 Definitions	17
3.1 Terms and definitions	17
3.2 Abbreviations and symbols	17
3.3 Conventions	18
4 Conformance to communication profiles.....	21
5 Communication Profile Family 1 (FOUNDATION® Fieldbus)	22
5.1 General overview.....	22
5.2 Profile 1/1 – FF H1	22
5.3 Profile 1/2 – FF HSE.....	105
5.4 Profile 1/3 – FF H2	107
6 Communication Profile Family 2 (ControlNet™)	110
6.1 General overview.....	110
6.2 Profile 2/1 ControlNet	110
6.3 Profile 2/2 EtherNet/IP	115
7 Communication Profile Family 3 (PROFIBUS).....	119
7.1 General overview.....	119
7.2 Profile 3/1	120
7.3 Profile 3/2.....	186
7.4 Profile 3/3 (PROFINET)	200
8 Communication Profile Family 4 (P-NET®).....	202
8.1 General overview.....	202
8.2 Profile 4/1, P-NET RS-485.....	202
8.3 Profile 4/2, P-NET RS-232	206
9 Communication Profile 5 (WorldFIP®).....	207
9.1 General overview.....	207
9.2 Profile 5/1 WorldFIP	208
9.3 Profile 5/2 WorldFIP	216
9.4 Profile 5/3 WorldFIP	221
10 Communication Profile Family 6 - INTERBUS®.....	223
10.1 General overview.....	223
10.2 Profile 6/1	224
10.3 Profile 6/2.....	230
10.4 Profile 6/3.....	233
11 Communication Profile Family 7 (SwiftNet)	237
11.1 General overview.....	237
11.2 Profile 7/1 SwiftNet transport	237
11.3 Profile 7/2 SwiftNet full stack	240
Annex A (informative) Communication concepts	244
A.1 CPF 1 (FOUNDATION Fieldbus) communication concepts	244
A.2 CPF 2 (ControlNet) communication concepts.....	245
A.3 CPF 3 (PROFIBUS) communication concepts	247
A.4 CPF 4 (P-NET) communication concepts	250

A.5	CPF 5 (WorldFIP) communication concepts	251
A.6	CPF 6 (INTERBUS) communication concepts	252
A.7	CPF 7 (SwiftNet) communication concepts	253
Annex B (informative) Added value of IEC 61784-1		257
Bibliography		258

FIGURES

Figure 1	– Communication profile families and profiles	14
Figure 2	– Example optical power budget for a 100/140 µm fibre system with a 16/16 optical passive star coupler	37
Figure 3	– CP 3/2 Slave devices usable in applications	120

TABLES

Table 1	– Relations of Communication Profile Families to type numbers	14
Table 2	– Layout of profile (sub)clause selection tables	18
Table 3	– Contents of (sub)clause selection tables	18
Table 4	– Layout of service selection tables	18
Table 5	– Contents of service selection tables	19
Table 6	– Layout of parameter selection tables	19
Table 7	– Contents of parameter selection tables	19
Table 8	– Layout of class attribute selection tables	20
Table 9	– Contents of class attribute selection tables	20
Table 10	– CPF 1: overview of profile sets	22
Table 11	– CP 1/1: PhL selection for communicating devices and their MAUs	23
Table 12	– CP 1/1: PhL classification of MAUs and attached devices	24
Table 13	– CP 1/1: PhL selection of Clause 16 for devices and their MAUs	25
Table 14	– CP 1/1: PhL selection of Clause 12 for devices and their MAUs	25
Table 15	– CP 1/1: PhL selection of Clause 21 for devices and their MAUs (denigrated)	26
Table 16	– CP 1/1: PhL selection of recommended IS parameters for FF MAU classes 111, 112, 121, 122, 511 and 512	27
Table 17	– CP 1/1: PhL selection for media components	28
Table 18	– CP 1/1: PhL selection of imperative IS parameters for media in FISCO systems	28
Table 19	– CP 1/1: PhL selection for power supplies	29
Table 20	– CP 1/1: PhL selection of power supply types	29
Table 21	– CP 1/1: PhL selection of permissible output voltage and IS parameters for FISCO power supplies	30
Table 22	– CP 1/1: PhL selection for terminators	31
Table 23	– CP 1/1: PhL selection of IS parameters for terminators	31
Table 24	– CP 1/1: PhL selection of Clause 12 for intrinsic safety barriers	33
Table 25	– CP 1/1: PhL selection of recommended IS parameters for intrinsic safety barriers and galvanic isolators (Entity model only)	34
Table 26	– CP 1/1: PhL selection of Clause 12 for intrinsically safe galvanic isolators	35
Table 27	– CP 1/1: PhL selection of Clause 15, recommended optical fibre types	36
Table 28	– CP 1/1: PhL selection of passive star couplers, recommended maximum insertion loss	36
Table 29	– CP 1/1: PhL selection of active star couplers	36
Table 30	– CP 1/1: Optical power budget considerations	37
Table 31	– CP 1/1: DLL service selection	38
Table 32	– CP 1/1: DLL service selection of Clause 7	38
Table 33	– CP 1/1: DLL service selection of 7.4	38

Table 34 – CP 1/1: DLL service selection of 7.4.1	39
Table 35 – CP 1/1: DLL service selection of 7.4.3	39
Table 36 – CP 1/1: DLL service selection of 7.4.6	40
Table 37 – CP 1/1: DLL service selection of Clause 8	40
Table 38 – CP 1/1: DLL service selection of the summary of 8.3, DL-connection QoS	41
Table 39 – CP 1/1: DLL service selection of figures 11–16 of 8.4	41
Table 40 – CP 1/1: DLL service selection of 8.5	41
Table 41 – CP 1/1: DLL service selection: replacement for Table 13 of 8.5	42
Table 42 – CP 1/1: DLL service selection of 8.5, replacement for Table 14	42
Table 43 – CP 1/1: DLL service selection of 8.5 for use of addresses for peer DLC.....	43
Table 44 – CP 1/1: DLL service selection of 8.5 for use of addresses for multipeer DLC connect request at publisher	43
Table 45 – CP 1/1: DLL service selection of 8.5 for use of addresses for multipeer DLC connect request at subscriber	43
Table 46 – CP 1/1: DLL service selection of 8.6	43
Table 47 – CP 1/1: DLL service selection: replacement for Table 15 of 8.6	44
Table 48 – CP 1/1: DLL service selection of 8.7	44
Table 49 – CP 1/1: DLL service selection of 8.7, replacement for Table 16	44
Table 50 – CP 1/1: DLL service selection of 8.7, replacement for Table 17	44
Table 51 – CP 1/1: DLL service selection of 8.7, replacement for Table 18	45
Table 52 – CP 1/1: DLL service selection of Clause 9	45
Table 53 – CP 1/1: DLL service selection of 9.5, replacement for table 23	46
Table 54 – CP 1/1: DLL service selection of Clause 10	46
Table 55 – CP 1/1: DLL service selection of 10.5, replacement for table 28.....	46
Table 56 – CP 1/1: DLL protocol selection.....	47
Table 57 – CP 1/1: DLL protocol selection of Clause 6.....	47
Table 58 – CP 1/1: DLL protocol selection of 6.3.....	48
Table 59 – CP 1/1: DLL protocol selection of 6.3.2.1 for use of link designators.....	48
Table 60 – CP 1/1: DLL protocol selection of 6.3.2.2 for use of node designators.....	48
Table 61 – CP 1/1: DLL protocol selection of 6.3.3.1 for predefined flat non-local DL-addresses.....	48
Table 62 – CP 1/1: DLL protocol selection of 6.3.3.2 for predefined flat link-local DL-addresses.....	49
Table 63 – CP 1/1: DLL protocol selection of 6.3.3.3 for predefined node-local DL-addresses.....	49
Table 64 – CP 1/1: DLL protocol selection of 6.7.....	50
Table 65 – CP 1/1: DLL protocol selection of 6.7.4.....	51
Table 66 – CP 1/1: DLL protocol selection of 6.7.5.....	52
Table 67 – CP 1/1: DLL protocol selection of Clause 8.....	53
Table 68 – CP 1/1: DLL protocol selection, replacement for Table 10 of 8.0.....	54
Table 69 – CP 1/1: DLL protocol selection of 8.5.....	55
Table 70 – CP 1/1: DLL protocol selection of 8.7.....	58
Table 71 – CP 1/1: DLL protocol selection of 8.8.....	62
Table 72 – CP 1/1: DLL protocol selection of 8.11.....	63
Table 73 – CP 1/1: DLL protocol selection of 8.12.....	63
Table 74 – CP 1/1: DLL protocol selection of 8.15.....	64
Table 75 – CP 1/1: DLL protocol selection of 8.20.....	65
Table 76 – CP 1/1: DLL protocol selection of Clause 9.....	66
Table 77 – CP 1/1: DLL protocol selection of 9.4.....	67
Table 78 – CP 1/1: DLL protocol selection of Clause 10.....	68
Table 79 – CP 1/1: DLL protocol selection of 10.2.....	69
Table 80 – CP 1/1: DLL protocol selection of 10.2.2.....	79
Table 81 – CP 1/1: DLL protocol selection of 10.3.....	91

Table 82 – CP 1/1: DLL protocol selection of 10.4.....	92
Table 83 – CP 1/1: DLL protocol selection of Clause 11.....	93
Table 84 – CP 1/1: DLL protocol selection of 11.3.....	94
Table 85 – CP 1/1: DLL protocol selection of 11.3.5.....	96
Table 86 – CP 1/1: DLL protocol selection of 11.3.5.2.2, replacement for element encoding	97
Table 87 – CP 1/1: DLL protocol selection of Clause 12.....	97
Table 88 – CP 1/1: DLL protocol selection of 12.2.....	98
Table 89 – CP 1/1: DLL protocol selection of 12.3.....	99
Table 90 – CP 1/1: DLL protocol selection of 12.3.7, specification of errors.....	101
Table 91 – CP 1/1: DLL protocol selection of 12.4.....	102
Table 92 – CP 1/1: DLL protocol selection of 12.5.....	103
Table 93 – CP 1/1: DLL protocol selection of 12.6.....	103
Table 94 – CP 1/1: AL service selection.....	104
Table 95 – CP 1/1: AL service selection of Clause 3.....	104
Table 96 – CP 1/1: AL protocol selection.....	105
Table 97 – CP 1/2: AL service selection.....	106
Table 98 – CP 1/2: AL service selection of Clause 15.....	106
Table 99 – CP 1/2: AL protocol selection.....	107
Table 100 – CP 1/3: PhL selection for FF H2 devices.....	108
Table 101 – CP 1/3: PhL selection for FF H2 media and related components.....	109
Table 102 – CP 2/1: PhL selection.....	111
Table 103 – CP 2/1: DLL service selection.....	112
Table 104 – CP 2/1: DLL protocol selection.....	113
Table 105 – CP 2/1: DLL protocol selection of management objects.....	114
Table 106 – CPF 2: AL service selection.....	114
Table 107 – CP 2/1: AL protocol selection.....	115
Table 108 – CP 2/2: DLL protocol selection.....	116
Table 109 – CP 2/2: DLL protocol selection of management objects.....	117
Table 110 – CP 2/2: AL protocol selection.....	118
Table 111 – CPF 3: overview of profile sets.....	119
Table 112 – CP 3/1: PhL selection.....	121
Table 113 – CP 3/1: PhL selection of Clause 3.....	122
Table 114 – CP 3/1: PhL selection of Clause 4.....	122
Table 115 – CP 3/1: General DLL service selection.....	123
Table 116 – CP 3/1: DLL service selection for DP-V0 master (class 1).....	124
Table 117 – CP 3/1: DLM service selection for DP-V0 master (class 1).....	124
Table 118 – CP 3/1: DLL service selection for DP-V1 master (class 1).....	125
Table 119 – CP 3/1: DLM service selection for DP-V1 master (class 1).....	126
Table 120 – CP 3/1: DLL service selection for DP-V0 master (class 2).....	126
Table 121 – CP 3/1: DLL service selection for DP-V1 master (class 2).....	127
Table 122 – CP 3/1: DLL service selection for DP-V0 slave.....	128
Table 123 – CP 3/1: DLM service selection for DP-V0 slave.....	129
Table 124 – CP 3/1: DLL service selection for DP-V1 slave.....	130
Table 125 – CP 3/1: DLM service selection for DP-V1 slave.....	131
Table 126 – CP 3/1: General DLL protocol selection.....	132
Table 127 – CP 3/1: DLL protocol selection of Clause 20.....	132
Table 128 – CP 3/1: DLL protocol selection of Clause 21.....	133
Table 129 – CP 3/1: DLL protocol selection of Clause 22.....	133
Table 130 – CP 3/1: Time variable selection for DP-V0 master (class 1).....	134
Table 131 – CP 3/1: Timer and counter selection for DP-V0 master (class 1).....	134
Table 132 – CP 3/1: DLPDU selection for DP-V0 master (class 1).....	135
Table 133 – CP 3/1: MAC state selection for DP-V0 master (class 1).....	135
Table 134 – CP 3/1: Time variable selection for DP-V1 master (class 1).....	136

Table 135 – CP 3/1: Timer and counter selection for DP-V1 master (class 1)	136
Table 136 – CP 3/1: DLPDU selection for DP-V1 master (class 1).....	137
Table 137 – CP 3/1: MAC state selection for DP-V1 master (class 1)	137
Table 138 – CP 3/1: CS protocol selection for DP-V1 master (class 1)	137
Table 139 – CP 3/1: Time variable selection for DP-V1 master (class 2)	138
Table 140 – CP 3/1: Timer and counter selection for DP-V1 master (class 2)	138
Table 141 – CP 3/1: DLPDU selection for DP-V1 master (class 2).....	139
Table 142 – CP 3/1: Time variable selection for DP-V0 slave	139
Table 143 – CP 3/1: Timer and counter selection for DP-V0 slave.....	140
Table 144 – CP 3/1: DLPDU selection for DP-V0 slave	140
Table 145 – CP 3/1: MAC state selection for DP-V0 slave.....	141
Table 146 – CP 3/1: Time variable selection for DP-V1 slave	141
Table 147 – CP 3/1: Timer and counter selection for DP-V1 slave.....	142
Table 148 – CP 3/1: DLPDU selection for DP-V1 slave	142
Table 149 – CP 3/1: CS protocol selection for DP-V1 slave.....	142
Table 150 – CP 3/1, 3/2: AL service selection	143
Table 151 – CP 3/1, 3/2: AL service selection of data types	143
Table 152 – CP 3/1, 3/2: AL service selection of Clause 8.....	145
Table 153 – CP 3/1, 3/2: AL service selection of I/O data ASE.....	145
Table 154 – CP 3/1, 3/2: AL service selection of Diagnosis ASE.....	145
Table 155 – CP 3/1, 3/2: AL service selection of Context ASE	146
Table 156 – CP 3/1, 3/2: AL service selection of Management ASE	147
Table 157 – CP 3/1, 3/2: AL service selection of AR ASE.....	147
Table 158 – CP 3/1, 3/2: AL service selection of Clause 8.....	148
Table 159 – CP 3/1, 3/2: AL service selection of Process data ASE	148
Table 160 – CP 3/1, 3/2: AL service selection of I/O data ASE	149
Table 161 – CP 3/1, 3/2: AL service selection of Alarm ASE	149
Table 162 – CP 3/1, 3/2: AL service selection of Context ASE	149
Table 163 – CP 3/1, 3/2: AL service selection of Load region ASE	149
Table 164 – CP 3/1, 3/2: AL service selection of Function invocation ASE	150
Table 165 – CP 3/1, 3/2: AL service selection of Time ASE.....	150
Table 166 – CP 3/1, 3/2: AL service selection of AR ASE.....	151
Table 167 – CP 3/1, 3/2: AL service selection of Clause 8.....	152
Table 168 – CP 3/1, 3/2: AL service selection of I/O data ASE	152
Table 169 – CP 3/1, 3/2: AL service selection of Diagnosis ASE	152
Table 170 – CP 3/1, 3/2: AL service selection of Context ASE	153
Table 171 – CP 3/1, 3/2: AL service selection of Management ASE	154
Table 172 – CP 3/1, 3/2: AL service selection of AR ASE.....	154
Table 173 – CP 3/1, 3/2: AL service selection of Clause 8.....	155
Table 174 – CP 3/1, 3/2: AL service selection of Process data ASE	155
Table 175 – CP 3/1, 3/2: AL service selection of Context ASE	156
Table 176 – CP 3/1, 3/2: AL service selection of Load region ASE	157
Table 177 – CP 3/1, 3/2: AL service selection of Function invocation ASE	157
Table 178 – CP 3/1, 3/2: AL service selection of Time ASE.....	157
Table 179 – CP 3/1, 3/2: AL service selection of AR ASE.....	158
Table 180 – CP 3/1, 3/2: AL service selection of Clause 8.....	159
Table 181 – CP 3/1, 3/2: AL service selection of I/O data ASE	159
Table 182 – CP 3/1, 3/2: AL service selection of Diagnosis ASE	160
Table 183 – CP 3/1, 3/2: AL service selection of Context ASE	161
Table 184 – CP 3/1, 3/2: AL service selection of AR ASE.....	162
Table 185 – CP 3/1, 3/2: AL service selection of Clause 8.....	163
Table 186 – CP 3/1, 3/2: AL service selection of Process data ASE	163
Table 187 – CP 3/1, 3/2: AL service selection of I/O data ASE	163

Table 189 – CP 3/1, 3/2: AL service selection of Alarm ASE	164
Table 190 – CP 3/1, 3/2: AL service selection of Context ASE	165
Table 191 – CP 3/1, 3/2: AL service selection of Load region ASE	166
Table 192 – CP 3/1, 3/2: AL service selection of Function invocation ASE	166
Table 193 – CP 3/1, 3/2: AL service selection of Time ASE	166
Table 194 – CP 3/1, 3/2: AL service selection of AR ASE	167
Table 195 – CP 3/1, 3/2: AL protocol selection	168
Table 196 – CP 3/1, 3/2: AL protocol selection of Clause 6	168
Table 197 – CP 3/1, 3/2: AL protocol selection of APDUs	169
Table 198 – CP 3/1, 3/2: AL protocol selection of FSPM services primitives	170
Table 199 – CP 3/1, 3/2: AL protocol selection of DMPM services primitives	170
Table 200 – CP 3/1, 3/2: AL protocol selection of Clause 6	171
Table 201 – CP 3/1, 3/2: AL protocol selection of APDUs	172
Table 202 – CP 3/1, 3/2: AL protocol selection of FSPM services primitives	173
Table 203 – CP 3/1, 3/2: AL protocol selection of DMPM services primitives	174
Table 204 – CP 3/1, 3/2: AL protocol selection of Clause 6	174
Table 205 – CP 3/1, 3/2: AL protocol selection of APDUs	175
Table 206 – CP 3/1, 3/2: AL protocol selection of FSPM services primitives	175
Table 207 – CP 3/1, 3/2: AL protocol selection of DMPM services primitives	176
Table 208 – CP 3/1, 3/2: AL protocol selection of Clause 6	176
Table 209 – CP 3/1, 3/2: AL protocol selection of APDUs	176
Table 210 – CP 3/1, 3/2: AL protocol selection of FSPM services primitives	178
Table 211 – CP 3/1, 3/2: AL protocol selection of DMPM services primitives	178
Table 212 – CP 3/1, 3/2: AL protocol selection of Clause 6	179
Table 213 – CP 3/1, 3/2: AL protocol selection of APDU selection	179
Table 214 – CP 3/1, 3/2: AL protocol selection of FSPM services primitives	180
Table 215 – CP 3/1, 3/2: AL protocol selection of DMPM services primitives	180
Table 216 – CP 3/1, 3/2: AL protocol selection of Clause 6	181
Table 217 – CP 3/1, 3/2: AL protocol selection of APDUs	182
Table 218 – CP 3/1, 3/2: AL protocol selection of FSPM services primitives	183
Table 219 – CP 3/1, 3/2: AL protocol selection of DMPM services primitives	184
Table 220 – CP 3/2: PhL selection	186
Table 221 – CP 3/2: PhL selection of Clause 12 for devices and their MAUs	188
Table 222 – CP 3/2: PhL selection of Clause 21 for devices and their MAUs	189
Table 223 – CP 3/2: General DLL protocol selection	190
Table 224 – CP 3/2: DLL protocol selection of Clause 5	190
Table 225 – CP 3/2: DLL protocol selection of Clause 20	191
Table 226 – CP 3/2: DLL protocol selection of Clause 21	191
Table 227 – CP 3/2: DLL protocol selection of Clause 22	192
Table 228 – CP 3/2: Time variable selection for DP-V0 master (class 1)	192
Table 229 – CP 3/2: Timer and counter selection for DP-V0 master (class 1)	193
Table 230 – CP 3/2: DLPDU selection for DP-V0 master (class 1)	193
Table 231 – CP 3/2: Time variable selection for DP-V1 master (class 1)	194
Table 232 – CP 3/2: Timer and counter selection for DP-V1 master (class 1)	194
Table 233 – CP 3/2: DLPDU selection for DP-V1 master (class 1)	195
Table 234 – CP 3/2: Time variable selection for DP-V1 master (class 2)	196
Table 235 – CP 3/2: Timer and counter selection for DP-V1 master (class 2)	196
Table 236 – CP 3/2: DLPDU selection for DP-V1 master (class 2)	197
Table 237 – CP 3/2: Time variable selection for DP-V0 slave	197
Table 238 – CP 3/2: Timer and counter selection for DP-V0 slave	198
Table 239 – CP 3/2: DLPDU selection for DP-V0 slave	198
Table 240 – CP 3/2: Time variable selection for DP-V1 slave	199
Table 241 – CP 3/2: Timer and counter selection for DP-V1 slave	199

Table 242 – CP 3/2: DLPDU selection for DP-V1 slave	200
Table 243 – CP 3/3: AL service selection	201
Table 244 – CP 3/3: AL protocol selection.....	201
Table 245 – CP 4/1: PhL selection	203
Table 246 – CP 4/1: DLL service selection	204
Table 247 – CP 4/1: DLL protocol selection.....	204
Table 248 – CP 4/1: AL service selection	205
Table 249 – CP 4/1: AL protocol selection.....	205
Table 250 – CP 4/2: PhL selection	206
Table 251 – CPF 5: overview of profile sets	207
Table 252 – CPF 5: PhL selection	208
Table 253 – CPF 5: DLL service selection.....	209
Table 254 – CPF 5: DLL service selection of Clause 18	209
Table 255 – CPF 5: DLL protocol selection	210
Table 256 – CPF 5: DLL protocol selection of variables and resources.....	210
Table 257 – CPF 5: DLL protocol selection of DLPDUs	211
Table 258 – CP 5/1: AL service selection	211
Table 259 – CP 5/1: AL service selection of ASEs.....	211
Table 260 – CPF 5: AL service selection of MPS ASEs	212
Table 261 – CPF 5: AL service selection of variable elements.....	212
Table 262 – CPF 5: AL service selection of produced variable elements	212
Table 263 – CPF 5: AL service selection of consumed variable elements	212
Table 264 – CP 5/1: AL service selection of MPS services	213
Table 265 – CP 5/1, 5/2: AL service selection of A_Readloc service parameters.....	213
Table 266 – CP 5/1, 5/2: AL service selection of A_Readfar service parameters	213
Table 267 – CP 5/1, 5/2: AL service selection of A_Read service parameters	213
Table 268 – CP 5/1: AL service selection of MCS service classes	213
Table 269 – CP 5/1: AL service selection of QoS	214
Table 270 – CP 5/1: AL service selection of MCS services	214
Table 271 – CP 5/1, 5/2: AL service selection of A_Data parameters	214
Table 272 – CP 5/1: AL protocol selection.....	214
Table 273 – CPF 5: AL protocol selection of MPS data types	215
Table 274 – CPF 5: AL protocol selection of MPS PDUs	215
Table 275 – CPF 5: AL protocol selection of MPS encoding rules.....	215
Table 276 – CP 5/1, 5/2: AL protocol selection of MCS PDUs	215
Table 277 – CP 5/1: AL protocol selection of MCS state machines	216
Table 278 – CP 5/2: AL service selection	216
Table 279 – CP 5/2: AL service selection of ASEs.....	216
Table 280 – CP 5/2: AL service selection of MPS services	217
Table 281 – CP 5/2: AL service selection of MCS service classes	217
Table 282 – CP 5/2: AL service selection of QoS	217
Table 283 – CP 5/2: AL service selection of MCS services	217
Table 284 – CP 5/2: AL service selection of domain services	218
Table 285 – CP 5/2: AL service selection of domain object attributes	218
Table 286 – CP 5/2: AL service selection of program services.....	218
Table 287 – CP 5/2: AL service selection of program object attributes	218
Table 288 – CP 5/2: AL service selection of variable services	219
Table 289 – CP 5/2: AL service selection of variable classes	219
Table 290 – CP 5/2: AL service selection of variable class attributes	219
Table 291 – CP 5/2: AL protocol selection.....	219
Table 292 – CP 5/2: AL protocol selection of MCS state machines.....	220
Table 293 – CP 5/2: AL protocol selection of sub-MMS coding rules	220
Table 294 – CP 5/2: AL protocol selection of sub-MMS PDUs	221

Table 295 – CP 5/3: AL service selection	221
Table 296 – CP 5/3: AL service selection of ASEs.....	221
Table 297 – CP 5/3: AL protocol selection.....	222
Table 298 – CPF 6: device CP identifier assignment.....	223
Table 299 – CPF 6: PhL selection	224
Table 300 – CPF 6: DLL service selection.....	225
Table 301 – CP 6/1: DLL service selection, assignment of DLL services to device types ...	226
Table 302 – CPF 6: DLL protocol selection	227
Table 303 – CPF 6: DLL protocol selection of data widths supported by master	228
Table 304 – CP 6/1 and CP 6/2: AL service selection.....	229
Table 305 – CP 6/1: AL service selection, assignment of AL services to device types	230
Table 306 – CPF 6: AL protocol selection.....	230
Table 307 – CP 6/2: DLL service selection, assignment of DLL services to device types ...	231
Table 308 – CP 6/2: AL service selection, assignment of AL services to device types	232
Table 309 – CP 6/2: AL service selection of AR-Data-Send-Acknowledge service parameters.....	233
Table 310 – CP 6/3: DLL service selection, assignment of DLL services to device types ...	234
Table 311 – CP 6/3: AL service selection	235
Table 312 – CP 6/3: AL service selection, assignment of AL services to device types	236
Table 313 – CPF 7: PhL selection	238
Table 314 – CP 7/1: DLL service selection	239
Table 315 – CP 7/1: DLL protocol selection.....	240
Table 316 – CP 7/2: DLL service selection.....	241
Table 317 – CP 7/2: DLL protocol selection.....	242
Table 318 – CP 7/2: AL service selection	243
Table 319 – CP 7/2: AL protocol selection.....	243
Table A.1 – CPF 7: Maximum segment and logical-link length as a function of data-rate ...	254
Table A.2 – CPF 7: Data link connection characteristics.....	255

INTERNATIONAL ELECTROTECHNICAL COMMISSION

DIGITAL DATA COMMUNICATIONS FOR MEASUREMENT AND CONTROL –

Part 1: Profile sets for continuous and discrete manufacturing relative to fieldbus use in industrial control systems

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The 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 the 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 National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

The International Electrotechnical Commission (IEC) draws attention to the fact that use of this International Standard involves the use of IEC 61158 series, and so may involve the use of patents given in IEC 61158. Each of the parts of IEC 61158 lists patents that may apply to that part, and at least some of the protocol types defined or specified within that part to which those patents may apply. The IEC takes no position concerning the evidence, validity and scope of any of those patent rights.

The holders of the patent rights identified in IEC 61158 series have assured the IEC that they are willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statements of the holders of these patent rights are registered with the IEC.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights other than those identified above. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61784-1 has been prepared by subcommittee 65C: Digital communications, of IEC technical committee 65: Industrial-process measurement and control.

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

FDIS	Report on voting
65C/294/FDIS	65C/302/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

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

The committee has decided that the contents of this publication will remain unchanged until 2007. At that date this publication will be

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

The contents of the corrigendum of July 2004 have been included in this copy.

Withdrawn

INTRODUCTION

This part of IEC 61784 provides a set of communication profiles in the sense of ISO/IEC TR 10000-1. These answer the need of identifying the protocol families co-existing within the IEC 61158 series, as a result of the international harmonisation of fieldbus technologies available on the market. More specifically, these profiles help to correctly state the compliance to the IEC 61158 series, and to avoid the spreading of divergent implementations, which would limit its use, clearness and understanding. Additional profiles to address specific market concerns, such as functional safety or information security, may be addressed by future parts of this standard.

This standard contains several communication profile families, which specify one or more communication profiles. Such profiles identify, in a strict sense, protocol subsets of the IEC 61158 series via protocol specific communication profiles. They do not define device-type-specific communication profiles for the purpose of guiding manufacturers in feature set selection – for example, in selecting the minimum set of communication services and protocol to implement a specific class of devices, such as generic slaves or transmitters ("implementation profiles"). Neither do they define device profiles that specify communication profiles together with application functions needed to answer the need of a specific application ("application profiles").

It is agreed that these latter classes of profiles would help the use of the IEC 61158 series of standards; the profiles defined in this document are a necessary step to achieve that task.

It is also important to clarify that interoperability — defined as the ability of two or more network systems to exchange information and to make mutual use of the information that has been exchanged (see 3.2.1 of ISO/IEC TR 10000-1) — can be directly achieved on the same link only for those devices complying to the same communication profile.

Profiles contained in this International Standard are constructed of references to IEC 61158-2 through IEC 61158-6 and other IS, TS or worldwide-accepted standards, as appropriate¹. Each profile is required to reference at least one part of IEC 61158-2 through IEC 61158-6.

Two or more Profiles, which are related to a common family, are specified within a "Communication Profile Family" (CPF).

¹ International Standardised Profiles may contain normative references to specifications other than International Standards; see ISO/IEC JTC 1 N 4047.

DIGITAL DATA COMMUNICATIONS FOR MEASUREMENT AND CONTROL –

Part 1: Profile sets for continuous and discrete manufacturing relative to fieldbus use in industrial control systems

1 Scope

This part of IEC 61784 defines a set of protocol specific communication profiles based primarily on the IEC 61158 series, to be used in the design of devices involved in communications in factory manufacturing and process control.

Each profile selects specifications for the communications protocol stack at a device. It contains a minimal set of required services at the Application Layer and specification of options in intermediate layers defined through references. If no Application Layer is included, then a minimal set of required services at the Data Link Layer is specified. The appropriate references to the protocol specific types are given in each communication profile family or associated profiles.

NOTE All profiles are based on standards or draft standards or International Standards published by the IEC or from standards or International Standards established by other standards bodies or open standards processes.

The structure of communication profile families is specified in Figure 1.

Withhold

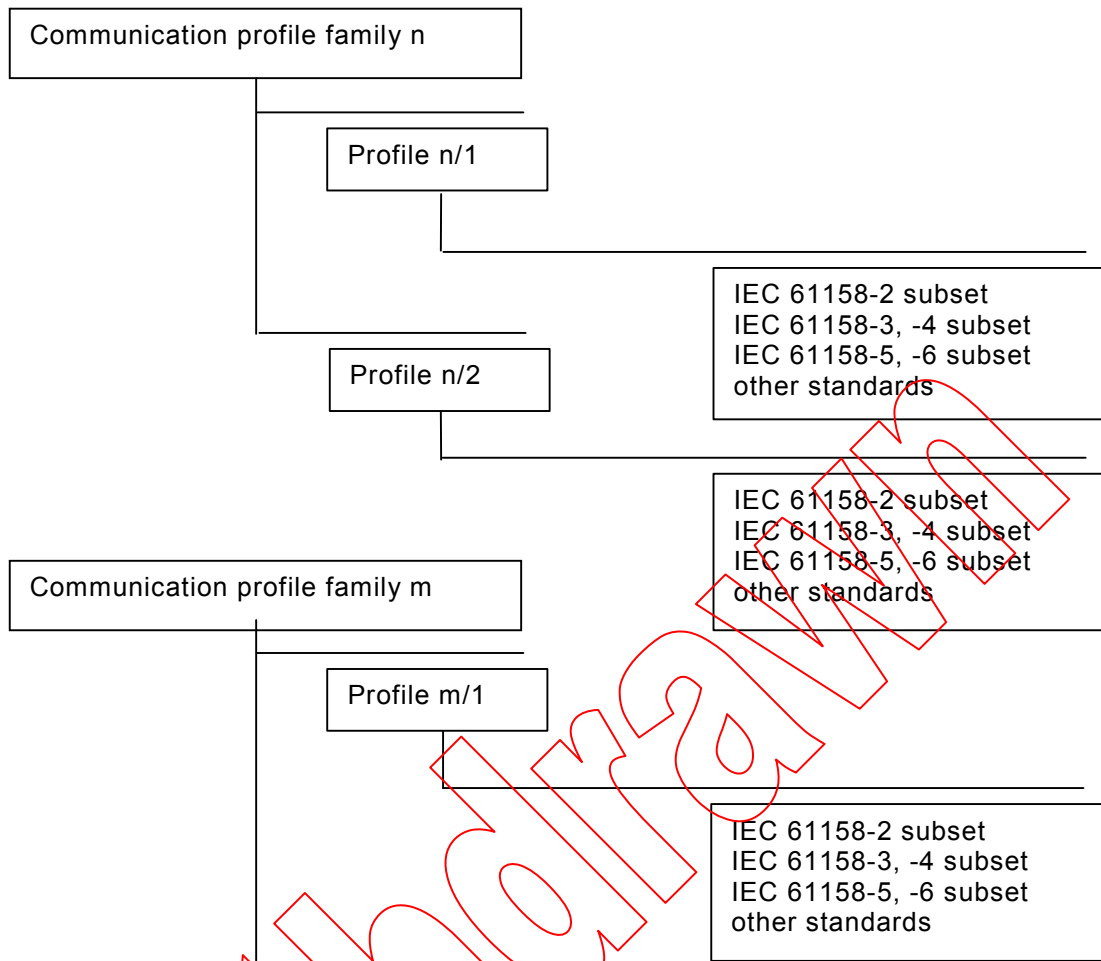


Figure 1 – Communication profile families and profiles

Each profile selects an appropriate consistent and compatible subset of services and protocols from the total available set that is defined and modelled in IEC 61158. For the selected subset of services and protocols, the profile also describes any possible or necessary constraints in parameter values.

Table 1 shows the communication profile families that are defined in this standard.

Table 1 – Relations of Communication Profile Families to type numbers

IEC 61784-1 contents			Corresponding IEC 61158 Types
CPF	Clause	Communication Profile Families (Note 1)	Type
1	5	FOUNDATION® Fieldbus	1, 5, 9 (Note 2)
2	6	ControlNet™	2
3	7	PROFIBUS	3, 10 (Note 3)
4	8	P-NET®	4
5	9	WorldFIP®	7
6	10	INTERBUS®	8
7	11	SwiftNet™	6

NOTE 1 See the specific CPF clauses for information on the respective trademark holders.

NOTE 2 CP 1/1 has a denigrated PhL device profile subclass, which uses a variant of a Type 3 PhL.

NOTE 3 CP 3/2 has a denigrated PhL device profile subclass, which uses a variant of a Type 1 PhL.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies.

For undated references to the IEC 61158 series, only the edition published contemporaneously with this edition of these profiles applies.² For all other undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60079-11:1999, *Electrical apparatus for explosive gas atmospheres – Part 11: Intrinsic safety “i”*

IEC 60079-14:2002, *Electrical apparatus for explosive gas atmospheres – Part 14: Electrical installations in hazardous areas (other than mines)*

IEC 60079-25, *Electrical apparatus for explosive gas atmospheres – Part 25: Intrinsically safe systems*³

IEC 60079-27:2002, *Electrical apparatus for explosive gas atmospheres – Part 27: Fieldbus intrinsically safe concept (FISCO)*

IEC 61010 (all parts), *Safety requirements for electrical equipment for measurement, control and laboratory use*

IEC 61131-2:1992, *Programmable controllers – Part 2: Equipment requirements and tests*

IEC 61158-2:2003, *Digital data communications for measurement and control – Fieldbus for use in industrial control systems – Part 2: Physical Layer specification and service definition*

IEC 61158-3:2003, *Digital data communications for measurement and control – Fieldbus for use in industrial control systems – Part 3: Data Link Service definition*

IEC 61158-4:2003, *Digital data communications for measurement and control – Fieldbus for use in industrial control systems – Part 4: Data Link Protocol specification*

IEC 61158-5:2003, *Digital data communications for measurement and control – Fieldbus for use in industrial control systems – Part 5: Application Layer Service definition*

IEC 61158-6:2003, *Digital data communications for measurement and control – Fieldbus for use in industrial control systems – Part 6: Application Layer protocol specification*

ISO/IEC 7498-1, *Information technology – Open Systems Interconnection – Basic Reference Model – Part 1: The Basic Model*

ISO/IEC 7498-2, *Information technology – Open Systems Interconnection – Basic Reference Model – Part 2: Security Architecture*

ISO/IEC 7498-3, *Information technology – Open Systems Interconnection – Basic Reference Model – Part 3: Naming and addressing*

ISO/IEC 8802-3:2001, *Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and Physical Layer specifications*

ISO/DIS 15745-3, *Industrial automation systems and integration – Open systems application integration framework – Part 3: Reference description for IEC 61158-based control systems*⁴

ANSI TIA/EIA-232F:1997, *Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange*

² This variance from the IEC editing rules was adopted because of the large number of references to the IEC 61158 series.

³ To be published.

⁴ To be published.

ANSI TIA/EIA 422-B:1994, *Electrical Characteristics of Balanced Voltage Digital Interface Circuits*

ANSI TIA/EIA-485-A:1998, *Electrical Characteristics of Generators and Receivers for Use in Balanced Digital Multipoint Systems*

Internet Engineering Task Force (IETF), *Request for Comments (RFC)*:

- | | |
|--|--|
| RFC 768, <i>User Datagram Protocol</i> | (available at < http://www.ietf.org/rfc/rfc0768.txt >) |
| RFC 791, <i>Internet Protocol</i> | (available at < http://www.ietf.org/rfc/rfc0791.txt >) |
| RFC 792, <i>Internet Control Message Protocol</i> | (available at < http://www.ietf.org/rfc/rfc0792.txt >) |
| RFC 793, <i>Transmission Control Protocol</i> | (available at < http://www.ietf.org/rfc/rfc0793.txt >) |
| RFC 826, <i>Ethernet Address Resolution Protocol</i> | (available at < http://www.ietf.org/rfc/rfc0826.txt >) |
| RFC 894, <i>A standard for the Transmission of IP Datagrams over Ethernet Networks</i> | (available at < http://www.ietf.org/rfc/rfc0894.txt >) |
| RFC 1112, <i>Host Extensions for IP Multicasting</i> | (available at < http://www.ietf.org/rfc/rfc1112.txt >) |
| RFC 2236, <i>Internet Group Management Protocol, Version 2</i> | (available at < http://www.ietf.org/rfc/rfc2236.txt >) |

Open Software Foundation (OSF):

- C706, *CAE Specification DCE11: Remote Procedure Call*
(available at <<http://www.opengroup.org/onlinepubs/9629399/toc.htm>>)

Withdrawn