

ISO 9506-1:2003-08 (E)

Industrial automation systems - Manufacturing Message Specification - Part 1: Service definition

Contents

Page

Foreword	xi
Introduction	xii
1 Scope	1
2 Normative references	1
3 Definitions	2
3.1 Reference Model definitions	2
3.2 Service Convention definitions	3
3.3 Abstract Syntax Notation definitions	3
3.4 Other definitions	3
4 Abbreviations	6
5 Conventions	7
5.1 Base of Numeric Values	7
5.2 Object modelling	7
5.3 Specialisation of MMS	8
5.4 Service Parameter Description	9
5.5 Invocation Identifier on Service Primitives	11
5.6 List Of Modifier on Service Primitives	11
5.7 Addressing in MMS	11
5.8 Service Conventions	11
5.9 Calling and Called MMS-user	11
5.10 Sending and Receiving MMS-user and MPPM	12
5.11 Requesting and Responding MMS-user	12
5.12 Client and Server of a Service	12
5.13 Relationship of Object Models to Service Tables	13
6 MMS in the OSI Environment	13
6.1 Information Processing Tasks and Real Systems	13
6.2 Application Processes	13
6.3 Interaction of Application Processes	13
6.4 Interaction of Application Processes in OSI	14
6.5 Structure of Application Entities	14
6.6 Addressing of Application Entities	14
6.7 Application Context	15
6.8 Presentation Context, Abstract Syntaxes, and Transfer Syntaxes	15
6.9 MMS requirements of the communication system	15
7 The Virtual Manufacturing Device	21
7.1 Introduction	21
7.2 The Structure of a VMD	22
7.3 Transactions	30
7.4 Specification of Named objects	32
7.5 Object Name structure	35
7.6 Object Class structure	36
8 Environment And General Management services	36

8.1	Introduction and Models	36
8.2	Initiate service	45
8.3	Conclude service	51
8.4	Abort service	52
8.5	Cancel service	53
8.6	Reject service	55
9	Conditioned service response	59
9.1	Introduction and Models	59
9.2	AccessCondition parameter	65
9.3	DefineAccessControlList service	67
9.4	GetAccessControlListAttributes service	68
9.5	ReportAccessControlledObjects service	71
9.6	DeleteAccessControlList service	72
9.7	ChangeAccessControl service	73
10	VMD Support Services	77
10.1	Introduction	77
10.2	Status Response parameter	77
10.3	Status service	78
10.4	UnsolicitedStatus service	79
10.5	GetNameList service	79
10.6	Identify service	81
10.7	Rename service	82
10.8	GetCapabilityList service	84
10.9	VMDStop service	85
10.10	VMDReset service	86
11	Domain Management Services	87
11.1	Introduction and Models	87
11.2	InitiateDownloadSequence service	93
11.3	DownloadSegment service	95
11.4	TerminateDownloadSequence service	97
11.5	InitiateUploadSequence service	98
11.6	UploadSegment service	100
11.7	TerminateUploadSequence service	101
11.8	RequestDomainDownload service	102
11.9	RequestDomainUpload service	104
11.10	LoadDomainContent service	105
11.11	StoreDomainContent service	107
11.12	DeleteDomain service	110
11.13	GetDomainAttributes service	111
12	Program Invocation Management Services	113
12.1	Introduction and Models	113
12.2	CreateProgramInvocation service	120
12.3	DeleteProgramInvocation service	123
12.4	Start service	124
12.5	Stop service	128
12.6	Resume service	129
12.7	Reset service	132
12.8	Kill service	133
12.9	GetProgramInvocationAttributes service	134
12.10	Select service	137
12.11	AlterProgramInvocationAttributes service	139
12.12	ReconfigureProgramInvocation service	141
13	Unit Control	143
13.1	Introduction and Models	143
13.2	Control Element	144
13.3	InitiateUnitControlLoad service	145
13.4	UnitControlLoadSegment service	147

13.5	UnitControlUpload service	149
13.6	StartUnitControl service	151
13.7	StopUnitControl service	152
13.8	CreateUnitControl service	154
13.9	AddToUnitControl service	155
13.10	RemoveFromUnitControl service	156
13.11	GetUnitControlAttributes service	157
13.12	LoadUnitControlFromFile service	159
13.13	StoreUnitControlToFile service	160
13.14	DeleteUnitControl service	161
14	Variable Access Services	163
14.1	The MMS Variable Access Model	164
14.2	Specification of Types	171
14.3	Specification of Alternate Access	175
14.4	Specification of Data Values	179
14.5	Specification of Access to Variables	181
14.6	Read service	184
14.7	Write service	185
14.8	InformationReport service	187
14.9	GetVariableAccessAttributes service	188
14.10	DefineNamedVariable service	190
14.11	DeleteVariableAccess service	192
14.12	DefineNamedVariableList service	194
14.13	GetNamedVariableListAttributes service	196
14.14	DeleteNamedVariableList service	197
14.15	DefineNamedType service	199
14.16	GetNamedTypeAttributes service	201
14.17	DeleteNamedType service	202
14.18	Conformance	204
14.19	Guidance To Implementors	205
15	Data Exchange Management Services	206
15.1	The Data Exchange management model	206
15.2	ExchangeData service	207
15.3	GetDataExchangeAttributes service	209
16	Semaphore Management Services	210
16.1	The Semaphore Management Model	210
16.2	TakeControl service	217
16.3	RelinquishControl service	221
16.4	DefineSemaphore service	222
16.5	DeleteSemaphore service	224
16.6	ReportSemaphoreStatus service	226
16.7	ReportPoolSemaphoreStatus service	227
16.8	ReportSemaphoreEntryStatus service	229
16.9	AttachToSemaphore Modifier	232
16.10	Conformance	234
17	Operator Communication services	235
17.1	The Operator Communications Model	235
17.2	Input service	237
17.3	Output service	239
18	Event Management services	241
18.1	Event Detection and Notification	242
18.2	TriggerEvent service	247
18.3	EventNotification service	248
18.4	AcknowledgeEventNotification service	250
18.5	GetAlarmSummary service	252
18.6	GetAlarmEnrollmentSummary service	256
18.7	Attach To Event Condition Modifier	260

18.8	Conformance Requirements Unique to Event Management	262
19	Event Condition services	263
19.1	Event Conditions	263
19.2	DefineEventCondition service	268
19.3	DeleteEventCondition service	271
19.4	GetEventConditionAttributes service	273
19.5	ReportEventConditionStatus service	275
19.6	AlterEventConditionMonitoring service	277
20	Event Action services	279
20.1	Event Actions	279
20.2	DefineEventAction service	280
20.3	DeleteEventAction service	282
20.4	GetEventActionAttributes service	284
20.5	ReportEventActionStatus service	285
21	Event Enrollment services	287
21.1	Event Enrollments	287
21.2	DefineEventEnrollment service	295
21.3	DeleteEventEnrollment service	299
21.4	GetEventEnrollmentAttributes service	302
21.5	ReportEventEnrollmentStatus service	306
21.6	AlterEventEnrollment service	308
22	Event Condition List services	311
22.1	Event Condition Lists	311
22.2	DefineEventConditionList service	312
22.3	DeleteEventConditionList service	314
22.4	AddEventConditionListReference service	316
22.5	RemoveEventConditionListReference service	318
22.6	GetEventConditionListAttributes service	321
22.7	ReportEventConditionListStatus service	322
22.8	AlterEventConditionListMonitoring service	324
23	Journal Management services	326
23.1	The Journal Management Model	326
23.2	ReadJournal service	328
23.3	WriteJournal service	336
23.4	InitializeJournal service	339
23.5	ReportJournalStatus service	340
23.6	CreateJournal service	342
23.7	DeleteJournal service	343
23.8	Conformance Requirements Unique to Journals	344
24	Errors	344
24.1	Error Type	344
24.2	Description of structure of generic error type:	345
24.3	Additional Code	351
24.4	Additional Detail	351
24.5	Modifier Position	351
25	MMS Standardized Names	351
25.1	Introduction	351
25.2	Unique Name Assignment Mechanism	352
25.3	MMS Standardized Names	352
25.4	End of Module	355
26	Conformance	355
26.1	Introduction	355
26.2	Conformance Building Blocks (CBBs)	355
26.3	Static Conformance Requirements	357

26.4	Calling MMS-user Conformance Requirements	357
26.5	Called MMS-user Conformance Requirements	357
26.6	Server Conformance Requirements	357
26.7	Client Conformance Requirements	358
26.8	Parameter CBB Conformance Requirements	359
26.9	Dynamic Conformance	360
Annex A (normative) Relationship of the VMD to an OSI Communication System		361
A.1	Introduction	361
A.2	Addressing of Application Entities	362
A.3	Conformance Requirements	362
Annex B (normative) Requirements for Companion Standards		363
B.1	Introduction	363
B.2	Scope	363
B.3	Requirements	363
B.4	Outline of an MMS Companion Standard	363
Annex C (normative) File Access service		369
C.1	ObtainFile service	369
Annex D (informative) File Management services		371
D.1	Introduction	371
D.2	The MMS File Model	371
D.3	FileOpen service	373
D.4	FileRead service	374
D.5	FileClose service	375
D.6	FileRename service	376
D.7	FileDelete service	378
D.8	FileDirectory service	379
D.9	File Attributes parameter	381
D.10	Additional Specification for the Conclude Service	381
Annex E (informative) Scattered Access		383
E.1	Introduction	383
E.2	Variable Specification parameter	385
E.3	DefineScatteredAccess service	386
E.4	GetScatteredAccessAttributes service	388
E.5	DeleteVariableAccess service	390
E.6	DefineNamedVariableList service	390
E.7	GetNamedVariableListAttributes service	391
E.8	DeleteNamedVariableList service	391
Annex F (informative) MMS on TCP/IP		392
F.1	Introduction	392
F.2	General Internet Environments	392
F.3	References	392
Index	393
Figures Figure 1 - Relationships of Client and Server, Requesting and Responding MMS-user, and Sending and Receiving MMPM		12
Figure 2 - M-ASSOCIATE service		16
Figure 3 - M-RELEASE service		18

Figure 4 - M-DATA service	19
Figure 5 - M-U-ABORT service	20
Figure 6 - M-P-ABORT service	21
Figure 7 - Environment Management State Diagram	37
Figure 8 - Domain State Diagram	91
Figure 9 - Upload State Machines	93
Figure 10 - LoadDomainContent	105
Figure 11 - StoreDomainContent	108
Figure 12 - Program Invocation State Diagram	119
Figure 13 - Semaphore Entry model	215
Figure 14 - Token Semaphore model	216
Figure 15 - Pool Semaphore model	217
Figure 16 - Operator Station State Diagram	237
Figure 17 - Relationship Between Event Management Objects	242
Figure 18 - Network-triggered Event Condition State Diagram	266
Figure 19 - Monitored Event Condition State Diagram	267
Figure 20 - Event Action State Diagram	286
Figure 21 - State Diagram for &alarmAcknowledgmentRule = none	292
Figure 22 - State Diagram for &alarmAcknowledgmentRule = simple	293
Figure 23 - State Diagram for &alarmAcknowledgmentRule = ack-active	294
Figure 24 - State Diagram for &alarmAcknowledgmentRule = ack-all	295
Figure A.1 - The MMS Server Application Process	361
Figure D.1 - File Read State Machine	372
Tables Table 1 - M-ASSOCIATE service	16
Table 2 - M-Release service parameters	18
Table 3 - M-Data service parameters	19
Table 4 - M-U-Abort service parameters	20
Table 5 - M-P-Abort service parameters	21
Table 6 - Local control	29
Table 7 - Name Class and Scope	33
Table 8 - Object Name	35

Table 9 - Object Class	36
Table 10 - Initiate service	45
Table 11 - Conclude service	51
Table 12 - Abort service	53
Table 13 - Cancel service	54
Table 14 - Reject service	55
Table 15 - Access Condition parameter	66
Table 16 - DefineAccessControlList service	67
Table 17 - GetAccessControlListAttributes service	69
Table 18 - ReportAccessControlledObjects service	71
Table 19 - DeleteAccessControlList service	72
Table 20 - ChangeAccessControl service	74
Table 21 - Status Response parameter	77
Table 22 - Status service	78
Table 23 - UnsolicitedStatus service	79
Table 24 - GetNameList service	80
Table 25 - Identify service	81
Table 26 - Rename service	83
Table 27 - GetCapabilityList service	84
Table 28 - VMDStop service	85
Table 29 - VMD attributes after VMDStop	86
Table 30 - VMDReset service	86
Table 31 - InitiateDownloadSequence service	94
Table 32 - DownloadSegment service	96
Table 33 - TerminateDownloadSequence service	97
Table 34 - InitiateUploadSequence service	99
Table 35 - UploadSegment service	100
Table 36 - TerminateUploadSequence service	101
Table 37 - RequestDomainDownload service	102
Table 38 - RequestDomainUpload service	104
Table 39 - LoadDomainContent service	106

Table 40 - StoreDomainContent service	108
Table 41 - DeleteDomain service	110
Table 42 - GetDomainAttributes service	111
Table 43 - CreateProgramInvocation service	120
Table 44 - DeleteProgramInvocation service	123
Table 45 - Start service	125
Table 46 - Stop service	128
Table 47 - Resume service	129
Table 48 - Reset service	132
Table 49 - Kill service	133
Table 50 - GetProgramInvocationAttributes service	135
Table 51 - Select service	138
Table 52 - AlterProgramInvocationAttributes service	140
Table 53 - ReconfigureProgramInvocation service	141
Table 54 - Control Element parameter	144
Table 55 - Interaction of Unit Control Primitives	146
Table 56 - InitiateUnitControlLoad service	146
Table 57 - UnitControlLoadSegment service	147
Table 58 - UnitControlUpload service	149
Table 59 - StartUnitControl service	151
Table 60 - StopUnitControl service	153
Table 61 - CreateUnitControl service	154
Table 62 - AddToUnitControl service	155
Table 63 - RemoveFromUnitControl service	156
Table 64 - GetUnitControlAttributes service	158
Table 65 - LoadUnitControlFromFile service	159
Table 66 - StoreUnitControlToFile service	160
Table 67 - DeleteUnitControl service	162
Table 68 - Type Description parameter	172
Table 69 - Type Specification parameter	175
Table 70 - Alternate Access parameter	176

Table 71 - Access Result parameter	179
Table 72 - Data parameter	180
Table 73 - Variable Access Specification parameter	181
Table 74 - Variable Specification parameter	182
Table 75 - Address parameter	183
Table 76 - Read service	184
Table 77 - Write service	186
Table 78 - InformationReport service	187
Table 79 - GetVariableAccessAttributes service	189
Table 80 - DefineNamedVariable service	190
Table 81 - DeleteVariableAccess service	192
Table 82 - DefineNamedVariableList service	194
Table 83 - GetNamedVariableListAttributes service	196
Table 84 - DeleteNamedVariableList service	198
Table 85 - DefineNamedType service	200
Table 86 - GetNamedTypeAttributes service	201
Table 87 - DeleteNamedType service	203
Table 88 - DataExchange service	207
Table 89 - GetDataExchangeAttributes service	209
Table 90 - TakeControl service	217
Table 91 - RelinquishControl service	221
Table 92 - DefineSemaphore service	223
Table 93 - DeleteSemaphore service	225
Table 94 - ReportSemaphoreStatus service	226
Table 95 - ReportPoolSemaphoreStatus service	228
Table 96 - ReportSemaphoreEntryStatus service	230
Table 97 - AttachToSemaphore Modifier	232
Table 98 - Input service	238
Table 99 - Output service	240
Table 100 - TriggerEvent service	247
Table 101 - EventNotification service	248

Table 102 - AcknowledgeEventNotification service	251
Table 103 - GetAlarmSummary service	253
Table 104 - GetAlarmEnrollmentSummary service	257
Table 105 - Attach To Event Condition Modifier	261
Table 106 - DefineEventCondition service	268
Table 107 - DeleteEventCondition service	271
Table 108 - GetEventConditionAttributes service	273
Table 109 - ReportEventConditionStatus service	276
Table 110 - AlterEventConditionMonitoring service	277
Table 111 - DefineEventAction service	281
Table 112 - DeleteEventAction service	282
Table 113 - GetEventActionAttributes service	284
Table 114 - ReportEventActionStatus service	285
Table 115 - DefineEventEnrollment service	296
Table 116 - DeleteEventEnrollment service	299
Table 117 - GetEventEnrollmentAttributes service	302
Table 118 - ReportEventEnrollmentStatus service	307
Table 119 - AlterEventEnrollment service	309
Table 120 - DefineEventConditionList service	313
Table 121 - DeleteEventConditionList service	315
Table 122 - AddEventConditionListReference service	316
Table 123 - RemoveEventConditionListReference service	319
Table 124 - GetEventConditionListAttributes service	321
Table 125 - ReportEventConditionListStatus service	322
Table 126 - AlterEventConditionListMonitoring service	324
Table 127 - ReadJournal service	329
Table 128 - WriteJournal service	336
Table 129 - InitializeJournal service	339
Table 130 - ReportJournalStatus service	341
Table 131 - CreateJournal service	342
Table 132 - DeleteJournal service	343

Table 133 - Structure of Error Type	345
Table C.1 - ObtainFile service	369
Table D.1 - FileOpen service	373
Table D.2 - FileRead service	374
Table D.3 - FileClose service	376
Table D.4 - FileRename service	377
Table D.5 - FileDelete service	378
Table D.6 - FileDirectory service	379
Table D.7 - File Attributes parameter	381
Table E.1 - Scattered Access Description parameter	386
Table E.2 - DefineScatteredAccess service	387
Table E.3 - GetScatteredAccessAttributes service	389