



MTConnect[®] Standard

Part 3.0 – Streams Information Model

Version 1.5.0

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1 1 Purpose of This Document

2 This document, *MTConnect Standard: Part 3.0 - Streams Information Model* of the MT-
3 Connect Standard, establishes the rules and terminology that describes the information
4 returned by an MTConnect *Agent* from a piece of equipment. The *Streams Information*
5 *Model* also defines, in *Section ?? - ??*, the structure for the XML documents that are re-
6 turned from an *Agent* in response to a *Sample Request* or *Current Request*.

7 *MTConnect Standard: Part 3.0 - Streams Information Model* is not a stand-alone docu-
8 ment. This document is used in conjunction with *MTConnect Standard Part 1.0 - Overview*
9 *and Fundamentals* which defines the fundamentals of the operation of the MTConnect
10 Standard and *MTConnect Standard: Part 2.0 - Devices Information Model* that defines
11 the semantic model representing the information that may be returned from a piece of
12 equipment.

13 Note: *MTConnect Standard: Part 5.0 - Interfaces* provides details on extensions to
14 the *Streams Information Model* required to describe the interactions between pieces of
15 equipment.

16 In the MTConnect Standard, equipment represents any tangible property that is used in the
17 operation of a manufacturing facility. Examples of equipment are machine tools, ovens,
18 sensor units, workstations, software applications, and bar feeders.

19 2 Terminology and Conventions

20 Refer to *Section 3 of MTConnect Standard Part 1.0 - Overview and Fundamentals* for a
 21 dictionary of terms, reserved language, and document conventions used in the MTConnect
 22 Standard.

23 2.1 Glossary

24 HTTP

25 Hyper-Text Transport Protocol. The protocol used by all web browsers and web
 26 applications.

27 Note: HTTP is an IETF standard and is defined in RFC 7230.
 28 See <https://tools.ietf.org/html/rfc7230> for more information.

29 XML

30 Stands for eXtensible Markup Language.

31 XML defines a set of rules for encoding documents that both a human-readable and
 32 machine-readable.

33 XML is the language used for all code examples in the MTConnect Standard.

34 Refer to <http://www.w3.org/XML> for more information about XML.

35 ***Agent***

36 Refers to an MTConnect Agent.

37 Software that collects data published from one or more piece(s) of equipment, orga-
 38 nizes that data in a structured manner, and responds to requests for data from client
 39 software systems by providing a structured response in the form of a *Response Doc-*
 40 *ument* that is constructed using the *semantic data models* defined in the Standard.

41 Appears in the documents in the following form: *Agent*.

42 ***Asset Document***

43 An electronic document published by an *Agent* in response to a *Request* for infor-
 44 mation from a client software application relating to Assets.

45 ***Current Request***

46 An HTTP request to the *Agent* for returning latest known values for the `DataItem`
 47 as an `MTConnectStreams` XML document

48 ***Data Entity***

49 A primary data modeling element that represents all elements that either describe
50 data items that may be reported by an *Agent* or the data items that contain the actual
51 data published by an *Agent*.

52 Appears in the documents in the following form: *Data Entity*.

53 ***Document***

54 General meaning:

55 A piece of written, printed, or electronic matter that provides information.

56 Used to represent an *MTConnect Document*:

57 Refers to printed or electronic document(s) that represent a *Part(s)* of the MTCon-
58 nect Standard.

59 Appears in the documents in the following form: *MTConnect Document*.

60 Used to represent a specific representation of an *MTConnect Document*:

61 Refers to electronic document(s) associated with an *Agent* that are encoded using
62 XML; *Response Documents* or *Asset Documents*.

63 Appears in the documents in the following form: *MTConnect XML Document*.

64 Used to describe types of information stored in an *Agent*:

65 In an implementation, the electronic documents that are published from a data source
66 and stored by an *Agent*.

67 Appears in the documents in the following form: *Asset Document*.

68 Used to describe information published by an *Agent*:

69 A document published by an *Agent* based upon one of the *semantic data models*
70 defined in the MTConnect Standard in response to a request from a client.

71 Appears in the documents in the following form: *Response Document*.

72 ***Equipment Metadata***

73 See *Metadata*

74 ***Metadata***

75 Data that provides information about other data.

76 For example, *Equipment Metadata* defines both the *Structural Elements* that rep-
77 resent the physical and logical parts and sub-parts of each piece of equipment, the
78 relationships between those parts and sub-parts, and the definitions of the *Data En-*
79 *tities* associated with that piece of equipment.

80 Appears in the documents in the following form: *Metadata* or *Equipment Metadata*.

81 ***MTConnect Document***

82 See *Document*.

83 ***MTConnect XML Document***

84 See *Document*.

85 ***Response Document***

86 See *Document*.

87 ***Sample Request***

88 A request from the *Agent* for a stream of time series data.

89 ***semantic data model***

90 A methodology for defining the structure and meaning for data in a specific logical
91 way.

92 It provides the rules for encoding electronic information such that it can be inter-
93 preted by a software system.

94 Appears in the documents in the following form: *semantic data model*.

95 ***Streaming Data***

96 The values published by a piece of equipment for the *Data Entities* defined by the
97 *Equipment Metadata*.

98 Appears in the documents in the following form: *Streaming Data*.

99 ***Streams Information Model***

100 The rules and terminology (*semantic data model*) that describes the *Streaming Data*
101 returned by an *Agent* from a piece of equipment in response to a *Sample Request* or
102 a *Current Request*.

103 Appears in the documents in the following form: *Streams Information Model*.

104 **2.2 Acronyms**

105 ***AMT***

106 The Association for Manufacturing Technology

107 2.3 MTConnect References

- 108 [MTConnect Part 1.0] *MTConnect Standard Part 1.0 - Overview and Fundamentals*. Ver-
109 sion 1.5.0.
- 110 [MTConnect Part 2.0] *MTConnect Standard: Part 2.0 - Devices Information Model*. Ver-
111 sion 1.5.0.
- 112 [MTConnect Part 3.0] *MTConnect Standard: Part 3.0 - Streams Information Model*. Ver-
113 sion 1.5.0.
- 114 [MTConnect Part 5.0] *MTConnect Standard: Part 5.0 - Interfaces*. Version 1.5.0.

115 **3 Observations Model**

116 **3.1 Observations**

117 **3.1.1 DataSet**

118 Placeholder for documentation!

Table 1: Properties of DataSet

| Properties | Value | Multiplicity |
|--------------------|---------|--------------|
| count | integer | 1 |
| Entry | Entry | 0..* |
| observationDataSet | | 1 |

119 **3.1.1.1 count**

120 Placeholder for documentation!

121 **3.1.1.2 Entry**

122 Placeholder for documentation!

123 **3.1.1.3 observationDataSet**

124 Placeholder for documentation!

125 **3.1.2 Discrete**

126 Placeholder for documentation!

Table 2: Properties of Discrete

| Properties | Value | Multiplicity |
|---------------------|-------|--------------|
| observationDiscrete | | 1 |

127 3.1.2.1 observationDiscrete

128 Placeholder for documentation!

129 3.1.3 Entry

130 Placeholder for documentation!

Table 3: Properties of Entry

| Properties | Value | Multiplicity |
|------------|---------|--------------|
| key | ID | 1 |
| removed | boolean | 0..1 |
| Entry | DataSet | 1 |
| value | T | 0..1 |

131 3.1.3.1 key

132 Placeholder for documentation!

133 3.1.3.2 removed

134 Placeholder for documentation!

135 3.1.3.3 Entry

136 Placeholder for documentation!

137 3.1.3.4 value

138 Placeholder for documentation!

139 3.1.4 Observation

140 Placeholder for documentation!

Table 4: Properties of Observation

| Properties | Value | Multiplicity |
|---------------|--------------|--------------|
| compositionId | ID | 0..1 |
| dataItemId | ID | 1 |
| name | string | 0..1 |
| sequence | integer | 1 |
| subType | string | 0..1 |
| timestamp | dateTime | 1 |
| type | string | 1 |
| category | CategoryEnum | 1 |
| units | string | 0..1 |
| isUnavailable | boolean | 1 |
| result | string | 0..1 |

141 3.1.4.1 compositionId

142 Placeholder for documentation!

143 3.1.4.2 dataItemId

144 Placeholder for documentation!

145 3.1.4.3 name

146 Placeholder for documentation!

147 3.1.4.4 sequence

148 Placeholder for documentation!

149 **3.1.4.5 subType**

150 Placeholder for documentation!

151 **3.1.4.6 timestamp**

152 Placeholder for documentation!

153 **3.1.4.7 type**

154 Placeholder for documentation!

155 **3.1.4.8 category**

156 Placeholder for documentation!

157 Placeholder for documentation!

Table 5: CategoryEnum Enumeration

| Name | Description |
|-----------|--------------------------------|
| SAMPLE | Placeholder for documentation! |
| EVENT | Placeholder for documentation! |
| CONDITION | Placeholder for documentation! |

158 **3.1.4.9 units**

159 Placeholder for documentation!

160 **3.1.4.10 isUnavailable**

161 Placeholder for documentation!

162 **3.1.4.11 result**

163 Placeholder for documentation!

164 **3.1.5 Condition**

165 Subtype of Observation

166 Placeholder for documentation!

Table 6: Properties of Condition

| Properties | Value | Multiplicity |
|----------------|---------------|--------------|
| nativeCode | string | 0..1 |
| nativeSeverity | string | 0..1 |
| qualifier | QualifierEnum | 0..1 |
| statistic | StatisticEnum | 0..1 |
| xs:lang | xslang | 0..1 |
| Condition | ProtocolStack | 1 |
| category | CategoryEnum | 1 |

167 **3.1.5.1 nativeCode**

168 Placeholder for documentation!

169 **3.1.5.2 nativeSeverity**

170 Placeholder for documentation!

171 **3.1.5.3 qualifier**

172 Placeholder for documentation!

173 Placeholder for documentation!

Table 7: QualifierEnum Enumeration

| Name | Description |
|------|--------------------------------|
| HIGH | Placeholder for documentation! |
| LOW | Placeholder for documentation! |

174 **3.1.5.4 statistic**

175 Placeholder for documentation!

176 Placeholder for documentation!

Table 8: StatisticEnum Enumeration

| Name | Description |
|--------------------|--------------------------------|
| AVERAGE | Placeholder for documentation! |
| KURTOSIS | Placeholder for documentation! |
| MAXIMUM | Placeholder for documentation! |
| MEDIAN | Placeholder for documentation! |
| MINIMUM | Placeholder for documentation! |
| MODE | Placeholder for documentation! |
| RANGE | Placeholder for documentation! |
| ROOT_MEAN_SQUARE | Placeholder for documentation! |
| STANDARD_DEVIATION | Placeholder for documentation! |

177 **3.1.5.5 xs:lang**

178 Placeholder for documentation!

179 **3.1.5.6 Condition**

180 Placeholder for documentation!

181 **3.1.5.7 category**

182 Placeholder for documentation!

183 Placeholder for documentation!

Table 9: CategoryEnum Enumeration

| Name | Description |
|-----------|--------------------------------|
| SAMPLE | Placeholder for documentation! |
| EVENT | Placeholder for documentation! |
| CONDITION | Placeholder for documentation! |

184 3.1.6 Event

185 Subtype of Observation

186 Placeholder for documentation!

Table 10: Properties of Event

| Properties | Value | Multiplicity |
|----------------|--------------------|--------------|
| resetTriggered | ResetTriggeredEnum | 0..1 |
| Events | ProtocolStack | 1 |
| category | CategoryEnum | 1 |

187 3.1.6.1 resetTriggered

188 Placeholder for documentation!

189 Placeholder for documentation!

Table 11: ResetTriggeredEnum Enumeration

| Name | Description |
|-----------------|--------------------------------|
| ACTION_COMPLETE | Placeholder for documentation! |
| ANNUAL | Placeholder for documentation! |
| DAY | Placeholder for documentation! |
| MAINTENANCE | Placeholder for documentation! |
| MANUAL | Placeholder for documentation! |
| MONTH | Placeholder for documentation! |
| POWER_ON | Placeholder for documentation! |
| SHIFT | Placeholder for documentation! |
| WEEK | Placeholder for documentation! |

190 3.1.6.2 Events

191 Placeholder for documentation!

192 3.1.6.3 category

193 Placeholder for documentation!

194 Placeholder for documentation!

Table 12: CategoryEnum Enumeration

| Name | Description |
|-----------|--------------------------------|
| SAMPLE | Placeholder for documentation! |
| EVENT | Placeholder for documentation! |
| CONDITION | Placeholder for documentation! |

195 3.1.7 Sample

196 Subtype of Observation

197 Placeholder for documentation!

Table 13: Properties of Sample

| Properties | Value | Multiplicity |
|----------------|--------------------|--------------|
| duration | second | 0..1 |
| resetTriggered | ResetTriggeredEnum | 0..1 |
| sampleRate | float | 0..1 |
| statistic | StatisticEnum | 0..1 |
| Samples | ProtocolStack | 1 |
| category | CategoryEnum | 1 |
| result | float | 0..1 |
| units | string | 1 |

198 3.1.7.1 duration

199 Placeholder for documentation!

200 3.1.7.2 resetTriggered

201 Placeholder for documentation!

202 Placeholder for documentation!

Table 14: ResetTriggeredEnum Enumeration

| Name | Description |
|-----------------|--------------------------------|
| ACTION_COMPLETE | Placeholder for documentation! |
| ANNUAL | Placeholder for documentation! |
| DAY | Placeholder for documentation! |
| MAINTENANCE | Placeholder for documentation! |
| MANUAL | Placeholder for documentation! |
| MONTH | Placeholder for documentation! |
| POWER_ON | Placeholder for documentation! |
| SHIFT | Placeholder for documentation! |
| WEEK | Placeholder for documentation! |

203 3.1.7.3 sampleRate

204 Placeholder for documentation!

205 **3.1.7.4 statistic**

206 Placeholder for documentation!

207 Placeholder for documentation!

Table 15: StatisticEnum Enumeration

| Name | Description |
|--------------------|--------------------------------|
| AVERAGE | Placeholder for documentation! |
| KURTOSIS | Placeholder for documentation! |
| MAXIMUM | Placeholder for documentation! |
| MEDIAN | Placeholder for documentation! |
| MINIMUM | Placeholder for documentation! |
| MODE | Placeholder for documentation! |
| RANGE | Placeholder for documentation! |
| ROOT_MEAN_SQUARE | Placeholder for documentation! |
| STANDARD_DEVIATION | Placeholder for documentation! |

208 **3.1.7.5 Samples**

209 Placeholder for documentation!

210 **3.1.7.6 category**

211 Placeholder for documentation!

212 Placeholder for documentation!

Table 16: CategoryEnum Enumeration

| Name | Description |
|-----------|--------------------------------|
| SAMPLE | Placeholder for documentation! |
| EVENT | Placeholder for documentation! |
| CONDITION | Placeholder for documentation! |

213 **3.1.7.7 units**

Placeholder for documentation!

3.1.8 ProtocolStack

Placeholder for documentation!

Table 17: Properties of ProtocolStack

| Properties | Value | Multiplicity |
|------------|-----------|--------------|
| Condition | Condition | 0..* |
| Samples | Sample | 0..* |
| Events | Event | 0..* |

3.1.8.1 Condition

Placeholder for documentation!

3.1.8.2 Samples

Placeholder for documentation!

3.1.8.3 Events

Placeholder for documentation!

3.1.9 TimeSeries

Placeholder for documentation!

Table 18: Properties of TimeSeries

| Properties | Value | Multiplicity |
|-----------------------|---------|--------------|
| sampleCount | integer | 1 |
| observationTimeSeries | | 1 |

225 **3.1.9.1 sampleCount**

226 Placeholder for documentation!

227 **3.1.9.2 observationTimeSeries**

228 Placeholder for documentation!

229 **3.2 ConditionTypes**

230 **3.2.1 Fault**

231 Subtype of Condition

232 Placeholder for documentation!

233 **3.2.2 Normal**

234 Subtype of Condition

235 Placeholder for documentation!

236 **3.2.3 Warning**

237 Subtype of Condition

238 Placeholder for documentation!

239 **3.3 EventTypes**

240 **3.3.1 ActiveAxes**

241 Subtype of Event

242 The set of axes currently associated with a model:Path or model:Controller term:Structural
243 Element.

Table 19: Properties of ActiveAxes

| Properties | Value |
|------------|-------------|
| type | ACTIVE_AXES |

244 3.3.2 ActuatorState

245 Subtype of Event

246 Represents the operational state of an apparatus for moving or controlling a mechanism or
 247 system.

Table 20: Properties of ActuatorState

| Properties | Value |
|------------|-------------------|
| type | ACTUATOR_STATE |
| result | ActuatorStateEnum |

Enumerated result values for ActuatorState are:

Table 21: ActuatorStateEnum Enumeration

| Name | Description |
|----------|---|
| ACTIVE | The value of the term:Data Entity that is engaging. |
| INACTIVE | The value of the term:Data Entity that is not engaging. |

248

249 3.3.3 Alarm

250 Subtype of Event

251 ***DEPRECATED:*** Replaced with model:CONDITION category data items in Version
 252 1.1.0.

Table 22: Properties of Alarm

| Properties | Value |
|------------|-------|
| type | ALARM |

253 3.3.4 AssetChanged

254 Subtype of Event

255 The value of the term:CDATA for the event *MUST* be the model:assetId of the asset that
 256 has been added or changed. There will not be a separate message for new assets.

Table 23: Properties of AssetChanged

| Properties | Value |
|------------|---------------|
| type | ASSET_CHANGED |

257 3.3.5 AssetRemoved

258 Subtype of Event

259 The value of the term:CDATA for the event *MUST* be the model:assetId of the asset that
 260 has been removed. The asset will still be visible if requested with the model:includeRemoved
 261 parameter as described in the protocol section. When assets are removed they are not
 262 moved to the beginning of the most recently modified list.

Table 24: Properties of AssetRemoved

| Properties | Value |
|------------|---------------|
| type | ASSET_REMOVED |

263 3.3.6 Availability

264 Subtype of Event

265 Represents the term:Agent's ability to communicate with the data source.

Table 25: Properties of Availability

| Properties | Value |
|------------|------------------|
| type | AVAILABILITY |
| result | AvailabilityEnum |

Enumerated result values for Availability are:

Table 26: AvailabilityEnum Enumeration

| Name | Description |
|-------------|--|
| AVAILABLE | The value or status of an XML element when it is available. |
| UNAVAILABLE | The value of the term:Data Entity either when the data is not received or the entity is incapable of providing data. |

266

267 3.3.7 AxisCoupling

268 Subtype of Event

269 Describes the way the axes will be associated to each other.

270 This is used in conjunction with model:COUPLED_AXES to indicate the way they are
 271 interacting.

Table 27: Properties of AxisCoupling

| Properties | Value |
|------------|------------------|
| type | AXIS_COUPLING |
| result | AxisCouplingEnum |

272 Enumerated result values for AxisCoupling are:

Table 28: AxisCouplingEnum Enumeration

| Name | Description |
|-------------|--|
| TANDEM | Elements are physically connected to each other and operate as a single unit. |
| SYNCHRONOUS | Physical or logical parts which are not physically connected to each other but are operating together. |
| MASTER | It provides information or state values that influences the operation of other model:DataItem of similar type. |
| SLAVE | The axis is a slave to the model:COUPLED_AXES |

273 3.3.8 AxisFeedrateOverride

274 Subtype of Event

275 The value of a signal or calculation issued to adjust the feedrate of an individual linear
276 type axis.

Table 29: Properties of AxisFeedrateOverride

| Properties | Value |
|------------|------------------------|
| type | AXIS_FEEDRATE_OVERRIDE |

277 Subtypes of AxisFeedrateOverride are :

- 278 • Jog : The feedrate specified by a logic or motion program, by a pre-set value, or set
279 by a switch as the feedrate for the model:Axes.
- 280 • Programmed : The value of a signal or calculation specified by a logic or motion
281 program or set by a switch.
- 282 • Rapid : The value of a signal or calculation issued to adjust the feedrate of a
283 component or composition that is operating in a rapid positioning mode.

284 3.3.9 AxisInterlock

285 Subtype of Event

286 An indicator of the state of the axis lockout function when power has been removed and
287 the axis is allowed to move freely.

Table 30: Properties of AxisInterlock

| Properties | Value |
|------------|-------------------|
| type | AXIS_INTERLOCK |
| result | ActuatorStateEnum |

Enumerated result values for AxisInterlock are:

Table 31: ActuatorStateEnum Enumeration

| Name | Description |
|----------|---|
| ACTIVE | The value of the term:Data Entity that is engaging. |
| INACTIVE | The value of the term:Data Entity that is not engaging. |

288

289 3.3.10 AxisState

290 Subtype of Event

291 An indicator of the controlled state of a model:Linear or model:Rotary component repre-
 292 senting an axis.

Table 32: Properties of AxisState

| Properties | Value |
|------------|---------------|
| type | AXIS_STATE |
| result | AxisStateEnum |

293 Enumerated result values for AxisState are:

Table 33: AxisStateEnum Enumeration

| Name | Description |
|---------|---|
| HOME | The component at its home position. |
| TRAVEL | The component is in motion. |
| PARKED | The component has been moved to a fixed position. |
| STOPPED | The component is stopped. |

294 3.3.11 Block**295 Subtype of Event**

296 The line of code or command being executed by a model:Controller term:Structural Ele-
 297 ment.

Table 34: Properties of Block

| Properties | Value |
|------------|-------|
| type | BLOCK |

298 3.3.12 BlockCount**299 Subtype of Event**

300 The total count of the number of blocks of program code that have been executed since
 301 execution started.

Table 35: Properties of BlockCount

| Properties | Value |
|------------|-------------|
| type | BLOCK_COUNT |

302 3.3.13 ChuckInterlock**303 Subtype of Event**

304 An indication of the state of an interlock function or control logic state intended to prevent
 305 the associated model:CHUCK component from being operated.

Table 36: Properties of ChuckInterlock

| Properties | Value |
|------------|-------------------|
| type | CHUCK_INTERLOCK |
| result | ActuatorStateEnum |

Enumerated result values for ChuckInterlock are:

Table 37: ActuatorStateEnum Enumeration

| Name | Description |
|----------|---|
| ACTIVE | The value of the term:Data Entity that is engaging. |
| INACTIVE | The value of the term:Data Entity that is not engaging. |

306

307 Subtypes of ChuckInterlock are :

- 308 • ManualUnclamp : An indication of the state of an operator controlled interlock
 309 that can inhibit the ability to initiate an unclamp action of an electronically con-
 310 trolled chuck. The term:Valid Data Value *MUST* be model:ACTIVE or model:INACTIVE.
 311 When model:MANUAL_UNCLAMP is model:ACTIVE, it is expected that a chuck
 312 cannot be unclamped until model:MANUAL_UNCLAMP is set to model:INACTIVE.

313 3.3.14 ChuckState

314 Subtype of Event

315 An indication of the operating state of a mechanism that holds a part or stock material
 316 during a manufacturing process. It may also represent a mechanism that holds any other
 317 mechanism in place within a piece of equipment.

Table 38: Properties of ChuckState

| Properties | Value |
|------------|------------------|
| type | CHUCK_STATE |
| result | LatchedStateEnum |

318 Enumerated result values for ChuckState are:

Table 39: LatchedStateEnum Enumeration

| Name | Description |
|-----------|--|
| OPEN | A component is open to the point of a positive confirmation. |
| CLOSED | A component is closed to the point of a positive confirmation. |
| UNLATCHED | An intermediate position. |

319 3.3.15 CloseChuck

320 Subtype of Event

321 Service to close a chuck.

Table 40: Properties of CloseChuck

| Properties | Value |
|------------|-------------|
| type | CLOSE_CHUCK |

322 3.3.16 CloseDoor

323 Subtype of Event

324 Service to close a door.

Table 41: Properties of CloseDoor

| Properties | Value |
|------------|------------|
| type | CLOSE_DOOR |

325 3.3.17 Code

326 Subtype of Event

327 *DEPRECATED* in Version 1.1.

Table 42: Properties of Code

| Properties | Value |
|------------|-------|
| type | CODE |

328 3.3.18 CompositionState

329 Subtype of Event

330 An indication of the operating condition of a mechanism represented by a model:Composition
331 type element.

Table 43: Properties of CompositionState

| Properties | Value |
|------------|-------------------|
| type | COMPOSITION_STATE |

332 Subtypes of CompositionState are :

- 333 • **Action** : An indication of the operating state of a mechanism represented by
334 a model:Composition type component. The operating state indicates whether the
335 model:Composition element is activated or disabled. The term:Valid Data Value
336 *MUST* be model:ACTIVE or model:INACTIVE.
- 337 • **Lateral** : An indication of the position of a mechanism that may move in a lateral
338 direction. The mechanism is represented by a model:Composition type component.
339 The position information indicates whether the model:Composition element is posi-
340 tioned to the right, to the left, or is in transition. The term:Valid Data Value *MUST*
341 be model:RIGHT, model:LEFT, or model:TRANSITIONING.
- 342 • **Motion** : An indication of the open or closed state of a mechanism. The mecha-
343 nism is represented by a model:Composition type component. The operating state
344 indicates whether the state of the model:Composition element is open, closed, or un-
345 latched. The term:Valid Data Value *MUST* be model:OPEN, model:UNLATCHED,
346 or model:CLOSED.
- 347 • **Switched** : An indication of the activation state of a mechanism represented
348 by a model:Composition type component. The activation state indicates whether
349 the model:Composition element is activated or not. The term:Valid Data Value
350 *MUST* be model:ON or model:OFF.
- 351 • **Vertical** : An indication of the position of a mechanism that may move in a ver-
352 tical direction. The mechanism is represented by a model:Composition type compo-
353 nent. The position information indicates whether the model:Composition element is

354 positioned to the top, to the bottom, or is in transition. The term:Valid Data Value
 355 *MUST* be model:UP, model:DOWN, or model:TRANSITIONING.

356 3.3.19 ControllerMode

357 Subtype of Event

358 The current operating mode of the model:Controller component.

Table 44: Properties of ControllerMode

| Properties | Value |
|------------|--------------------|
| type | CONTROLLER_MODE |
| result | ControllerModeEnum |

Enumerated result values for ControllerMode are:

Table 45: ControllerModeEnum Enumeration

| Name | Description |
|-------------------|---|
| AUTOMATIC | The model:Controller is configured to automatically execute a program. |
| MANUAL | Operations based on the instructions received from an external source. |
| MANUAL_DATA_INPUT | The operator can enter a series of operations for the controller to perform. |
| SEMI_AUTOMATIC | The controller executes a single set of instructions from an active program and then stops until given a command to execute the next set of instructions. |
| EDIT | The controller is currently functioning as a programming device and is not capable of executing an active program. |

359

360 3.3.20 ControllerModeOverride

361 Subtype of Event

362 A setting or operator selection that changes the behavior of a piece of equipment.

Table 46: Properties of ControllerModeOverride

| Properties | Value |
|------------|--------------------------|
| type | CONTROLLER_MODE_OVERRIDE |
| result | OnOffEnum |

Enumerated result values for ControllerModeOverride are:

Table 47: OnOffEnum Enumeration

| Name | Description |
|------|---------------------|
| ON | On state or value. |
| OFF | Off state or value. |

363

364 Subtypes of ControllerModeOverride are :

- 365 • DryRun : A setting or operator selection used to execute a test mode to confirm the
 366 execution of machine functions. The term:Valid Data Value *MUST* be model:ON
 367 or model:OFF. When model:DRY_RUN is model:ON, the equipment performs all
 368 of its normal functions, except no part or product is produced. If the equipment has
 369 a spindle, spindle operation is suspended.
- 370 • MachineAxisLock : A setting or operator selection that changes the behavior
 371 of the controller on a piece of equipment. The term:Valid Data Value *MUST*
 372 be model:ON or model:OFF. When model:MACHINE_AXIS_LOCK is model:ON,
 373 program execution continues normally, but no equipment motion occurs
- 374 • OptionalStop : A setting or operator selection that changes the behavior of
 375 the controller on a piece of equipment. The term:Valid Data Value *MUST* be
 376 model:ON or model:OFF. The program execution is stopped after a specific program
 377 block is executed when model:OPTIONAL_STOP is model:ON. In the case of a
 378 G-Code program, a program model:BLOCK containing a M01 code designates the
 379 command for an model:OPTIONAL_STOP. model:EXECUTION *MUST* change
 380 to model:OPTIONAL_STOP after a program block specifying an optional stop is
 381 executed and the model:OPTIONAL_STOP selection is model:ON.
- 382 • SingleBlock : A setting or operator selection that changes the behavior of the
 383 controller on a piece of equipment. The term:Valid Data Value *MUST* be model:ON
 384 or model:OFF. Program execution is paused after each model:BLOCK of code
 385 is executed when model:SINGLE_BLOCK is model:ON. When model:SINGLE_-
 386 BLOCK is model:ON, model:EXECUTION *MUST* change to model:INTERRUPTED
 387 after completion of each model:BLOCK of code.

- **ToolChangeStop** : A setting or operator selection that changes the behavior of the controller on a piece of equipment. The term:Valid Data Value ***MUST*** be model:ON or model:OFF. Program execution is paused when a command is executed requesting a cutting tool to be changed. model:EXECUTION ***MUST*** change to model:INTERRUPTED after completion of the command requesting a cutting tool to be changed and model:TOOL_CHANGE_STOP is model:ON.

3.3.21 CoupledAxes

Subtype of Event

Refers to the set of associated axes.

Table 48: Properties of CoupledAxes

| Properties | Value |
|------------|--------------|
| type | COUPLED_AXES |

3.3.22 DateCode

Subtype of Event

The time and date code associated with a material or other physical item.

model:DATE_CODE ***MUST*** be reported in ISO 8601 format.

Table 49: Properties of DateCode

| Properties | Value |
|------------|-----------|
| type | DATE_CODE |

Subtypes of DateCode are :

- **Expiration** : The time and date code relating to the expiration or end of useful life for a material or other physical item.
- **FirstUse** : The time and date code relating the first use of a material or other physical item.
- **Manufacture** : The time and date code relating to the production of a material or other physical item.

408 3.3.23 DeviceUuid

409 Subtype of Event

410 The identifier of another piece of equipment that is temporarily associated with a compo-
411 nent of this piece of equipment to perform a particular function.

412 The term:Valid Data Value **MUST** be a NMTOKEN XML type.

Table 50: Properties of DeviceUuid

| Properties | Value |
|------------|-------------|
| type | DEVICE_UUID |

413 3.3.24 Direction

414 Subtype of Event

415 The direction of motion.

Table 51: Properties of Direction

| Properties | Value |
|------------|-----------|
| type | DIRECTION |

416 Subtypes of Direction are :

- 417 • Linear : The direction of motion of a linear motion.
- 418 • Rotary : The rotational direction of a rotary motion using the right hand rule con-
419 vention. The term:Valid Data Value **MUST** be model:CLOCKWISE or model:COUNTER_
420 CLOCKWISE.

421 3.3.25 DoorState

422 Subtype of Event

423 The operational state of a model:DOOR type component or composition element.

Table 52: Properties of DoorState

| Properties | Value |
|------------|------------------|
| type | DOOR_STATE |
| result | LatchedStateEnum |

Enumerated result values for DoorState are:

Table 53: LatchedStateEnum Enumeration

| Name | Description |
|-----------|--|
| OPEN | A component is open to the point of a positive confirmation. |
| CLOSED | A component is closed to the point of a positive confirmation. |
| UNLATCHED | An intermediate position. |

424

425 3.3.26 EmergencyStop

426 Subtype of Event

427 The current state of the emergency stop signal for a piece of equipment, controller path, or
 428 any other component or subsystem of a piece of equipment.

Table 54: Properties of EmergencyStop

| Properties | Value |
|------------|-------------------|
| type | EMERGENCY_STOP |
| result | EmergencyStopEnum |

429 Enumerated result values for EmergencyStop are:

Table 55: EmergencyStopEnum Enumeration

| Name | Description |
|-----------|---|
| ARMED | The emergency stop circuit is complete and the piece of equipment, component, or composition element is allowed to operate. |
| TRIGGERED | The operation of the piece of equipment, component, or composition element is inhibited. |

430 3.3.27 EndOfBar

431 Subtype of Event

432 An indication of whether the end of a piece of bar stock being feed by a bar feeder has
 433 been reached.

Table 56: Properties of EndOfBar

| Properties | Value |
|------------|------------|
| type | END_OF_BAR |
| result | YesNoEnum |

Enumerated result values for EndOfBar are:

Table 57: YesNoEnum Enumeration

| Name | Description |
|------|--|
| YES | The model:END_OF_BAR has been reached. |
| NO | The model:END_OF_BAR has not been reached. |

434

435 Subtypes of EndOfBar are :

- 436 • **Auxiliary** : When multiple locations on a piece of bar stock are referenced as
 437 the indication for the model:END_OF_BAR, the additional location(s) ***MUST*** be
 438 designated as model:AUXILIARY indication(s) for the model:END_OF_BAR.
- 439 • **Primary** : Specific applications ***MAY*** reference one or more locations on a
 440 piece of bar stock as the indication for the model:END_OF_BAR. The main or
 441 most important location ***MUST*** be designated as the model:PRIMARY indication
 442 for the model:END_OF_BAR. If no model:subType is specified, model:PRIMARY
 443 ***MUST*** be the default model:END_OF_BAR indication.

444 3.3.28 EquipmentMode

445 Subtype of Event

446 An indication that a piece of equipment, or a sub-part of a piece of equipment, is perform-
 447 ing specific types of activities.

Table 58: Properties of EquipmentMode

| Properties | Value |
|------------|----------------|
| type | EQUIPMENT_MODE |
| result | OnOffEnum |

Enumerated `result` values for EquipmentMode are:

Table 59: OnOffEnum Enumeration

| Name | Description |
|------|---------------------|
| ON | On state or value. |
| OFF | Off state or value. |

448

449 Subtypes of EquipmentMode are :

- 450 • Delay : A piece of equipment waiting for an event or an action to occur.
- 451 • Loaded : Subparts of a piece of equipment are under load.
- 452 • Operating : A piece of equipment are powered or performing any activity.
- 453 • Powered : Primary power is applied to the piece of equipment and, as a minimum,
 454 the controller or logic portion of the piece of equipment is powered and functioning
 455 or components that are required to remain on are powered.
- 456 • Working : A piece of equipment performing any activity, the equipment is active
 457 and performing a function under load or not.

458 3.3.29 Execution

459 Subtype of Event

460 The execution status of the model:Controller.

Table 60: Properties of Execution

| Properties | Value |
|------------|---------------|
| type | EXECUTION |
| result | ExecutionEnum |

Enumerated result values for Execution are:

Table 61: ExecutionEnum Enumeration

| Name | Description |
|-------------------|--|
| READY | A component is ready to engage. |
| ACTIVE | The value of the term:Data Entity that is engaging. |
| INTERRUPTED | The action of a model:Component has been suspended due to an external signal. |
| FEED_HOLD | Motion of a model:Component has been commanded to stop at its current position. |
| STOPPED | The component is stopped. |
| OPTIONAL_STOP | The controllers program has been intentionally stopped |
| PROGRAM_STOPPED | The execution of the model:Controller's program has been stopped by a command from within the program. |
| PROGRAM_COMPLETED | The execution of the controllers program has been stopped by a command from within the program. |

461

462 3.3.30 FunctionalMode

463 Subtype of Event

464 The current intended production status of the device or component.

Table 62: Properties of FunctionalMode

| Properties | Value |
|------------|--------------------|
| type | FUNCTIONAL_MODE |
| result | FunctionalModeEnum |

465 Enumerated result values for FunctionalMode are:

Table 63: FunctionalModeEnum Enumeration

| Name | Description |
|---------------------|---|
| PRODUCTION | A term:Structural Element is currently producing product. |
| SETUP | A term:Structural Element is being prepared or modified to begin production of product. |
| TEARDOWN | Typically, a term:Structural Element has completed the production of a product and is being modified or returned to a neutral state such that it may then be prepared to begin production of a different product. |
| MAINTENANCE | Action related to maintenance on the piece of equipment. |
| PROCESS_DEVELOPMENT | A term:Structural Element is being used to prove-out a new process. |

466 3.3.31 Hardness

467 Subtype of Event

468 The measurement of the hardness of a material.

Table 64: Properties of Hardness

| Properties | Value |
|------------|----------|
| type | HARDNESS |

469 Subtypes of Hardness are :

- 470 • Brinell : A scale to measure the resistance to deformation of a surface.
- 471 • Leeb : A scale to measure the elasticity of a surface.
- 472 • Mohs : A scale to measure the resistance to scratching of a surface.
- 473 • Rockwell : A scale to measure the resistance to deformation of a surface.
- 474 • Shore : A scale to measure the resistance to deformation of a surface.
- 475 • Vickers : A scale to measure the resistance to deformation of a surface.

476 3.3.32 InterfaceState

477 Subtype of Event

478 An indication of the operational state of an model:Interface component.

Table 65: Properties of InterfaceState

| Properties | Value |
|------------|------------------|
| type | INTERFACE_STATE |
| result | EnabledStateEnum |

Enumerated result values for InterfaceState are:

Table 66: EnabledStateEnum Enumeration

| Name | Description |
|----------|--|
| ENABLED | A component is currently operational and performing as expected. |
| DISABLED | A component is currently not operational. |

479

480 3.3.33 Line

481 Subtype of Event

482 *DEPRECATED* in Version 1.4.0.

Table 67: Properties of Line

| Properties | Value |
|------------|-------|
| type | LINE |

483 Subtypes of Line are :

- 484 • Maximum : Maximum value of a data entity or attribute.
- 485 • Minimum : The minimum value of a data entity or attribute.

486 3.3.34 LineLabel**487 Subtype of Event**

488 An optional identifier for a model:BLOCK of code in a model:PROGRAM.

Table 68: Properties of LineLabel

| Properties | Value |
|------------|------------|
| type | LINE_LABEL |

489 3.3.35 LineNumber**490 Subtype of Event**

491 A reference to the position of a block of program code within a control program.

Table 69: Properties of LineNumber

| Properties | Value |
|------------|-------------|
| type | LINE_NUMBER |

492 Subtypes of LineNumber are :

- 493 • **Absolute** : The position of a block of program code relative to the beginning of
 494 the control program.
- 495 • **Incremental** : The position of a block of program code relative to the occurrence
 496 of the last model:LINE_LABEL encountered in the control program.

497 3.3.36 Material**498 Subtype of Event**

499 The identifier of a material used or consumed in the manufacturing process.

Table 70: Properties of Material

| Properties | Value |
|------------|----------|
| type | MATERIAL |

500 3.3.37 MaterialChange

501 Subtype of Event

502 Service to change the type of material or product being loaded or fed to a piece of equip-
503 ment.

Table 71: Properties of MaterialChange

| Properties | Value |
|------------|-----------------|
| type | MATERIAL_CHANGE |

504 3.3.38 MaterialFeed

505 Subtype of Event

506 Service to advance material or feed product to a piece of equipment from a continuous or
507 bulk source.

Table 72: Properties of MaterialFeed

| Properties | Value |
|------------|---------------|
| type | MATERIAL_FEED |

508 3.3.39 MaterialLayer

509 Subtype of Event

510 Identifies the layers of material applied to a part or product as part of an additive manufac-
511 turing process.

512 The term:Valid Data Value *MUST* be an integer.

Table 73: Properties of MaterialLayer

| Properties | Value |
|------------|----------------|
| type | MATERIAL_LAYER |

513 Subtypes of MaterialLayer are :

- 514 • Actual : The measured value of the data item type given by a sensor or encoder.

- 515 • Target : The desired measure or count for a data item value.

516 **3.3.40 MaterialLoad**

517 **Subtype of Event**

518 Service to load a piece of material or product.

Table 74: Properties of MaterialLoad

| Properties | Value |
|------------|---------------|
| type | MATERIAL_LOAD |

519 **3.3.41 MaterialRetract**

520 **Subtype of Event**

521 Service to remove or retract material or product.

Table 75: Properties of MaterialRetract

| Properties | Value |
|------------|------------------|
| type | MATERIAL_RETRACT |

522 **3.3.42 MaterialUnload**

523 **Subtype of Event**

524 Service to unload a piece of material or product.

Table 76: Properties of MaterialUnload

| Properties | Value |
|------------|-----------------|
| type | MATERIAL_UNLOAD |

525 3.3.43 Message**526 Subtype of Event**

527 Any text string of information to be transferred from a piece of equipment to a client
 528 software application.

Table 77: Properties of Message

| Properties | Value |
|------------|---------|
| type | MESSAGE |

529 3.3.44 OpenChuck**530 Subtype of Event**

531 Service to open a chuck.

Table 78: Properties of OpenChuck

| Properties | Value |
|------------|------------|
| type | OPEN_CHUCK |

532 3.3.45 OpenDoor**533 Subtype of Event**

534 Service to open a door.

Table 79: Properties of OpenDoor

| Properties | Value |
|------------|-----------|
| type | OPEN_DOOR |

535 3.3.46 OperatorId**536 Subtype of Event**

537 The identifier of the person currently responsible for operating the piece of equipment.

Table 80: Properties of OperatorId

| Properties | Value |
|------------|-------------|
| type | OPERATOR_ID |

538 3.3.47 PalletId

539 Subtype of Event

540 The identifier for a pallet.

Table 81: Properties of PalletId

| Properties | Value |
|------------|-----------|
| type | PALLET_ID |

541 3.3.48 PartChange

542 Subtype of Event

543 Service to change the part or product associated with a piece of equipment to a different
544 part or product.

Table 82: Properties of PartChange

| Properties | Value |
|------------|-------------|
| type | PART_CHANGE |

545 3.3.49 PartCount

546 Subtype of Event

547 The count of parts produced.

Table 83: Properties of PartCount

| Properties | Value |
|------------|------------|
| type | PART_COUNT |

548 Subtypes of PartCount are :

- 549 • All : The count of all the parts produced. If the subtype is not given, this is the
550 default.
- 551 • Bad : Indicates the count of incorrect parts produced.
- 552 • Good : Indicates the count of correct parts made.
- 553 • Remaining : Remaining measure of an object or an action.
- 554 • Target : The desired measure or count for a data item value.

555 3.3.50 PartDetect

556 Subtype of Event

557 An indication designating whether a part or work piece has been detected or is present.

558 The term:Valid Data Value *MUST* be model:PRESENT or model:NOT_PRESENT.

Table 84: Properties of PartDetect

| Properties | Value |
|------------|-------------|
| type | PART_DETECT |

559 3.3.51 PartId

560 Subtype of Event

561 An identifier of a part in a manufacturing operation.

Table 85: Properties of PartId

| Properties | Value |
|------------|---------|
| type | PART_ID |

562 3.3.52 PartNumber

563 Subtype of Event

564 An identifier of a part or product moving through the manufacturing process. The term: Valid
 565 Data Value *MUST* be a text string.

Table 86: Properties of PartNumber

| Properties | Value |
|------------|-------------|
| type | PART_NUMBER |

566 3.3.53 PathFeedrateOverride

567 Subtype of Event

568 The value of a signal or calculation issued to adjust the feedrate for the axes associated with
 569 a model:Path component that may represent a single axis or the coordinated movement of
 570 multiple axes.

Table 87: Properties of PathFeedrateOverride

| Properties | Value |
|------------|------------------------|
| type | PATH_FEEDRATE_OVERRIDE |

571 Subtypes of PathFeedrateOverride are :

- 572 • Jog : The feedrate specified by a logic or motion program, by a pre-set value, or set
 573 by a switch as the feedrate for the model:Axes.
- 574 • Programmed : The value of a signal or calculation specified by a logic or motion
 575 program or set by a switch.
- 576 • Rapid : The value of a signal or calculation issued to adjust the feedrate of a
 577 component or composition that is operating in a rapid positioning mode.

578 3.3.54 PathMode

579 Subtype of Event

580 Describes the operational relationship between a model:Path term:Structural Element and
 581 another model:Path term:Structural Element for pieces of equipment comprised of multi-
 582 ple logical groupings of controlled axes or other logical operations.

Table 88: Properties of PathMode

| Properties | Value |
|------------|--------------|
| type | PATH_MODE |
| result | PathModeEnum |

Enumerated result values for PathMode are:

Table 89: PathModeEnum Enumeration

| Name | Description |
|-------------|--|
| INDEPENDENT | The path is operating independently and without the influence of another path. |
| MASTER | It provides information or state values that influences the operation of other model:DataItem of similar type. |
| SYNCHRONOUS | Physical or logical parts which are not physically connected to each other but are operating together. |
| MIRROR | The axes associated with the path are mirroring the motion of the model:MASTER path. |

583

584 3.3.55 PowerState

585 Subtype of Event

586 The indication of the status of the source of energy for a term:Structural Element to allow
 587 it to perform its intended function or the state of an enabling signal providing permission
 588 for the term:Structural Element to perform its functions.

Table 90: Properties of PowerState

| Properties | Value |
|------------|-------------|
| type | POWER_STATE |
| result | OnOffEnum |

Enumerated `result` values for `PowerState` are:

Table 91: OnOffEnum Enumeration

| Name | Description |
|------|---------------------|
| ON | On state or value. |
| OFF | Off state or value. |

589

590 Subtypes of `PowerState` are :

- 591 • `Control` : The state of the enabling signal or control logic that enables or disables
592 the function or operation of the term:Structural Element.
- 593 • `Line` : The state of the power source for the term:Structural Element.

594 3.3.56 PowerStatus

595 Subtype of Event

596 *DEPRECATED* in Version 1.1.0.

Table 92: Properties of PowerStatus

| Properties | Value |
|------------|--------------|
| type | POWER_STATUS |

597 3.3.57 ProcessTime

598 Subtype of Event

599 The time and date associated with an activity or event.

600 `model:PROCESS_TIME` *MUST* be reported in ISO 8601 format.

Table 93: Properties of ProcessTime

| Properties | Value |
|------------|--------------|
| type | PROCESS_TIME |

601 Subtypes of ProcessTime are :

- 602 • Complete : Completion of an action.
- 603 • Start : The time and date associated with the beginning of an activity or event.
- 604 • TargetCompletion : The projected time and date associated with the end or
- 605 completion of an activity or event.

606 3.3.58 Program

607 Subtype of Event

608 The name of the logic or motion program being executed by the model:Controller compo-

609 nent.

Table 94: Properties of Program

| Properties | Value |
|------------|---------|
| type | PROGRAM |

610 3.3.59 ProgramComment

611 Subtype of Event

612 A comment or non-executable statement in the control program. The term:Valid Data

613 Value *MUST* be a text string.

Table 95: Properties of ProgramComment

| Properties | Value |
|------------|-----------------|
| type | PROGRAM_COMMENT |

614 3.3.60 ProgramEdit

615 Subtype of Event

616 An indication of the status of the model:Controller components program editing mode. On
 617 many controls, a program can be edited while another program is currently being executed.

Table 96: Properties of ProgramEdit

| Properties | Value |
|------------|-----------------|
| type | PROGRAM_EDIT |
| result | ActiveStateEnum |

Enumerated result values for ProgramEdit are:

Table 97: ActiveStateEnum Enumeration

| Name | Description |
|-----------|---|
| ACTIVE | The value of the term:Data Entity that is engaging. |
| READY | A component is ready to engage. |
| NOT_READY | A component is not ready to engage. |

618

619 3.3.61 ProgramEditName

620 Subtype of Event

621 The name of the program being edited. This is used in conjunction with model:PROGRAM_-
 622 EDIT when in model:ACTIVE state. The term:Valid Data Value *MUST* be a text string.

Table 98: Properties of ProgramEditName

| Properties | Value |
|------------|-------------------|
| type | PROGRAM_EDIT_NAME |

623 3.3.62 ProgramHeader

624 Subtype of Event

625 The non-executable header section of the control program.

Table 99: Properties of ProgramHeader

| Properties | Value |
|------------|----------------|
| type | PROGRAM_HEADER |

626 3.3.63 ProgramLocation

627 Subtype of Event

628 The Uniform Resource Identifier (URI) for the source file associated with model:PROGRAM.

Table 100: Properties of ProgramLocation

| Properties | Value |
|------------|------------------|
| type | PROGRAM_LOCATION |

629 Subtypes of ProgramLocation are :

- 630 • Active : The value of the term:Data Entity that is engaging.
- 631 • Main : The identity of the primary logic or motion program currently being exe-
- 632 cuted. It is the starting nest level in a call structure and may contain calls to sub
- 633 programs.
- 634 • Schedule : The identity of a control program that is used to specify the order of
- 635 execution of other programs.

636 3.3.64 ProgramLocationType

637 Subtype of Event

638 Defines whether the logic or motion program defined by model:PROGRAM is being exe-

639 cuted from the local memory of the controller or from an outside source.

640 The term:Valid Data Value *MUST* be model:LOCAL or model:EXTERNAL.

Table 101: Properties of ProgramLocationType

| Properties | Value |
|------------|-----------------------|
| type | PROGRAM_LOCATION_TYPE |

641 Subtypes of ProgramLocationType are :

- 642 • `Active` : The value of the term:Data Entity that is engaging.
- 643 • `Main` : The identity of the primary logic or motion program currently being exe-
- 644 cuted. It is the starting nest level in a call structure and may contain calls to sub
- 645 programs.
- 646 • `Schedule` : The identity of a control program that is used to specify the order of
- 647 execution of other programs.

648 3.3.65 ProgramNestLevel

649 Subtype of Event

650 An indication of the nesting level within a control program that is associated with the code
 651 or instructions that is currently being executed.

652 If an Initial Value is not defined, the nesting level associated with the highest or initial
 653 nesting level of the program **MUST** default to zero (0).

654 The value reported for model:PROGRAM_NEST_LEVEL **MUST** be an integer.

Table 102: Properties of ProgramNestLevel

| Properties | Value |
|------------|--------------------|
| type | PROGRAM_NEST_LEVEL |

655 3.3.66 RotaryMode

656 Subtype of Event

657 The current operating mode for a model:Rotary type axis.

Table 103: Properties of RotaryMode

| Properties | Value |
|------------|----------------|
| type | ROTARY_MODE |
| result | RotaryModeEnum |

658 Enumerated `result` values for RotaryMode are:

Table 104: RotaryModeEnum Enumeration

| Name | Description |
|---------|---|
| SPINDLE | The axis is functioning as a spindle. |
| INDEX | The axis is configured to index. |
| CONTOUR | The position of the axis is being interpolated. |

659 3.3.67 RotaryVelocityOverride

660 Subtype of Event

661 The value of a command issued to adjust the programmed velocity for a model:Rotary
 662 type axis. This command represents a percentage change to the velocity calculated by a
 663 logic or motion program or set by a switch for a model:Rotary type axis.

Table 105: Properties of RotaryVelocityOverride

| Properties | Value |
|------------|--------------------------|
| type | ROTARY_VELOCITY_OVERRIDE |

664 3.3.68 SerialNumber

665 Subtype of Event

666 The serial number associated with a model:Component, model:Asset, or model:Device.
 667 The term:Valid Data Value *MUST* be a text string.

Table 106: Properties of SerialNumber

| Properties | Value |
|------------|---------------|
| type | SERIAL_NUMBER |

668 3.3.69 SpindleInterlock

669 Subtype of Event

670 An indication of the status of the spindle for a piece of equipment when power has been
 671 removed and it is free to rotate.

Table 107: Properties of SpindleInterlock

| Properties | Value |
|------------|-------------------|
| type | SPINDLE_INTERLOCK |
| result | ActuatorStateEnum |

Enumerated result values for SpindleInterlock are:

Table 108: ActuatorStateEnum Enumeration

| Name | Description |
|----------|---|
| ACTIVE | The value of the term:Data Entity that is engaging. |
| INACTIVE | The value of the term:Data Entity that is not engaging. |

672

673 3.3.70 ToolAssetId

674 Subtype of Event

675 The identifier of an individual tool asset.The term:Valid Data Value *MUST* be a text
676 string.

Table 109: Properties of ToolAssetId

| Properties | Value |
|------------|---------------|
| type | TOOL_ASSET_ID |

677 3.3.71 ToolGroup

678 Subtype of Event

679 An identifier for the tool group associated with a specific tool. Commonly used to designate spare tools.
680

Table 110: Properties of ToolGroup

| Properties | Value |
|------------|------------|
| type | TOOL_GROUP |

681 3.3.72 ToolId**682 Subtype of Event**

683 *DEPRECATED* in Version 1.2.0. See model:TOOL_ASSET_ID. *DEPRECATED:The
 684 identifier of the tool currently in use for a given model:Path.*

Table 111: Properties of ToolId

| Properties | Value |
|------------|---------|
| type | TOOL_ID |

685 3.3.73 ToolNumber**686 Subtype of Event**

687 The identifier assigned by the model:Controller component to a cutting tool when in use
 688 by a piece of equipment. The term:Valid Data Value *MUST* be a text string.

Table 112: Properties of ToolNumber

| Properties | Value |
|------------|-------------|
| type | TOOL_NUMBER |

689 3.3.74 ToolOffset**690 Subtype of Event**

691 A reference to the tool offset variables applied to the active cutting tool associated with a
 692 model:Path in a model:Controller type component.

Table 113: Properties of ToolOffset

| Properties | Value |
|------------|-------------|
| type | TOOL_OFFSET |

693 Subtypes of ToolOffset are :

- 694 • Length : A reference to a length type tool offset variable.
- 695 • Radial : A reference to a radial type tool offset variable.

696 3.3.75 User

697 Subtype of Event

698 The identifier of the person currently responsible for operating the piece of equipment.

Table 114: Properties of User

| Properties | Value |
|------------|-------|
| type | USER |

699 Subtypes of User are :

- 700 • Maintenance : Action related to maintenance on the piece of equipment.
- 701 • Operator : The identifier of the person currently responsible for operating the
- 702 piece of equipment.
- 703 • SetUp : The identifier of the person currently responsible for preparing a piece of
- 704 equipment for production or restoring the piece of equipment to a neutral state after
- 705 production.

706 3.3.76 Variable

707 Subtype of Event

708 A data value whose meaning may change over time due to changes in the operation of a
709 piece of equipment or the process being executed on that piece of equipment.

Table 115: Properties of Variable

| Properties | Value |
|------------|----------|
| type | VARIABLE |

710 3.3.77 WaitState

711 Subtype of Event

712 An indication of the reason that model:EXECUTION is reporting a value of model:WAIT.

713 The term:Valid Data Value *MUST* be model:POWERING_UP, model:POWERING_-
 714 DOWN, model:PART_LOAD, model:PART_UNLOAD, model:TOOL_LOAD, model:TOOL_-
 715 UNLOAD, model:MATERIAL_LOAD, model:MATERIAL_UNLOAD, model:SECONDARY_-
 716 PROCESS, model:PAUSING, or model:RESUMING.

Table 116: Properties of WaitState

| Properties | Value |
|------------|------------|
| type | WAIT_STATE |

717 3.3.78 Wire

718 Subtype of Event

719 A string like piece or filament of relatively rigid or flexible material provided in a variety
 720 of diameters.

Table 117: Properties of Wire

| Properties | Value |
|------------|-------|
| type | WIRE |

721 3.3.79 WorkOffset

722 Subtype of Event

723 A reference to the offset variables for a work piece or part associated with a model:Path in
 724 a model:Controller type component.

Table 118: Properties of WorkOffset

| Properties | Value |
|------------|-------------|
| type | WORK_OFFSET |

725 3.3.80 WorkholdingId

726 Subtype of Event

727 The identifier for the current workholding or part clamp in use by a piece of equipment.

728 The term:Valid Data Value *MUST* be a text string.

Table 119: Properties of WorkholdingId

| Properties | Value |
|------------|----------------|
| type | WORKHOLDING_ID |

729 3.4 SampleTypes

730 3.4.1 Acceleration

731 Subtype of Sample

732 The measurement of the rate of change of velocity.

Table 120: Properties of Acceleration

| Properties | Value |
|------------|---------------------|
| units | MILLIMETER/SECOND^2 |
| type | ACCELERATION |

733 3.4.2 AccumulatedTime

734 Subtype of Sample

735 The measurement of accumulated time for an activity or event.

Table 121: Properties of AccumulatedTime

| Properties | Value |
|------------|------------------|
| units | SECOND |
| type | ACCUMULATED_TIME |

736 3.4.3 Amperage

737 Subtype of Sample

738 The measurement of electrical current.

Table 122: Properties of Amperage

| Properties | Value |
|------------|----------|
| units | AMPERE |
| type | AMPERAGE |

739 Subtypes of Amperage are :

- 740 • Actual : The measured value of the data item type given by a sensor or encoder.
- 741 • Alternating : The measurement of alternating voltage or current. If not speci-
- 742 fied further in statistic, defaults to RMS voltage.
- 743 • Direct : The measurement of DC current or voltage.
- 744 • Target : The desired measure or count for a data item value.

745 3.4.4 Angle

746 Subtype of Sample

747 The measurement of angular position.

Table 123: Properties of Angle

| Properties | Value |
|------------|--------|
| units | DEGREE |
| type | ANGLE |

748 Subtypes of Angle are :

- 749 • **Actual** : The measured value of the data item type given by a sensor or encoder.
- 750 • **Commanded** : A value specified by the model:Controller type component.

751 **3.4.5 AngularAcceleration**

752 **Subtype of Sample**

753 The measurement rate of change of angular velocity.

Table 124: Properties of AngularAcceleration

| Properties | Value |
|------------|----------------------|
| units | DEGREE/SECOND^2 |
| type | ANGULAR_ACCELERATION |

754 **3.4.6 AngularVelocity**

755 **Subtype of Sample**

756 The measurement of the rate of change of angular position.

Table 125: Properties of AngularVelocity

| Properties | Value |
|------------|------------------|
| units | DEGREE/SECOND |
| type | ANGULAR_VELOCITY |

757 **3.4.7 AxisFeedrate**

758 **Subtype of Sample**

759 The measurement of the feedrate of a linear axis.

Table 126: Properties of AxisFeedrate

| Properties | Value |
|------------|-------------------|
| units | MILLIMETER/SECOND |
| type | AXIS_FEEDRATE |

760 Subtypes of AxisFeedrate are :

- 761 • **Actual** : The measured value of the data item type given by a sensor or encoder.
- 762 • **Commanded** : A value specified by the model:Controller type component.
- 763 • **Jog** : The feedrate specified by a logic or motion program, by a pre-set value, or set
- 764 by a switch as the feedrate for the model:Axes.
- 765 • **Override** : The operators overridden value.
- 766 • **Programmed** : The value of a signal or calculation specified by a logic or motion
- 767 program or set by a switch.
- 768 • **Rapid** : The value of a signal or calculation issued to adjust the feedrate of a
- 769 component or composition that is operating in a rapid positioning mode.

770 **3.4.8 CapacityFluid**

771 **Subtype of Sample**

772 The fluid capacity of an object or container.

Table 127: Properties of CapacityFluid

| Properties | Value |
|------------|----------------|
| units | MILLILITER |
| type | CAPACITY_FLUID |

773 **3.4.9 CapacitySpatial**

774 **Subtype of Sample**

775 The geometric capacity of an object or container.

Table 128: Properties of CapacitySpatial

| Properties | Value |
|------------|------------------|
| units | CUBIC_MILLIMETER |
| type | CAPACITY_SPATIAL |

776 3.4.10 ClockTime**777 Subtype of Sample**

778 The value provided by a timing device at a specific point in time.

Table 129: Properties of ClockTime

| Properties | Value |
|------------|-------------------------|
| units | yyyy-mm-ddthh:mm:ss.fff |
| type | CLOCK_TIME |

779 3.4.11 Concentration**780 Subtype of Sample**

781 The measurement of the percentage of one component within a mixture of components

Table 130: Properties of Concentration

| Properties | Value |
|------------|---------------|
| units | PERCENT |
| type | CONCENTRATION |

782 3.4.12 Conductivity**783 Subtype of Sample**

784 The measurement of the ability of a material to conduct electricity.

Table 131: Properties of Conductivity

| Properties | Value |
|------------|---------------|
| units | SIEMENS/METER |
| type | CONDUCTIVITY |

785 3.4.13 CuttingSpeed

786 Subtype of Sample

787 The speed difference (relative velocity) between the cutting mechanism and the surface of
788 the workpiece it is operating on.

Table 132: Properties of CuttingSpeed

| Properties | Value |
|------------|-------------------|
| units | MILLIMETER/SECOND |
| type | CUTTING_SPEED |

789 Subtypes of CuttingSpeed are :

- 790 • Actual : The measured value of the data item type given by a sensor or encoder.
- 791 • Commanded : A value specified by the model:Controller type component.
- 792 • Programmed : The value of a signal or calculation specified by a logic or motion
793 program or set by a switch.

794 3.4.14 Density

795 Subtype of Sample

796 The volumetric mass of a material per unit volume of that material.

Table 133: Properties of Density

| Properties | Value |
|------------|----------------------------|
| units | MILLIGRAM/CUBIC_MILLIMETER |
| type | DENSITY |

797 3.4.15 DepositionAccelerationVolumetric

798 Subtype of Sample

799 The rate of change in spatial volume of material deposited in an additive manufacturing
800 process.

Table 134: Properties of DepositionAccelerationVolumetric

| Properties | Value |
|------------|------------------------------------|
| units | CUBIC_MILLIMETER/SECOND^2 |
| type | DEPOSITION_ACCELERATION_VOLUMETRIC |

801 Subtypes of DepositionAccelerationVolumetric are :

- 802 • Actual : The measured value of the data item type given by a sensor or encoder.
- 803 • Commanded : A value specified by the model:Controller type component.

804 3.4.16 DepositionDensity

805 Subtype of Sample

806 The density of the material deposited in an additive manufacturing process per unit of
807 volume.

Table 135: Properties of DepositionDensity

| Properties | Value |
|------------|----------------------------|
| units | MILLIGRAM/CUBIC_MILLIMETER |
| type | DEPOSITION_DENSITY |

808 Subtypes of DepositionDensity are :

- 809 • Actual : The measured value of the data item type given by a sensor or encoder.
- 810 • Commanded : A value specified by the model:Controller type component.

811 3.4.17 DepositionMass

812 Subtype of Sample

813 The mass of the material deposited in an additive manufacturing process.

Table 136: Properties of DepositionMass

| Properties | Value |
|------------|-----------------|
| units | MILLIGRAM |
| type | DEPOSITION_MASS |

814 Subtypes of DepositionMass are :

- 815 • Actual : The measured value of the data item type given by a sensor or encoder.
- 816 • Commanded : A value specified by the model:Controller type component.

817 3.4.18 DepositionRateVolumetric

818 Subtype of Sample

819 The rate at which a spatial volume of material is deposited in an additive manufacturing
820 process.

Table 137: Properties of DepositionRateVolumetric

| Properties | Value |
|------------|----------------------------|
| units | CUBIC_MILLIMETER/SECOND |
| type | DEPOSITION_RATE_VOLUMETRIC |

821 Subtypes of DepositionRateVolumetric are :

- 822 • Actual : The measured value of the data item type given by a sensor or encoder.
- 823 • Commanded : A value specified by the model:Controller type component.

824 3.4.19 DepositionVolume

825 Subtype of Sample

826 The spatial volume of material to be deposited in an additive manufacturing process.

Table 138: Properties of DepositionVolume

| Properties | Value |
|------------|-------------------|
| units | CUBIC_MILLIMETER |
| type | DEPOSITION_VOLUME |

827 Subtypes of DepositionVolume are :

- 828 • Actual : The measured value of the data item type given by a sensor or encoder.
- 829 • Commanded : A value specified by the model:Controller type component.

830 3.4.20 Displacement

831 Subtype of Sample

832 The measurement of the change in position of an object.

Table 139: Properties of Displacement

| Properties | Value |
|------------|--------------|
| units | MILLIMETER |
| type | DISPLACEMENT |

833 3.4.21 ElectricalEnergy

834 Subtype of Sample

835 The measurement of electrical energy consumption by a component.

Table 140: Properties of ElectricalEnergy

| Properties | Value |
|------------|-------------------|
| units | WATT_SECOND |
| type | ELECTRICAL_ENERGY |

836 3.4.22 EquipmentTimer

837 Subtype of Sample

838 The measurement of the amount of time a piece of equipment or a sub-part of a piece of
839 equipment has performed specific activities.

Table 141: Properties of EquipmentTimer

| Properties | Value |
|------------|-----------------|
| units | SECOND |
| type | EQUIPMENT_TIMER |

840 Subtypes of EquipmentTimer are :

- 841 • Delay : A piece of equipment waiting for an event or an action to occur.
- 842 • Loaded : Subparts of a piece of equipment are under load.
- 843 • Operating : A piece of equipment are powered or performing any activity.
- 844 • Powered : Primary power is applied to the piece of equipment and, as a minimum,
845 the controller or logic portion of the piece of equipment is powered and functioning
846 or components that are required to remain on are powered.
- 847 • Working : A piece of equipment performing any activity, the equipment is active
848 and performing a function under load or not.

849 3.4.23 FillLevel

850 Subtype of Sample

851 The measurement of the amount of a substance remaining compared to the planned maxi-
852 mum amount of that substance.

Table 142: Properties of FillLevel

| Properties | Value |
|------------|------------|
| units | PERCENT |
| type | FILL_LEVEL |

853 3.4.24 Flow**854 Subtype of Sample**

855 The measurement of the rate of flow of a fluid.

Table 143: Properties of Flow

| Properties | Value |
|------------|--------------|
| units | LITER/SECOND |
| type | FLOW |

856 3.4.25 Frequency**857 Subtype of Sample**

858 The measurement of the number of occurrences of a repeating event per unit time.

Table 144: Properties of Frequency

| Properties | Value |
|------------|-----------|
| units | HERTZ |
| type | FREQUENCY |

859 3.4.26 GlobalPosition**860 Subtype of Sample**

861 *DEPRECATED* in Version 1.1

Table 145: Properties of GlobalPosition

| Properties | Value |
|------------|-----------------|
| type | GLOBAL_POSITION |

862 3.4.27 Length**863 Subtype of Sample**

864 The measurement of the length of an object.

Table 146: Properties of Length

| Properties | Value |
|------------|------------|
| units | MILLIMETER |
| type | LENGTH |

865 Subtypes of Length are :

- 866 • Remaining : Remaining measure of an object or an action.
- 867 • Standard : The standard or original length of an object.
- 868 • Useable : The remaining useable length of an object.

869 3.4.28 Level

870 Subtype of Sample

871 *DEPRECATED* in Version 1.2. See model:FILL_LEVEL

Table 147: Properties of Level

| Properties | Value |
|------------|-------|
| type | LEVEL |

872 3.4.29 LinearForce

873 Subtype of Sample

874 The measurement of the push or pull introduced by an actuator or exerted on an object.

Table 148: Properties of LinearForce

| Properties | Value |
|------------|--------------|
| units | NEWTON |
| type | LINEAR_FORCE |

875 3.4.30 Load

876 Subtype of Sample

877 The measurement of the actual versus the standard rating of a piece of equipment.

Table 149: Properties of Load

| Properties | Value |
|------------|---------|
| units | PERCENT |
| type | LOAD |

878 3.4.31 Mass

879 Subtype of Sample

880 The measurement of the mass of an object(s) or an amount of material.

Table 150: Properties of Mass

| Properties | Value |
|------------|----------|
| units | KILOGRAM |
| type | MASS |

881 3.4.32 PH

882 Subtype of Sample

883 A measure of the acidity or alkalinity of a solution.

Table 151: Properties of PH

| Properties | Value |
|------------|-------|
| units | PH |
| type | PH |

884 3.4.33 PathFeedrate**885 Subtype of Sample**

886 The measurement of the feedrate for the axes, or a single axis, associated with a model:Path
 887 component-a vector.

Table 152: Properties of PathFeedrate

| Properties | Value |
|------------|-------------------|
| units | MILLIMETER/SECOND |
| type | PATH_FEEDRATE |

888 Subtypes of PathFeedrate are :

- 889 • Actual : The measured value of the data item type given by a sensor or encoder.
- 890 • Commanded : A value specified by the model:Controller type component.
- 891 • Jog : The feedrate specified by a logic or motion program, by a pre-set value, or set
 892 by a switch as the feedrate for the model:Axes.
- 893 • Override : The operators overridden value.
- 894 • Programmed : The value of a signal or calculation specified by a logic or motion
 895 program or set by a switch.
- 896 • Rapid : The value of a signal or calculation issued to adjust the feedrate of a
 897 component or composition that is operating in a rapid positioning mode.

898 3.4.34 PathFeedratePerRevolution**899 Subtype of Sample**

900 The feedrate for the axes, or a single axis.

Table 153: Properties of PathFeedratePerRevolution

| Properties | Value |
|------------|------------------------------|
| units | MILLIMETER/REVOLUTION |
| type | PATH_FEEDRATE_PER_REVOLUTION |

901 Subtypes of PathFeedratePerRevolution are :

- 902 • **Actual** : The measured value of the data item type given by a sensor or encoder.
- 903 • **Commanded** : A value specified by the model:Controller type component.
- 904 • **Programmed** : The value of a signal or calculation specified by a logic or motion
- 905 program or set by a switch.

906 **3.4.35 PathPosition**

907 **Subtype of Sample**

908 A measured or calculated position of a control point associated with a model:Controller
 909 element, or model:Path element if provided, of a piece of equipment.

Table 154: Properties of PathPosition

| Properties | Value |
|------------|---------------|
| units | MILLIMETER_3D |
| type | PATH_POSITION |

910 Subtypes of PathPosition are :

- 911 • **Actual** : The measured value of the data item type given by a sensor or encoder.
- 912 • **Commanded** : A value specified by the model:Controller type component.
- 913 • **Probe** : The position provided by a measurement probe.
- 914 • **Target** : The desired measure or count for a data item value.

915 **3.4.36 Position**

916 **Subtype of Sample**

917 A measured or calculated position of a model:Component element as reported by a piece
 918 of equipment.

Table 155: Properties of Position

| Properties | Value |
|------------|------------|
| units | MILLIMETER |
| type | POSITION |

919 Subtypes of Position are :

- 920 • Actual : The measured value of the data item type given by a sensor or encoder.
- 921 • Commanded : A value specified by the model:Controller type component.
- 922 • Programmed : The value of a signal or calculation specified by a logic or motion
- 923 program or set by a switch.
- 924 • Target : The desired measure or count for a data item value.

925 3.4.37 PowerFactor

926 Subtype of Sample

927 The measurement of the ratio of real power flowing to a load to the apparent power in that
928 AC circuit.

Table 156: Properties of PowerFactor

| Properties | Value |
|------------|--------------|
| units | PERCENT |
| type | POWER_FACTOR |

929 3.4.38 Pressure

930 Subtype of Sample

931 The measurement of force per unit area exerted by a gas or liquid.

Table 157: Properties of Pressure

| Properties | Value |
|------------|----------|
| units | PASCAL |
| type | PRESSURE |

932 3.4.39 ProcessTimer

933 Subtype of Sample

934 The measurement of the amount of time a piece of equipment has performed different
 935 types of activities associated with the process being performed at that piece of equipment.

Table 158: Properties of ProcessTimer

| Properties | Value |
|------------|---------------|
| units | SECOND |
| type | PROCESS_TIMER |

936 Subtypes of ProcessTimer are :

- 937 • Delay : A piece of equipment waiting for an event or an action to occur.
- 938 • Process : The measurement of the time from the beginning of production of a part
 939 or product on a piece of equipment until the time that production is complete for that
 940 part or product on that piece of equipment. This includes the time that the piece of
 941 equipment is running, producing parts or products, or in the process of producing
 942 parts.

943 3.4.40 Resistance

944 Subtype of Sample

945 The measurement of the degree to which a substance opposes the passage of an electric
 946 current.

Table 159: Properties of Resistance

| Properties | Value |
|------------|------------|
| units | OHM |
| type | RESISTANCE |

947 3.4.41 RotaryVelocity

948 Subtype of Sample

949 The measurement of the rotational speed of a rotary axis.

Table 160: Properties of RotaryVelocity

| Properties | Value |
|------------|-------------------|
| units | REVOLUTION/MINUTE |
| type | ROTARY_VELOCITY |

950 Subtypes of RotaryVelocity are :

- 951 • Actual : The measured value of the data item type given by a sensor or encoder.
- 952 • Commanded : A value specified by the model:Controller type component.
- 953 • Override : The operators overridden value.
- 954 • Programmed : The value of a signal or calculation specified by a logic or motion
- 955 program or set by a switch.

956 3.4.42 SoundLevel

957 Subtype of Sample

958 The measurement of a sound level or sound pressure level relative to atmospheric pressure.

Table 161: Properties of SoundLevel

| Properties | Value |
|------------|-------------|
| units | DECIBEL |
| type | SOUND_LEVEL |

959 Subtypes of SoundLevel are :

- 960 • `AScale` : A Scale weighting factor. This is the default weighting factor if no factor
- 961 is specified
- 962 • `BScale` : B Scale weighting factor
- 963 • `CScale` : C Scale weighting factor
- 964 • `DScale` : D Scale weighting factor
- 965 • `NoScale` : No weighting factor on the frequency scale

966 3.4.43 SpindleSpeed

967 Subtype of Sample

968 *DEPRECATED* in Version 1.2. Replaced by model:ROTARY_VELOCITY

Table 162: Properties of SpindleSpeed

| Properties | Value |
|------------|-------------------|
| units | REVOLUTION/MINUTE |
| type | SPINDLE_SPEED |

969 Subtypes of SpindleSpeed are :

- 970 • `Actual` : The measured value of the data item type given by a sensor or encoder.
- 971 • `Commanded` : A value specified by the model:Controller type component.
- 972 • `Override` : The operators overridden value.

973 3.4.44 Strain

974 Subtype of Sample

975 The measurement of the amount of deformation per unit length of an object when a load
 976 is applied.

Table 163: Properties of Strain

| Properties | Value |
|------------|---------|
| units | PERCENT |
| type | STRAIN |

977 3.4.45 Temperature

978 Subtype of Sample

979 The measurement of temperature.

Table 164: Properties of Temperature

| Properties | Value |
|------------|-------------|
| units | CELSIUS |
| type | TEMPERATURE |

980 3.4.46 Tension

981 Subtype of Sample

982 The measurement of a force that stretches or elongates an object.

Table 165: Properties of Tension

| Properties | Value |
|------------|---------|
| units | NEWTON |
| type | TENSION |

983 3.4.47 Tilt

984 Subtype of Sample

985 The measurement of angular displacement.

Table 166: Properties of Tilt

| Properties | Value |
|------------|--------------|
| units | MICRO_RADIAN |
| type | TILT |

986 3.4.48 Torque**987 Subtype of Sample**

988 The measurement of the turning force exerted on an object or by an object.

Table 167: Properties of Torque

| Properties | Value |
|------------|--------------|
| units | NEWTON_METER |
| type | TORQUE |

989 3.4.49 Velocity**990 Subtype of Sample**

991 The measurement of the rate of change of position of a model:Component.

Table 168: Properties of Velocity

| Properties | Value |
|------------|-------------------|
| units | MILLIMETER/SECOND |
| type | VELOCITY |

992 3.4.50 Viscosity**993 Subtype of Sample**

994 The measurement of a fluids resistance to flow.

Table 169: Properties of Viscosity

| Properties | Value |
|------------|---------------|
| units | PASCAL_SECOND |
| type | VISCOSITY |

995 3.4.51 VoltAmpere**996 Subtype of Sample**

997 The measurement of the apparent power in an electrical circuit, equal to the product of
 998 root-mean-square (RMS) voltage and RMS current (commonly referred to as VA).

Table 170: Properties of VoltAmpere

| Properties | Value |
|------------|-------------|
| units | VOLT_AMPERE |
| type | VOLT_AMPERE |

999 3.4.52 VoltAmpereReactive**1000 Subtype of Sample**

1001 The measurement of reactive power in an AC electrical circuit (commonly referred to as
 1002 VAR).

Table 171: Properties of VoltAmpereReactive

| Properties | Value |
|------------|----------------------|
| units | VOLT_AMPERE_REACTIVE |
| type | VOLT_AMPERE_REACTIVE |

1003 3.4.53 Voltage**1004 Subtype of Sample**

1005 The measurement of electrical potential between two points.

Table 172: Properties of Voltage

| Properties | Value |
|------------|---------|
| units | VOLT |
| type | VOLTAGE |

1006 Subtypes of Voltage are :

- 1007 • Actual : The measured value of the data item type given by a sensor or encoder.
- 1008 • Alternating : The measurement of alternating voltage or current. If not speci-
- 1009 fied further in statistic, defaults to RMS voltage.
- 1010 • Direct : The measurement of DC current or voltage.
- 1011 • Target : The desired measure or count for a data item value.

1012 3.4.54 VolumeFluid

1013 Subtype of Sample

1014 The fluid volume of an object or container.

Table 173: Properties of VolumeFluid

| Properties | Value |
|------------|--------------|
| units | MILLILITER |
| type | VOLUME_FLUID |

1015 Subtypes of VolumeFluid are :

- 1016 • Actual : The measured value of the data item type given by a sensor or encoder.
- 1017 • Consumed : The amount of bulk material consumed from an object or container
- 1018 during a manufacturing process.

1019 3.4.55 VolumeSpatial

1020 Subtype of Sample

1021 The geometric volume of an object or container.

Table 174: Properties of VolumeSpatial

| Properties | Value |
|------------|------------------|
| units | CUBIC_MILLIMETER |
| type | VOLUME_SPATIAL |

1022 Subtypes of VolumeSpatial are :

- 1023 • Actual : The measured value of the data item type given by a sensor or encoder.
- 1024 • Consumed : The amount of bulk material consumed from an object or container
- 1025 during a manufacturing process.

1026 3.4.56 Wattage

1027 Subtype of Sample

1028 The measurement of power flowing through or dissipated by an electrical circuit or piece
1029 of equipment.

Table 175: Properties of Wattage

| Properties | Value |
|------------|---------|
| units | WATT |
| type | WATTAGE |

1030 Subtypes of Wattage are :

- 1031 • Actual : The measured value of the data item type given by a sensor or encoder.
- 1032 • Target : The desired measure or count for a data item value.

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