

*Dimensional Metrology
Standards Consortium*

DMSC

Quality Information Framework (QIF) – An Integrated Model for Manufacturing Quality Information

Part 7: QIF Results Information Model and XML Schema File Version 2.0



QIF Version 2.0

ANSI/QIF Part 7-2014

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Foreword

The Dimensional Metrology Standards Consortium (DMSC, Inc.) is an American National Standards Institute (ANSI) accredited standards developing organization, as well as an A-Liaison to the International Organization for Standardization (ISO). The mission of the DMSC is to identify urgently needed standards in the field of dimensional metrology, and to promote, foster, and encourage the development and interoperability of these standards, along with related and supporting standards that will benefit the industry as a whole. More information about the DMSC can be found at www.dmsc-inc.org.

The Quality Information Framework (QIF) information model was developed by domain experts from the manufacturing quality (that is metrology) community representing a wide variety of industries and quality measurement needs. Specifically for this version 2.0 of QIF Results work, contributors include:

- Capvidia, Inc.
- Honeywell Federal Manufacturing & Technology
- Mitutoyo America
- National Institute of Standards and Technology (NIST)
- Origin International Inc.

More information about DMSC's QIF effort can be found at www.qifstandards.org.

The bulk of the work on this document was performed by the QIF Results Working Group, revised as needed and approved by the Quality Information Framework (QIF) Working Group, and given final approval for ANSI balloting by the DMSC's Quality Measurement Standards (QMS) Committee. QIF version 2.0 is solely a product of the DMSC and its committees and working groups.

The inaugural QIF standard, version 1.0, was published in 2013. This document is a component of the second release of the QIF suite of standards, denoted version 2.0. Each major release of the QIF standard is composed of several *Parts* documents. QIF version 2.0 includes revisions of the version 1.0 Parts 1, 2, 3 and 4, and introduces four new Parts documents that did not exist in version 1.0.

Version 2.0 of QIF consists of the following parts, under the general title *Quality Information Framework (QIF) — An Integrated Model for Manufacturing Quality Information*:

Part 1: Overview and Fundamental Principles Version 2.0

Part 2: QIF Library Information Model and XML Schema Files Version 2.0

Part 3: QIF Model Based Definition (MBD) Information Model and XML Schema File Version 2.0

Part 4: QIF Plans Information Model and XML Schema File Version 2.0

Part 5: QIF Resources Information Model and XML Schema File Version 2.0

Part 6: QIF Rules Information Model and XML Schema File Version 2.0

Part 7: QIF Results Information Model and XML Schema File Version 2.0

Part 8: QIF Statistics Information Model and XML Schema File version 2.0

Individual *Parts* documents of the QIF suite are given the version number of the major QIF revision, even when the Part document may be new. QIF version 2.0 documents cancel and replace all documents of version 1.0.

This document, designated QIF Part 7-2014, is a revision and redesignation of a previous QIF standard designated “ANSI/QIF Part 4: QMResults – 2013”. This Part 7 document cancels and replaces the 2013 version. It’s content was revised to reflect changes in the QIF information model, and its name was changed to reflect renumbering of the Parts documents and to refine the name. This document is solely a product of the DMSC and its committees and working groups.

The contents of the version 2.0 QIF Results information model changed very little from version 1.0. The architecture of the model was changed due to structural revisions in the QIF-wide information model. For this reason the format of version 2.0 QIF Results instance files is not backward compatible with version 1.0.

HTML-based data model viewer

The DMSC will make available an html-file based data dictionary for the entire QIF information model as an aid to understanding QIF. This data dictionary is non-normative material, but describes the normative content of the QIF data model. The html files facilitate viewing the complete data model, including all six application areas and Library content, using pictures and text. A user has the ability, through an internet browser, to follow navigation links forward and backward through the data model description using mouse clicks.

Introduction

Part inspection is carried out by a measurement execution activity, whose functionality is typically to interpret machine-level measurement plans, give equipment level commands to specific dimensional measuring equipment (DME) control units, collect point data, fit features to the data, and output feature and characteristic data. Measurement execution can also include software solutions that issue instructions to human operators using calipers, go/no-go gages, and specialized inspection equipment, to generate results data. Once the machine-level measurement plans are executed, the measurement data, either raw data or pre-processed data, is collected, reported, and analyzed. The QIF Results specification provides a vendor-neutral format for the data. Software solutions that support QIF, by either writing or reading QIF files, can exchange manufacturing quality data efficiently and accurately.

Quality Information Framework (QIF) — An Integrated Model for Manufacturing Quality Information

Part 7: QIF Results Information Model and XML Schema File

1 Scope

1.1 Contents of this document

This standard defines a QIF application information model called QIF Results. Part 1 describes the relationship of QIF Results to the rest of the QIF model. The information model is described in a data dictionary and consists of definitions for data types, elements, the logical relationships between them, and the semantics of the quality information. The information model is defined using the XML schema definition language (XSDL). The XSDL model is scoped to be a digital data exchange mechanism that can be easily incorporated in application software developed by commercial solution vendors that implement manufacturing quality systems.

XSDL also supports the definition of constraints for validation of QIF instance files. The QIFResults.xsd file defines only the highest levels of the QIF Results information model and one constraint. The bulk of the model is defined in the schema files of the QIF Library. All QIF XML schema files are a normative part of the QIF standard and are bundled into a single compressed folder file called “QIF_2.0_XMLSchemaFiles.zip” which can be downloaded at www.qifstandards.org.

1.2 Workflow of QIF Results data for manufacturing quality

The Part 1 document describes an example of enterprise quality information workflow that employs QIF modeled information at all interfaces. Figure 1 shows an example of quality workflow that uses only QIF Results data, in order to focus on the QIF Results information model.

In this example, upstream processes generate a set of part-specific inspection requirements. A common example is the set of characteristics and requirements data of a First Article Inspection Report (FAIR) conforming to the AS9102a standard. The Measurement Programming activity takes knowledge of actual inspection resources by capability and availability, assigns resources to the plan, and generates a program or set of inspection instructions suitable to the resource chosen. The execution program may be in DMIS format or any other proprietary format, including non-digital information like instructions to human operators using calipers, go/no-go gauges, or other specialized inspection equipment.

The Execute Measurement Process activity inspects the part or assembly by executing the program and generates results formatted according to the QIF Results standard. Finally, measurement results are collected, reported, and analyzed, through the Analyze and Report

Quality Data activity. Results of a single part inspection, as well as the statistical analysis of groups of parts, can provide feedback to upstream processes such as product manufacturing and quality engineering.

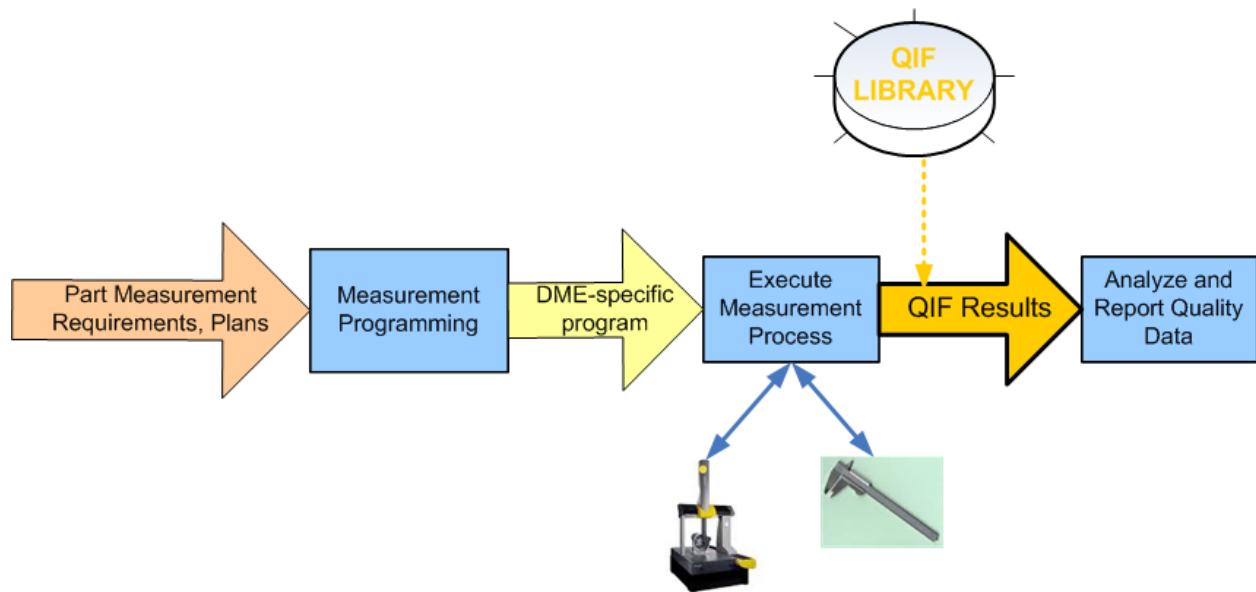


Figure 1 – Example of QIF information flow.

The dotted line indicates that the QIF Results information model uses data type definitions in the Library. The QIF information model has been harmonized with DMIS, to support all data that may be defined in a DMIS program.

1.3 Design guidelines for the QIF Results information model

The QIF Results information model was designed to satisfy these functional requirements:

- express results of dimensional inspection according to the principles of ASME Y14.5. It also supports data required to fully express the intent and results of inspection programs written in the DMIS language.
- support inspection traceability of quality data. This means that inspection results data can be identified with the factory resources used to inspect the part, including equipment, software, and people.
- support information needed by downstream processes, e.g., First Article Inspection Report (FAIR) generation, statistical process control and other computer aided quality solutions.
- support a workflow of quality data that is digital model-based or document/drawing-based.

2 Conformance

Software products that implement this specification to write QIF Results XML instance files must:

- follow the rules of XML when writing QIF Results instance files
- generate instance files that validate against the QIFDocument schema
- employ semantics of the information written that complies with the referenced standards and with the data dictionary in this specification.

Software products that implement this specification to read QIF Results files must:

- be able to read any valid QIF Results XML instance file and extract all numerical and semantic data correctly.

3 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ANSI/DMIS 105.2, Part 1-2009, *Dimensional Measuring Interface Standard, DMIS 5.2 Standard, Part 1*. Also available as ISO 22093:2011 *Industrial automation systems and integration -- Physical device control -- Dimensional Measuring Interface Standard (DMIS)*

ASME B1.7 - 2006, *Screw Threads: Nomenclature, Definitions, and Letter Symbols*

ASME Y14.36 - 1996, *Surface Texture Symbols*

ASME Y14.6 - 2001, *Screw Thread Representation*

ASME Y14.5M-1994 (reaffirmed 2004), *Dimensioning and Tolerancing - Engineering Drawing and Related Documentation Practices*

ASME Y14.5-2009, *Dimensioning and Tolerancing - Engineering Drawing and Related Documentation Practices*

ASME Y14.41 (2003), *Digital Product Definition Data Practices*

Extensible Markup Language (XML) 1.0 (Fifth Edition), W3C Recommendation 26 November 2008

ISO/IEC 9834-8:2008. *Information technology -- Open Systems Interconnection -- Procedures for the operation of OSI Registration Authorities: Generation and registration of Universally Unique Identifiers (UUIDs) and their use as ASN.1 Object Identifier components*

ISO/IEC 11578:1996: "Information technology - Open System Interconnection - Remote Procedure Call (RPC)"

ISO/IEC Guide 99:2007 (E/F) – *International vocabulary of metrology – Basic and general concepts and associated terms* (VIM)

XML Schema Part 1: Structures Second Edition, W3C Recommendation 28 October 2004

XML Schema Part 2: Datatypes Second Edition, W3C Recommendation 28 October 2004

4 Terms and definitions

The terms and definitions used in this document are given in Part 1 of this standard.

5 Symbols and abbreviated terms

| | |
|-------|--|
| ANSI | American National Standards Institute |
| ASCII | American Standard Code for Information Interchange |
| ASME | American Society of Mechanical Engineers |
| BREP | Boundary Representation |
| CAD | Computer-Aided Design |
| CAIPP | Computer-Aided Inspection Process Planning |
| CAM | Computer-Aided Machining |
| CAX | Computer-Aided Technologies |
| CMM | Coordinate Measuring Machine |
| CoP | Cloud of Points |
| COTS | Commercial Off-The-Shelf |
| DME | Dimensional Measuring Equipment |
| DMIS | Dimensional Measuring Interface Standard |
| DMSC | Dimensional Metrology Standards Consortium |
| DRF | Datum Reference Frame |
| ERP | Enterprise Resource Planning |
| GD&T | Geometric Dimensioning and Tolerancing |
| GPS | Geometrical Product Specifications |
| GUID | Globally Unique Identifier |
| ISO | International Organization for Standardization |
| MBD | Model Based Definition |

| | |
|-------|---|
| MES | Manufacturing Execution Systems |
| MRI | Measurement Resources Information |
| MRP | Materials Resource Planning |
| MSA | Measurement Systems Analysis |
| PDPMI | Product Definition with Product Manufacturing Information |
| PMI | Product Manufacturing Information |
| QIF | Quality Information Framework |
| QMS | Quality Measurement Standards (a DMSC committee) |
| QPIId | QIF Persistent Identifier |
| R&R | Repeatability and Reproducibility |
| SI | The International Systems of Units |
| SPC | Statistical Process Control |
| SQC | Statistical Quality Control |
| STEP | Standard for the Exchange of Product model data (ISO 10303) |
| UUID | Universally Unique Identifier |
| XML | eXtensible Markup Language |
| XSDL | XML Schema Definition Language |

6 The QIFResults.xsd schema file

6.1 High level structure of the QIF Results schema

This section describes the highest level *elements* of the QIF Results information model. The QIF Results schema model includes the information items from the QIFResults.xsd schema file and several of the schema files in the QIF Library. The QIF Library files are incorporated into the schema by a chain of "include" directives starting in the QIFResults.xsd schema file. *Elements* in the figure with + signs at the right (all but one) have substructure that is not shown in the figure. Most substructure is defined in the QIF Library files. A complete description of all data definitions and elements given in QIFResults.xsd is in the data dictionary in Annex C – QIF Results data dictionary.

The **MeasurementsResults** *element* shown in Figure 2, which is of type **MeasurementsResultsType**, is the highest level element of the QIF Results model. An XML

instance file written in conformance with the QIFDocument.xsd and QIFResults.xsd schema files may contain one **MeasurementsResults** element. Its components are:

- **Version** – an optional *element* containing information about the file, including **TimeCreated**, **Signoffs**, and **ThisInstanceQPIId**, a universally unique identifier for the file. QPIs are discussed in section 6.11 of Part 1. **QPIIdType** is defined in Primitives.xsd.
- a list of one or more **MeasurementResults** *elements*, each of which contains information about a set of related measurements. The user may decide which measurements are related. In a common scenario, several parts of the same design may be measured in order to collect data for statistical analysis. The data for each part would be put into a separate **MeasurementResults** *element*.
- optional **ActualComponentSet** *elements* which describe physical objects that may comprise the manufactured product that was inspected. Any product with two or more components is also called an assembly. QIF can identify inspection data by individual components of an assembly. The scheme for defining and identifying components of assemblies is described in more detail in Part 1: Overview.
- a single **InspectionTraceability** *element* which is optional. It contains information common to all product measurements in the QIF Results instance file about workflow details and the inspection resources that were used to generate the **MeasurementsResults** data. (Each **MeasurementResults** *element* also has a single, optional **InspectionTraceability** *element* that contains information particular to that single product measurement.)
- the *constraints* shown is a *key/keyref* pair. The **ActualComponentIdKey** collects all **QIFIds** of **ActualComponents**. The **ActualComponentKeyref** requires that an *element* that is supposed to be the id of an **ActualComponent** located anywhere be the id of an **ActualComponent**.

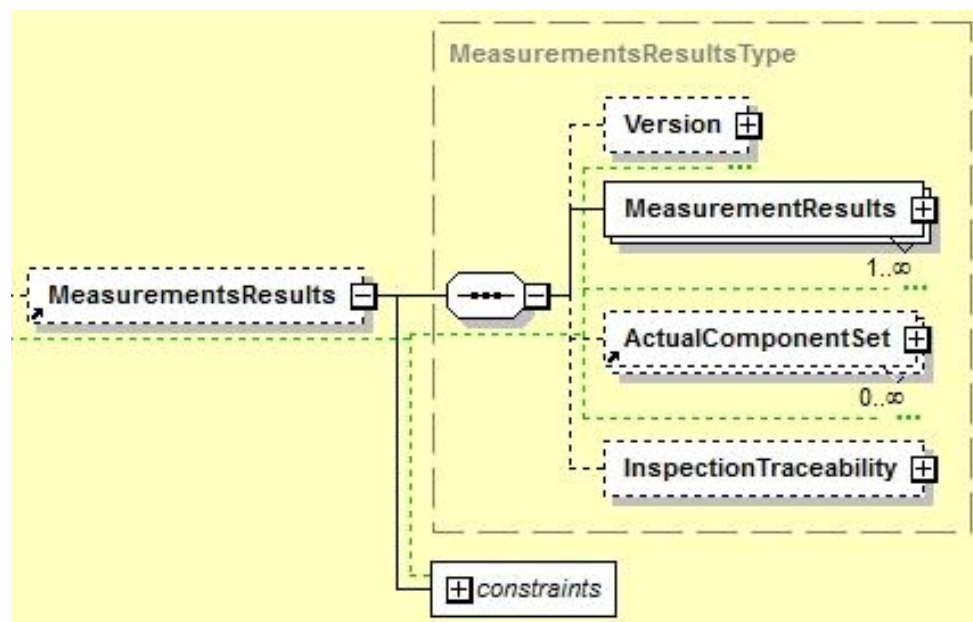


Figure 2 – High level view of the **MeasurementsResults** element

The sub-*elements* of the **MeasurementResultsType**, introduced in Figure 2 and described in Figure 3 are:

- **InspectionTraceability** - this optional *element*, of type **InspectionTraceabilityType**, gives traceability information that applies to this set of measurement results.
- **ThisResultsInstanceQPid** – this *element* uniquely identifies the measurement results. Versions of the QIF Results instance file reporting different measurements must have different **ThisResultsInstanceQPid** element values.
- **ExternalFileReference** - each optional *element*, of type **ExternalFileReferenceType** is a reference to an additional file created in the measurement process, e.g. a photo, a text CMM report, etc.
- **MeasuredFeatures** - this optional *element* gives information about the actual features that were measured.
- **MeasuredCharacteristics** - this optional *element* gives information about the actual characteristics that were measured and evaluated.
- **CoordinateSystemActualTransforms** - this optional *element* gives information about the coordinate system actual transforms used in the measurement results.
- **InspectionStatus** – this *element*, of type **InspectionStatusType**, reports the status of the **MeasurementResults**.
- **ActualComponentIds** – this *element* is the list of QIFIds of actual components involved in the **MeasurementResults**.

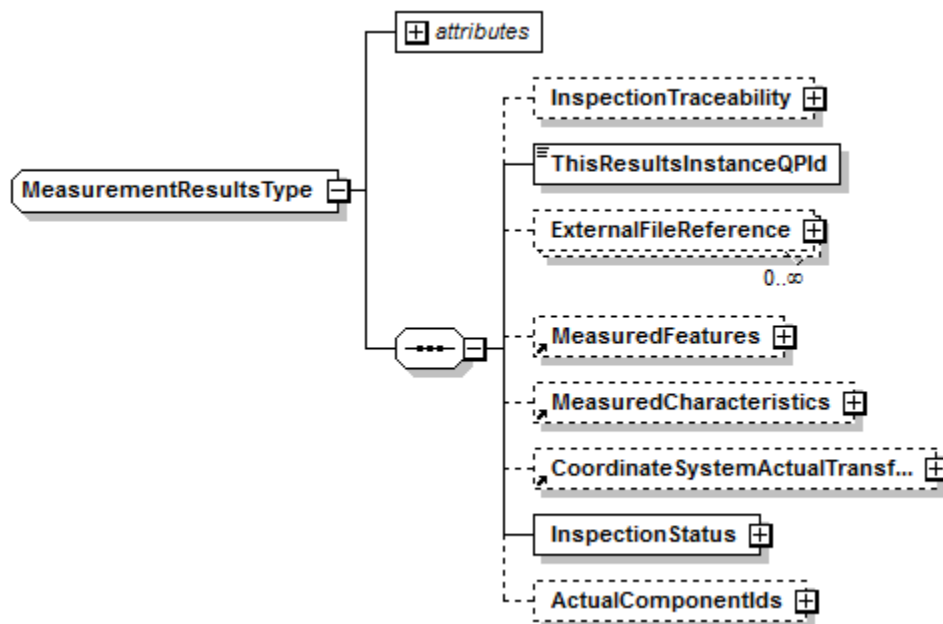


Figure 3 – Sub-*elements* of the MeasurementResults data type

The **ActualComponentsSet** *element*, introduced in Figure 2, is a list of *elements* of type **ActualComponentType** which is described in Figure 4. Its components are:

- local *attributes* – The *id attribute* is the QIF Id of the actual component, used for referencing.
- optional **Attributes** *element* - The optional **Attributes** *element* contains user defined attributes (e.g., typified, binary array, or XML structured).
- optional **SerialNumber** *element* – this *element* is a label of a specific actual component of a given type. Components with the same **ModelNumber** have different **SerialNumbers**. The combination of **ModelNumber** and **SerialNumber** should differentiate a given actual component from all other actual components in a QIF application instance file.
- optional **AdditionalChanges** *element* – this *element* is a record of any changes to the product beyond what is recorded in the product model. The information recorded here may be used for the Additional Changes field of an AS9102A form.
- **Status** – the required **Status** *element* gives the inspection status of the actual component.
- optional **Traceability** *element*, of type **ActualProductTraceabilityType** - this *element* gives traceability information for an actual component. See Part 2 for details about the **Traceability** *element*.
- optional **AsmPathId** *element* – this *element* is the id of the assembly path of this component. It gives information about where the actual component is located in an assembly.

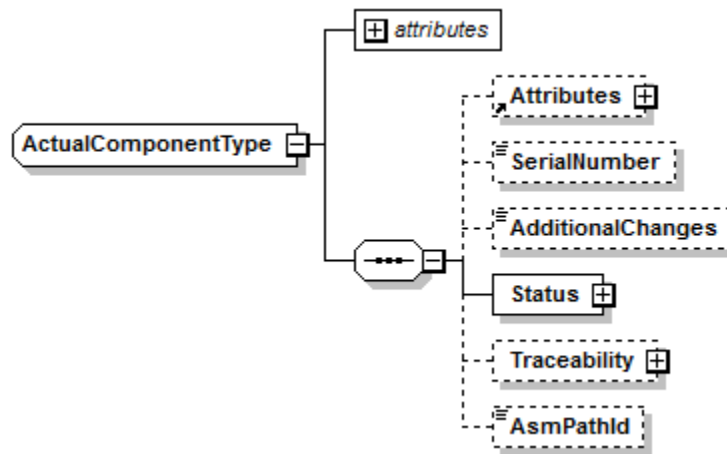


Figure 4 – The **ActualComponentType** data type

7 Data dictionary: QIFResults.xsd

QIFResults.xsd is a single XML schema file that describes the QIF Results information model. It defines several data types that are unique to the QIF Results application area, and, in keeping with QIF design guidelines, it reuses definitions from the QIF library whenever possible. For the description of the QIF Results data dictionary as instantiated using XML Schema, refer to

Annex C – QIF Results data dictionary.

Annex A – Location of QIFResults.xsd

The QIF Results information model is expressed in XML schema definition language in the file “QIFResults.xsd”. All QIF XML schema files are normative and are bundled into a single compressed folder file called “QIF_2.0_XMLSchemaFiles.zip” which is available for download at www.qifstandards.org.

Annex B - Graphical conventions of the data dictionary

(informative)

This section describes the graphical conventions used in the QIF data dictionaries. The data dictionaries describe the structure of the information models and the manufacturing quality semantics of the data types.

The rules of encoding QIF instance files are primarily defined in the XML schema files, but the data dictionaries express many of the same requirements via the pictures and table entries.

Data type definitions are indicated by a box with beveled corners on the left side, as in Figure B.1.

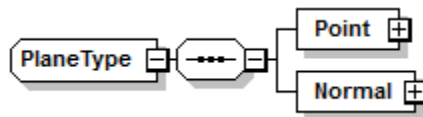


Figure B.1 – Notation for a type definition, *PlaneType*.

Rectangular boxes indicate data *elements*. A solid rectangle indicates a required *element*, whereas a dotted rectangle indicates an optional *element*. If an object is not designated optional, then it is required by default. Small boxes on the right hand end of *element* boxes, containing either "-" or "+" are used to indicate one of the following conditions exist:

- A ("+") indicates that the additional structures or *elements* below this node have been hidden in this diagram.
- A ("-") indicates that additional structures or *elements* below this node exist and are visible on the diagram.

The absence of any box at the right hand end of an *element* box indicates that the type of the *element* is a primitive type without any substructure, e.g., xs:decimal. In this case, there will also be three bars in the upper left corner of the *element* box. The beveled box with 3 dots on a line represents the XSDL *sequence* operator. It indicates that the object to the left is composed of all of the *elements* to the right, in that specified order.

Type definitions can be reused to generate data *elements*, as shown by a yellow box in dotted lines, with the name of the type definition at the top. Figure B.2 shows that **ZonePlane** is an *element* of type ***PlaneType***.

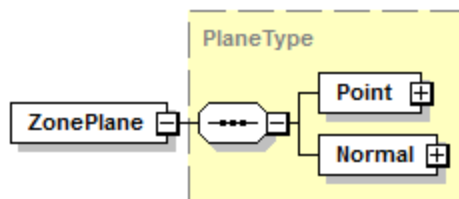


Figure B.2 – Reuse of the type definition *PlaneType* to generate *element* *ZonePlane*.

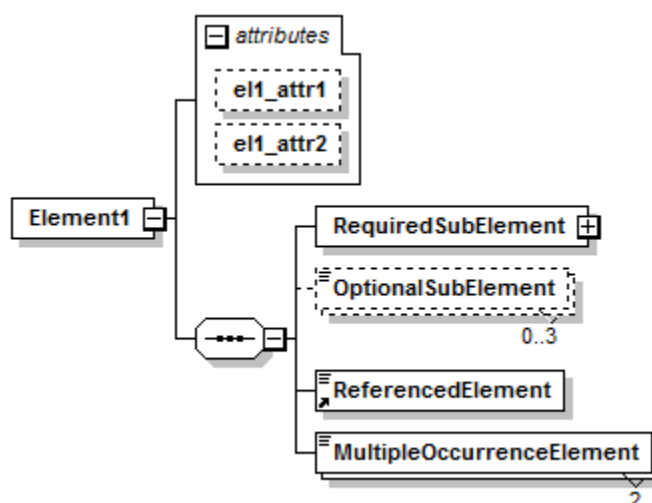



Figure B.3 – Notation for *elements*, *sub-elements*, and *attributes*.

Figure B.3 contains examples of numerous information modeling notations. *Element* definitions in XML schema files can be reused by "reference", indicated by an arrow in the lower left corner of the **ReferencedElement** box. *Elements* may appear in an XML instance document more than once. Figure B.3. shows the **OptionalSubElement** notated with two numerals separated by an ellipsis, "0..3", that indicates the number of occurrences as an inclusive range. The **OptionalSubElement** may occur zero, 1, 2, or 3 times as sub-*elements* of **Element1**. Where there is a single cardinality numeral, the *element* must occur exactly that number of times in the instance file. For example, the *element* **MultipleOccurrenceElement** must occur exactly two times as sub-*elements* of **Element1**. Information items can be instantiated in XSDL as *elements* or *attributes*. An *element's* *attributes* are shown in the data dictionaries as solid-lined boxes that are explicitly labeled *attributes*, as shown at the top of the diagram.

Figure B.4 shows an example *element* definition where exactly one of the three sub-*element* choices must be given. The beveled box with three square dots and a "switch" line ()

indicates the XSDL *choice* structure. When **Element2** is instantiated in an XML instance file, it must have exactly one sub-*element* chosen among the three sub-*elements* shown.

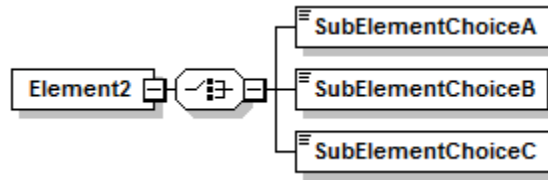


Figure B.4 – The *choice* of notation.

The data dictionaries are grouped by XML schema file. It is characteristic of QIF definitions to use types declared in other XML schema files. The sharing of definitions specified in other files is indicated by the XML schema file directive *include*.

Annex C – QIF Results data dictionary

(normative)

schema location: **..\QIFApplications\QIFResults.xsd**
 attributeFormDefault: **unqualified**
 elementFormDefault: **qualified**
 targetNamespace: **http://qifstandards.org/xsd/qif2**

Complex types

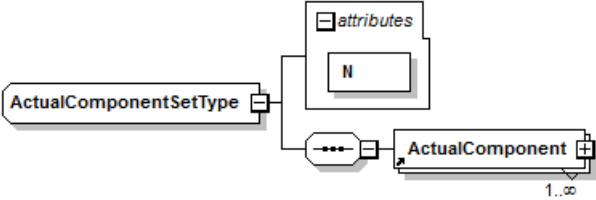
[ActualComponentSetType](#)

[ActualComponentType](#)

[MeasurementResultsType](#)

[MeasurementsResultsType](#)

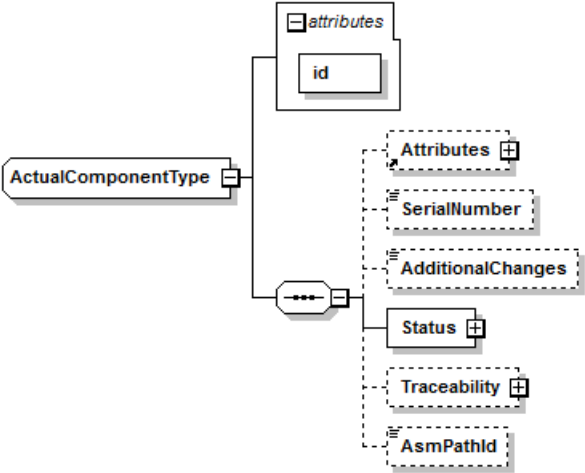
C.1 complexType ActualComponentSetType

| | | | | | | |
|------------|--|---------------------------|----------|---------|-------|--|
| diagram |  | | | | | |
| children | ActualComponent | | | | | |
| used by | element | ActualComponentSet | | | | |
| attributes | Name | Type | Use | Default | Fixed | Annotation |
| | N | NaturalType | required | | | documentation The N attribute shows how many objects are present in this set. |
| annotation | documentation The ActualComponentSetType describes the container for storing data of actual components. | | | | | |

C.2 attribute ActualComponentSetType/@N

| | | | |
|------------|--|----------|------------|
| type | NaturalType | | |
| properties | use | required | |
| facets | Kind | Value | Annotation |
| | minInclusive | 1 | |
| annotation | documentation The N attribute shows how many objects are present in this set. | | |

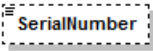
C.3 complexType ActualComponentType

| | | | | | | |
|------------|--|------------------------|----------|---------|-------|---|
| diagram |  | | | | | |
| children | Attributes SerialNumber AdditionalChanges Status Traceability AsmPathId | | | | | |
| used by | element | ActualComponent | | | | |
| attributes | Name | Type | Use | Default | Fixed | Annotation |
| | id | QIFIdType | required | | | documentation The id attribute is the QIF id of the actual component data, used for referencing. |
| annotation | documentation The ActualComponentType defines data of an actual component. | | | | | |

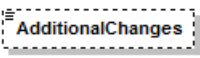
C.4 attribute ActualComponentType/@id

| | |
|------------|---|
| type | QIFIdType |
| properties | use required |
| annotation | documentation The id attribute is the QIF id of the actual component data, used for referencing. |

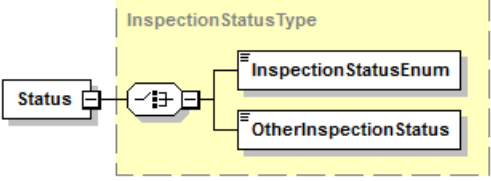
C.5 element ActualComponentType/SerialNumber

| | | | | | | |
|------------|---|---|--------|---|---------|--------|
| diagram |  | | | | | |
| type | xs:string | | | | | |
| properties | minOcc | 0 | maxOcc | 1 | content | simple |
| annotation | documentation The optional SerialNumber element is a label of a specific actual component of a given type. Components with the same ModelNumber have different SerialNumbers. The combination of ModelNumber and SerialNumber should differentiate a given actual component from all other actual components in a QIF application instance file. | | | | | |

C.6 element ActualComponentType/AdditionalChanges

| | |
|------------|--|
| diagram |  |
| type | xs:string |
| properties | minOcc 0 maxOcc 1 content simple |
| annotation | documentation The optional AdditionalChanges element is a record of any changes to the product beyond what is recorded in the product model. The information recorded here may be used for the Additional Changes field of an AS9102A form. |

C.7 element ActualComponentType/Status

| | |
|------------|--|
| diagram |  |
| type | InspectionStatusType |
| properties | content complex |
| children | InspectionStatusEnum OtherInspectionStatus |
| annotation | documentation The Status element gives the inspection status of the actual component. |

C.8 element ActualComponentType/Traceability

| | |
|------------|--|
| diagram | |
| type | ActualProductTraceabilityType |
| properties | minOcc 0 maxOcc 1 content complex |
| children | SampleNumber LotNumber ReportNumber ManufacturingProcessId FixtureId NotableEventIds NotedEventIds InspectionStart InspectionEnd InspectionSoftwareItems InspectionProgram InspectionOperator MeasurementDeviceIds ProductEnvironments Errors |
| annotation | documentation The optional Traceability element gives traceability information for an actual component. |

C.9 element ActualComponentType/AsmPathId

| | |
|------------|---|
| diagram | |
| type | QIFReferenceType |
| properties | minOcc 0 maxOcc 1 content complex |
| annotation | documentation The optional AsmPathId element is the id of the assembly path of this component. |

C.10 complexType MeasurementResultsType

| | | | | | | |
|------------|---|--|----------|---------|-------|------------|
| diagram | | | | | | |
| children | InspectionTraceability ThisResultsInstanceQPid ExternalFileReference MeasuredFeatures MeasuredCharacteristics CoordinateSystemActualTransforms InspectionStatus ActualComponentIds | | | | | |
| used by | element | MeasurementsResultsType/MeasurementResults | | | | |
| attributes | Name | Type | Use | Default | Fixed | Annotation |
| | id | QIFIdType | required | | | |
| annotation | documentation The MeasurementResultsType defines information about measurement results. | | | | | |

C.11 attribute MeasurementResultsType/@id


| | |
|------------|------------------|
| type | QIFIdType |
| properties | use required |

C.12 element MeasurementResultsType/InspectionTraceability

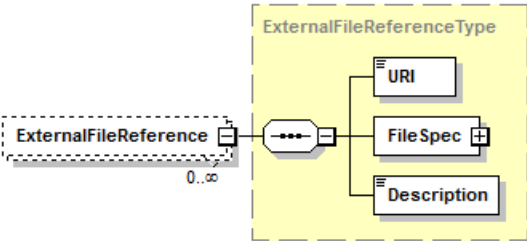
| | |
|------------|--|
| diagram | |
| type | InspectionTraceabilityType |
| properties | minOcc 0 maxOcc 1 content complex |
| children | InspectingOrganization CustomerOrganization SupplierCode PurchaseOrderNumber OrderNumber ReportNumber InspectionScope InspectionMode PartialInspection NotableEvents NotedEvents InspectionStart InspectionEnd InspectionSoftwareItems InspectionProgram InspectionOperator ReportPreparer ReportPreparationDate ReportType SecurityClassification PlantLocation ReferencedQIFPlanInstance ReferencedQIFPlan Errors |
| annotation | documentation The optional InspectionTraceability element gives traceability information that applies this set of measurement |

| | |
|--|----------|
| | results. |
|--|----------|

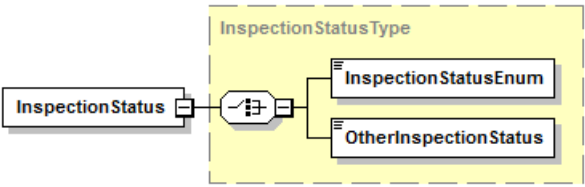
C.13 element MeasurementResultsType/ThisResultsInstanceQPid

| | |
|------------|---|
| diagram |  |
| type | QPidType |
| properties | minOcc 0 maxOcc 1 content simple |
| annotation | documentation The optional ThisResultsInstanceQPid element uniquely identifies the measurement results. Different versions of the file must have different ThisResultsInstanceQPid elements. |

C.14 element MeasurementResultsType/ExternalFileReference

| | |
|------------|---|
| diagram |  |
| type | ExternalFileReferenceType |
| properties | minOcc 0 maxOcc unbounded content complex |
| children | URI FileSpec Description |
| annotation | documentation Each optional ExternalFileReference element is a reference to an additional file created in the measurement process, e.g. a photo. |

C.15 element MeasurementResultsType/InspectionStatus

| | |
|------------|---|
| diagram |  |
| type | InspectionStatusType |
| properties | content complex |
| children | InspectionStatusEnum OtherInspectionStatus |
| annotation | documentation The InspectionStatus element reports the status of the MeasurementResults. |

C.16 element MeasurementResultsType/ActualComponentIds

| | | | | | | |
|------------|--|--------------------|----------|---------|---------|---|
| diagram | | | | | | |
| type | ArrayReferenceType | | | | | |
| properties | minOcc | 0 | maxOcc | 1 | content | complex |
| children | Id | | | | | |
| attributes | Name | Type | Use | Default | Fixed | Annotation |
| | N | NaturalType | required | | | documentation The required N attribute shows how many Id elements are present in this array. |
| annotation | documentation The ActualComponentIds element is the list of actual component QIF ids. | | | | | |

C.17 complexType MeasurementsResultsType

| | |
|------------|--|
| diagram | <pre>classDiagram class MeasurementsResultsType class Version class MeasurementResults class ActualComponentSet class InspectionTraceability MeasurementsResultsType "1" -- "*" MeasurementResults MeasurementsResultsType "1" -- "*" ActualComponentSet MeasurementsResultsType "1" -- "*" InspectionTraceability MeasurementsResultsType "1" -- "*" Version</pre> |
| children | Version MeasurementResults ActualComponentSet InspectionTraceability |
| used by | element MeasurementsResults |
| annotation | documentation The MeasurementsResultsType defines a list of one or more measurement results. |

C.18 element MeasurementsResultsType/Version

| | |
|------------|---|
| diagram | |
| type | VersionType |
| properties | minOcc 0 maxOcc 1 content complex |
| children | TimeCreated SignOffs ThisInstanceQPid |
| annotation | documentation The optional Version element gives version information about the measurements results. |

C.19 element MeasurementsResultsType/MeasurementResults

| diagram | | | | | | | | | | | | | |
|--------------------|--|----------|---------|--------|------------|---------|------------|--------------------|-----------|----------|--|--|--|
| type | MeasurementResultsType | | | | | | | | | | | | |
| properties | <table><tr><td>minOcc</td><td>1</td></tr><tr><td>maxOcc</td><td>unbounded</td></tr><tr><td>content</td><td>complex</td></tr></table> | minOcc | 1 | maxOcc | unbounded | content | complex | | | | | | |
| minOcc | 1 | | | | | | | | | | | | |
| maxOcc | unbounded | | | | | | | | | | | | |
| content | complex | | | | | | | | | | | | |
| children | InspectionTraceability ThisResultsInstanceQPid ExternalFileReference MeasuredFeatures MeasuredCharacteristics CoordinateSystemActualTransf... InspectionStatus ActualComponentIds | | | | | | | | | | | | |
| attributes | <table><tr><th>Name</th><th>Type</th><th>Use</th><th>Default</th><th>Fixed</th><th>Annotation</th></tr><tr><td>id</td><td>QIFIdType</td><td>required</td><td></td><td></td><td></td></tr></table> | Name | Type | Use | Default | Fixed | Annotation | id | QIFIdType | required | | | |
| Name | Type | Use | Default | Fixed | Annotation | | | | | | | | |
| id | QIFIdType | required | | | | | | | | | | | |
| annotation | documentation Each MeasurementResults element is a measurement results in the list. | | | | | | | | | | | | |

C.20 element MeasurementsResultsType/InspectionTraceability

| | |
|------------|--|
| diagram | |
| type | InspectionTraceabilityType |
| properties | minOcc 0 maxOcc 1 content complex |
| children | InspectingOrganization CustomerOrganization SupplierCode PurchaseOrderNumber OrderNumber ReportNumber InspectionScope InspectionMode PartialInspection NotableEvents NotedEvents InspectionStart InspectionEnd InspectionSoftwareItems InspectionProgram InspectionOperator |

| | |
|------------|--|
| | ReportPreparer ReportPreparationDate ReportType SecurityClassification PlantLocation ReferencedQIFPlanInstance ReferencedQIFPlan Errors |
| annotation | documentation The optional InspectionTraceability element gives traceability information that applies to all measurement results. |

~~ end of QIFResults.xsd data dictionary ~~

Bibliography

[1] SAE AS9102a (2004-01), *Aerospace First Article Inspection Requirement*

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