

IEC/PAS 61804-2

Edition 1.0
2002-10

PRE-STANDARD

**Function blocks (FB)
for process control –**

**Part 2:
Specification of FB concept and
Electronic Device Description Language
(EDDL)**

Document Preview

[IEC/PAS 61804-2:2002](https://standards.iteh.ai/cstdng/standards/iec/92189972-304c-4b9d-8a47-5eb8ba97c10a/iec-pas-61804-2-2002)

<https://standards.iteh.ai/cstdng/standards/iec/92189972-304c-4b9d-8a47-5eb8ba97c10a/iec-pas-61804-2-2002>

PUBLICLY AVAILABLE SPECIFICATION



INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

Reference number
IEC/PAS 61804-2

Withdrawn

iTeH Standards
(<https://standards.iteh.ai>)

Document Preview

IEC PAS 61804-2:2002

<https://standards.iteh.ai/cx/trad/standards/ics/92189972-304c-4b9d-8a47-5eb8ba97c10a/iec-pas-61804-2-2002>

IEC/PAS 61804-2

Edition 1.0
2002-10

PRE-STANDARD

**Function blocks (FB)
for process control –**

**Part 2:
Specification of FB concept and
Electronic Device Description Language
(EDDL)**

Document Preview

[IEC/PAS 61804-2:2002](https://standards.iteh.ai/cstdng/standards/iec/92189972-304c-4b9d-8a47-5eb8ba97c10a/iec-pas-61804-2-2002)

<https://standards.iteh.ai/cstdng/standards/iec/92189972-304c-4b9d-8a47-5eb8ba97c10a/iec-pas-61804-2-2002>

PUBLICLY AVAILABLE SPECIFICATION



INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

Reference number
IEC/PAS 61804-2

CONTENTS

FOREWORD.....	21
INTRODUCTION.....	22
1 Scope	24
2 Normative references	26
3 Terms and definitions	27
3.1 Definitions	27
3.2 Abbreviated terms and acronyms	33
3.3 Conventions for lexical structures	33
4 General Function Block (FB) definition and EDD model	35
4.1 Device structure (device model)	35
4.1.1 Device model description	35
4.1.2 FB type.....	39
4.1.3 FB execution.....	40
4.1.4 Reference between IEC 61499 and IEC 61804 models.....	41
4.1.5 UML specification of the device model.....	41
4.1.6 Classification of the algorithms.....	43
4.1.7 Algorithm description.....	43
4.1.8 Input and Output variables and Parameter definition	44
4.1.9 Choice of variables and parameters.....	45
4.1.10 Mode, Status and Diagnosis.....	45
4.2 Block combinations.....	45
4.2.1 Measurement channel.....	45
4.2.2 Actuation channel.....	46
4.2.3 Application.....	47
4.3 EDD and EDDL model	48
4.3.1 Overview of EDD and EDDL	48
4.3.2 EDD architecture	48
4.3.3 Concepts of EDD	48
4.3.4 Principles of the EDD development process.....	49
4.3.5 Interrelations between the lexical structure and formal definitions	50
4.3.6 Builtins.....	50
4.3.7 Profiles	50
5 Detailed block definition.....	51
5.1 Application FBs	51
5.1.1 Measurement (Input) FB.....	51
5.1.2 Analog Actuation (Output) FB	52
5.1.3 Discrete Input FB	54
5.1.4 On/Off Actuation (Output) FB	56
5.1.5 Calculation FB	57
5.1.6 Control FB	58
5.2 Component FBs.....	60
5.3 Technology Block	60
5.3.1 Temperature Technology Block	60
5.3.2 Pressure Technology Block	63
5.3.3 Modulating Actuation Technology Block.....	65
5.3.4 On/Off Actuation Technology Block	68

5.4	Device (Resource) Block.....	70
5.4.1	Identification	70
5.4.2	Device state.....	71
5.4.3	Message.....	72
5.4.4	Initialisation	73
5.5	Algorithms common to all blocks	73
5.5.1	Data Input/Data Output status	73
5.5.2	Restart Initialisation	73
5.5.3	Fail-safe	73
5.5.4	Remote Cascade Initialisation	74
6	FB Environment.....	74
7	Mapping to System Management	74
8	Mapping to Communication.....	75
9	Electronic Device Description Language	77
9.1	Overview	77
9.1.1	EDDL features	77
9.1.2	Syntax representation	77
9.1.3	EDD language elements.....	77
9.1.4	Basic construction elements	77
9.1.5	Common attributes.....	82
9.1.6	Special elements	83
9.1.7	Rules for instances	83
9.1.8	Rules for list of VARIABLEs	83
9.2	EDD identification information.....	83
9.2.1	General structure	83
9.2.2	Specific attributes	84
9.3	BLOCK.....	86
9.3.1	BLOCK_A	86
9.3.2	BLOCK_B	90
9.4	COLLECTION.....	92
9.4.1	General structure	92
9.4.2	Specific attributes - item-type	92
9.5	COMMAND.....	93
9.5.1	General structure	93
9.5.2	Specific attributes	94
9.6	CONNECTION.....	98
9.6.1	General structure	98
9.6.2	Specific attribute - APPINSTANCE	98
9.7	DOMAIN.....	99
9.7.1	General structure	99
9.7.2	Specific attribute - HANDLING.....	99
9.8	EDIT_DISPLAY	100
9.8.1	General structure	100
9.8.2	Specific attributes	100
9.9	IMPORT	101
9.9.1	General structure	101
9.9.2	Specific attributes – attribute-redefinition	103
9.10	LIKE.....	109

9.11	MENU	110
9.11.1	General structure	110
9.11.2	Specific attributes	111
9.11.3	Sequence diagrams for actions	115
9.12	METHOD.....	119
9.12.1	General structure	119
9.12.2	Specific attributes	119
9.13	PROGRAM	120
9.13.1	General structure	120
9.13.2	Specific attributes - ARGUMENT	120
9.14	RECORD.....	121
9.15	REFERENCE_ARRAY	121
9.15.1	General structure	121
9.15.2	Specific attributes - ELEMENTS	122
9.16	Relations	122
9.16.1	General structure	122
9.16.2	REFRESH.....	122
9.16.3	UNIT	123
9.16.4	WRITE_AS_ONE	123
9.17	RESPONSE_CODES	123
9.18	VALUE_ARRAY.....	124
9.18.1	General structure	124
9.18.2	Specific attributes	124
9.19	VARIABLE	125
9.19.1	General structure	125
9.19.2	Specific attributes	126
9.20	VARIABLE_LIST.....	139
9.21	Common attributes	139
9.21.1	DEFINITION	139
9.21.2	HELP	140
9.21.3	LABEL	140
9.21.4	MEMBERS	140
9.21.5	RESPONSE_CODES	141
9.22	Output redirection (OPEN and CLOSE)	141
9.23	Conditional expression	142
9.24	Referencing	143
9.24.1	Referencing an EDD instance.....	143
9.24.2	Referencing members of a RECORD	143
9.24.3	Referencing elements of a VALUE_ARRAY	144
9.24.4	Referencing members of a COLLECTION	144
9.24.5	Referencing elements of a REFERENCE_ARRAY	144
9.24.6	Referencing members of a VARIABLE_LISTS	145
9.24.7	Referencing elements of BLOCK_A PARAMETERS	145
9.24.8	Referencing elements of BLOCK_A PARAMETER_LISTS	146
9.24.9	Referencing BLOCK_A CHARACTERISTICS	146
9.25	Strings	147
9.25.1	Specifying a string as a string literal	147
9.25.2	Specifying a string as a string variable	147
9.25.3	Specifying a string as an enumeration value	147

9.25.4 Specifying a string as a dictionary reference.....	147
9.25.5 Referencing HELP and LABEL attributes of EDD instances	148
9.25.6 String operations.....	148
9.26 Expression	148
9.26.1 General structure	148
9.26.2 Primary expressions.....	149
9.26.3 Unary expressions	149
9.26.4 Binary expressions.....	150
9.27 Text dictionary.....	153
10 Conformance Statement	153
Annex A (informative) Parameter description	154
Annex B (normative) IEC 61804 Conformance Declaration.....	160
Annex C (normative) EDDL Formal Definition	161
C.1 EDDL Preprocessor	161
C.1.1 General structure.....	161
C.1.2 Directives.....	161
C.1.3 Predefined macros.....	164
C.1.4 Newline characters	164
C.1.5 Comments	164
C.2 Conventions	164
C.2.1 Integer constants.....	164
C.2.2 Floating point constants.....	165
C.2.3 String literals	165
C.2.4 Using language codes in string constants.....	166
C.3 Operators	166
C.4 Keywords	168
C.5 Terminals	169
C.6 Formal EDDL syntax	171
C.6.1 General	171
C.6.2 EDD identification information	171
C.6.3 BLOCK_A and BLOCK_B	172
C.6.4 COLLECTION	175
C.6.5 COMMAND	176
C.6.6 CONNECTION	180
C.6.7 DOMAIN	180
C.6.8 EDIT_DISPLAY	181
C.6.9 IMPORT	182
C.6.10 LIKE	183
C.6.11 MENU	185
C.6.12 METHOD	188
C.6.13 PROGRAM	189
C.6.14 RECORDS	190
C.6.15 REFERENCE_ARRAY	190
C.6.16 Relations	192
C.6.17 RESPONSE_CODES	193
C.6.18 VALUE_ARRAY	193
C.6.19 VARIABLE	194
C.6.20 VARIABLE_LIST	202

C.6.21	Common attributes.....	203
C.6.22	OPEN, CLOSE.....	205
C.6.23	Expression.....	205
C.6.24	C-Grammer.....	206
C.6.25	Redefinition	211
C.6.26	References	222
Annex D (normative) EDDL Builtin Library	224	
D.1	General	224
D.2	Conventions for Builtin descriptions	224
D.3	Builtin abort.....	224
D.4	Builtin abort_on_all_comm_errors	225
D.5	Builtin ABORT_ON_ALL_COMM_STATUS	225
D.6	Builtin ABORT_ON_ALL_DEVICE_STATUS	226
D.7	Builtin ABORT_ON_ALL_RESPONSE_CODES	226
D.8	Builtin abort_on_all_response_codes	227
D.9	Builtin abort_on_comm_error	227
D.10	Builtin ABORT_ON_COMM_ERROR	228
D.11	Builtin ABORT_ON_COMM_STATUS	228
D.12	Builtin ABORT_ON_DEVICE_STATUS	229
D.13	Builtin ABORT_ON_NO_DEVICE	229
D.14	Builtin ABORT_ON_RESPONSE_CODE	230
D.15	Builtin abort_on_response_code	231
D.16	Builtin ACKNOWLEDGE	231
D.17	Builtin acknowledge	231
D.18	Builtin add_abort_method (version A).....	232
D.19	Builtin add_abort_method (version B).....	232
D.20	Builtin assign	233
D.21	Builtin assign_double	233
D.22	Builtin assign_float	234
D.23	Builtin assign_int	234
D.24	Builtin assign_var	234
D.25	Builtin atof	235
D.26	Builtin atoi	235
D.27	Builtin dassign	235
D.28	Builtin DELAY	236
D.29	Builtin delay	236
D.30	Builtin DELAY_TIME	237
D.31	Builtin delayfor	237
D.32	Builtin DICT_ID	237
D.33	Builtin discard_on_exit.....	238
D.34	Builtin display	238
D.35	Builtin display_builtin_error	239
D.36	Builtin display_comm_error	239
D.37	Builtin display_comm_status	240

D.38	Builtin display_device_status	240
D.39	Builtin display_dynamics.....	240
D.40	Builtin display_message	241
D.41	Builtin display_response_code	242
D.42	Builtin display_response_status	242
D.43	Builtin display_xmtr_status	243
D.44	Builtin edit_device_value	243
D.45	Builtin edit_local_value	244
D.46	Builtin ext_send_command	245
D.47	Builtin ext_send_command_trans.....	245
D.48	Builtin fail_on_all_comm_errors	246
D.49	Builtin fail_on_all_response_codes	246
D.50	Builtin fail_on_comm_error	247
D.51	Builtin fail_on_response_code	247
D.52	Builtin fassign.....	248
D.53	Builtin fgetval	248
D.54	Builtin float_value	248
D.55	Builtin fsetval.....	249
D.56	Builtin ftoa	249
D.57	Builtin fvar_value	249
D.58	Builtin get_acknowledgement.....	250
D.59	Builtin get_comm_error.....	250
D.60	Builtin get_comm_error_string	251
D.61	Builtin get_date	251
D.62	Builtin get_date_value	252
D.63	Builtin get_dds_error	252
D.64	Builtin GET_DEV_VAR_VALUE.....	253
D.65	Builtin get_dev_var_value	253
D.66	Builtin get_dictionary_string	254
D.67	Builtin get_double	254
D.68	Builtin get_double_value	255
D.69	Builtin get_float	255
D.70	Builtin get_float_value	256
D.71	Builtin GET_LOCAL_VAR_VALUE	256
D.72	Builtin get_local_var_value	257
D.73	Builtin get_more_status	257
D.74	Builtin get_resolve_status	258
D.75	Builtin get_response_code	258
D.76	Builtin get_response_code_string.....	259
D.77	Builtin get_signed	259
D.78	Builtin get_signed_value	260
D.79	Builtin get_status_code_string	260
D.80	Builtin get_status_string.....	261

D.81	Builtin get_stddict_string.....	261
D.82	Builtin get_string.....	262
D.83	Builtin get_string_value.....	262
D.84	Builtin GET_TICK_COUNT.....	263
D.85	Builtin get_unsigned	263
D.86	Builtin get_unsigned_value	264
D.87	Builtin iassign	264
D.88	Builtin igetval.....	265
D.89	Builtin IGNORE_ALL_COMM_STATUS	265
D.90	Builtin IGNORE_ALL_DEVICE_STATUS	265
D.91	Builtin IGNORE_ALL_RESPONSE_CODES.....	266
D.92	Builtin IGNORE_COMM_ERROR	266
D.93	Builtin IGNORE_COMM_STATUS	267
D.94	Builtin IGNORE_DEVICE_STATUS	267
D.95	Builtin IGNORE_NO_DEVICE	268
D.96	Builtin IGNORE_RESPONSE_CODE.....	268
D.97	Builtin int_value	269
D.98	Builtin is_NaN.....	269
D.99	Builtin isetval	269
D.100	Builtin ITEM_ID	270
D.101	Builtin itoa	270
D.102	Builtin ivar_value	270
D.103	Builtin lassign	271
D.104	Builtin lgetval.....	271
D.105	Builtin LOG_MESSAGE	271
D.106	Builtin long_value	272
D.107	Builtin lsetval	272
D.108	Builtin livar_value	272
D.109	Builtin MEMBER_ID	273
D.110	Builtin method_abort.....	273
D.111	Builtin process_abort.....	274
D.112	Builtin put_date	274
D.113	Builtin put_date_value	274
D.114	Builtin put_double	275
D.115	Builtin put_double_value	275
D.116	Builtin put_float	276
D.117	Builtin put_float_value	276
D.118	Builtin PUT_MESSAGE.....	277
D.119	Builtin put_message	277
D.120	Builtin put_signed	278
D.121	Builtin put_signed_value	278
D.122	Builtin put_string.....	279
D.123	Builtin put_string_value.....	279

D.124 Builtin put_unsigned	280
D.125 Builtin put_unsigned_value	281
D.126 Builtin READ_COMMAND	281
D.127 Builtin read_value	282
D.128 Builtin remove_abort_method (version A)	282
D.129 Builtin remove_abort_method (version B)	283
D.130 Builtin remove_all_abort_methods	283
D.131 Builtin resolve_array_ref	283
D.132 Builtin resolve_block_ref	284
D.133 Builtin resolve_param_list_ref	284
D.134 Builtin resolve_param_ref	285
D.135 Builtin resolve_record_ref	285
D.136 Builtin retry_on_all_comm_errors	286
D.137 Builtin RETRY_ON_ALL_COMM_STATUS	286
D.138 Builtin RETRY_ON_ALL_DEVICE_STATUS	287
D.139 Builtin RETRY_ON_ALL_RESPONSE_CODES	287
D.140 Builtin retry_on_all_response_codes	288
D.141 Builtin RETRY_ON_COMM_ERROR	288
D.142 Builtin retry_on_comm_error	289
D.143 Builtin RETRY_ON_COMM_STATUS	289
D.144 Builtin RETRY_ON_DEVICE_STATUS	290
D.145 Builtin RETRY_ON_NO_DEVICE	290
D.146 Builtin RETRY_ON_RESPONSE_CODE	291
D.147 Builtin retry_on_response_code	291
D.148 Builtin rsopcode_string	292
D.149 Builtin save_on_exit	292
D.150 Builtin save_values	293
D.151 Builtin SELECT_FROM_LIST	293
D.152 Builtin select_from_list	293
D.153 Builtin select_from_menu	294
D.154 Builtin send	295
D.155 Builtin send_all_values	295
D.156 Builtin send_command	296
D.157 Builtin send_command_trans	296
D.158 Builtin send_on_exit	297
D.159 Builtin send_trans	297
D.160 Builtin send_value	298
D.161 Builtin SET_NUMBER_OF_RETRIES	298
D.162 Builtin VARID	299
D.163 Builtin vassign	299
D.164 Builtin WRITE_COMMAND	299
D.165 Builtin XMTR_ABORT_ON_ALL_COMM_STATUS	300
D.166 Builtin XMTR_ABORT_ON_ALL_DEVICE_STATUS	300

D.167 Builtin XMTR_ABORT_ON_ALL_RESPONSE_CODES	301
D.168 Builtin XMTR_ABORT_ON_COMM_ERROR	301
D.169 Builtin XMTR_ABORT_ON_COMM_STATUS	302
D.170 Builtin XMTR_ABORT_ON_DATA	302
D.171 Builtin XMTR_ABORT_ON_DEVICE_STATUS.....	303
D.172 Builtin XMTR_ABORT_ON_NO_DEVICE	303
D.173 Builtin XMTR_ABORT_ON_RESPONSE_CODE	304
D.174 Builtin XMTR_IGNORE_ALL_COMM_STATUS	304
D.175 Builtin XMTR_IGNORE_ALL_DEVICE_STATUS	305
D.176 Builtin XMTR_IGNORE_ALL_RESPONSE_CODES	305
D.177 Builtin XMTR_IGNORE_COMM_ERROR	306
D.178 Builtin XMTR_IGNORE_COMM_STATUS.....	306
D.179 Builtin XMTR_IGNORE_DEVICE_STATUS.....	307
D.180 Builtin XMTR_IGNORE_NO_DEVICE	307
D.181 Builtin XMTR_IGNORE_RESPONSE_CODE	308
D.182 Builtin XMTR_RETRY_ON_ALL_DEVICE_STATUS	308
D.183 Builtin XMTR_RETRY_ON_ALL_RESPONSE_CODE	309
D.184 Builtin XMTR_RETRY_ON_ALL_RESPONSE_CODES	309
D.185 Builtin XMTR_RETRY_ON_COMM_ERROR	310
D.186 Builtin XMTR_RETRY_ON_COMM_STATUS	310
D.187 Builtin XMTR_RETRY_ON_DATA	311
D.188 Builtin XMTR_RETRY_ON_DEVICE_STATUS	311
D.189 Builtin XMTR_RETRY_ON_NO_DEVICE	312
D.190 Builtin XMTR_RETRY_ON_RESPONSE_CODE	312
Annex E (informative) EDD Example	313
Annex F (normative) Profiles of EDDL and Builtins	327
F.1 Profile of EDDL and Builtins	327
F.2 Profiles for PROFIBUS	328
F.2.1 EDDL profile	328
F.2.2 Builtin profile	329
F.3 Profiles for Fieldbus Foundation ®	332
F.3.1 EDDL profile	332
F.3.2 Builtin profile	334
F.4 Profiles for HART® Communication Foundation (HCF)	338
F.4.1 EDDL profile	338
F.4.2 Builtin profile	340
F.5 Data types	343
F.5.1 METHOD DEFINITIONS data types	343
F.5.2 Coding of data DATE	346
F.5.3 Coding of data DATE_AND_TIME	346
F.5.4 Coding of data DURATION	346
F.5.5 Coding of data TIME	347
F.5.6 Coding of data TIME_VALUE	347
F.5.7 Coding of PACKED_ASCII (6-BIT ASCII) DATA FORMAT	347

Figures

Figure 1 – Position of IEC 61804 series related to other standards and products.....	25
Figure 2 – FB structure is derived out of the process (P&ID view)	35
Figure 3 – FB structure may be distributed between devices (according to IEC 61499-1).....	36
Figure 4 – IEC 61804 FBs can be implemented in different devices.....	37
Figure 5 – General components of devices	37
Figure 6 – Block types of IEC 61804	38
Figure 7 – IEC 61804 block overview (graphical representation not normative).....	39
Figure 8 – UML class diagram of the device model	42
Figure 9 – Measurement process signal flow	46
Figure 10 – Actuation process signal flow	46
Figure 11 – Application process signal flow	48
Figure 12 – EDD generation process	49
Figure 13 – Measurement FB	51
Figure 14 – Modulating Actuator FB	53
Figure 15 – Discrete input FB.....	55
Figure 16 – On/Off actuation FB.....	56
Figure 17 – Calculation FB.....	58
Figure 18 – Control FB.....	59
Figure 19 – Temperature Technology Block.....	61
Figure 20 – Pressure Technology Block.....	64
Figure 21 – Modulating actuation technology block	66
Figure 22 – On/Off Actuation Technology Block	69
Figure 23 – Harel state chart.....	72
Figure 24 – Application structure of ISO OSI Reference Model	75
Figure 25 – Client/Server relationship in terms of OSI Reference Model.....	76
Figure 26 – Mapping of IEC 61804 FBs to APOs.....	76
Figure 27 – BLOCK_A	78
Figure 28 – COLLECTION	78
Figure 29 – COMMAND	79
Figure 30 – DOMAIN	79
Figure 31 – EDIT_DISPLAY	79
Figure 32 – LIKE	80
Figure 33 – MENU	80
Figure 34 – PROGRAM	80
Figure 35 – RECORD	81
Figure 36 – REFERENCE_ARRAY	81
Figure 37 – REFRESH	81
Figure 38 – UNIT	81
Figure 39 – WRITE_AS_ONE	82
Figure 40 – VALUE_ARRAY	82
Figure 41 – VARIABLE	82
Figure 42 – VARIABLE_LIST	82

Figure 43 – EDDL import mechanisms.....	102
Figure 44 – MENU activation (ACCESS OFFLINE)	116
Figure 45 – Action performed after a new value is entered.....	116
Figure 46 – Action performed after all VARIABLE inputs of the MENU are accepted (ACCESS OFFLINE)	116
Figure 47 – Method execution	116
Figure 48 – MENU activation (ACCESS ONLINE)	117
Figure 49 – Cyclic reading of dynamic VARIABLEs (ACCESS ONLINE)	118
Figure 50 – Action performed after all VARIABLE inputs of the MENU are accepted (ACCESS ONLINE).....	118
Figure 51 – Time for read and write operation	138

Tables

Table 1 – Field attribute descriptions.....	34
Table 2 – References between IEC 61804 and IEC 61499 model elements	41
Table 3 – Variables and Parameter description template.....	44
Table 4 – Example of temperature sensors of Sensor_Type	62
Table 5 – Device status state table.....	71
Table 6 – Device status transition table.....	72
Table 7 – DD_REVISION attribute.....	84
Table 8 – DEVICE_REVISION attribute	84
Table 9 – DEVICE_TYPE attribute	85
Table 10 – EDD_PROFILE attribute	85
Table 11 – EDD_VERSION attribute	85
Table 12 – MANUFACTURER attribute.....	86
Table 13 – MANUFACTURER_EXT attribute	86
Table 14 – BLOCK_A attributes.....	87
Table 15 – CHARACTERISTIC attribute	87
Table 16 – PARAMETER attributes	88
Table 17 – COLLECTION_ITEMS attribute	88
Table 18 – EDIT_DISPLAY_ITEMS attribute.....	88
Table 19 – MENU_ITEMS attribute.....	88
Table 20 – METHOD_ITEMS attribute	89
Table 21 – PARAMETER_LISTS attributes	89
Table 22 – REFERENCE_ARRAY_ITEMS attribute.....	89
Table 23 – REFRESH_ITEMS attribute.....	90
Table 24 – UNIT_ITEMS attribute.....	90
Table 25 – WRITE_AS_ONE_ITEMS attribute	90
Table 26 – BLOCK_B attributes.....	91
Table 27 – NUMBER attributes.....	91
Table 28 – TYPE attributes	91
Table 29 – COLLECTION attributes.....	92