

*Dimensional Metrology  
Standards Consortium*

**DMSC**

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

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



QIF Version 2.0

ANSI/QIF Part 4–2014

Dimensional Metrology Standards Consortium, Inc. (DMSC)



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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) Technical Committee (TC) 184. 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](http://www.dmsc-inc.org).

The Quality Information Framework (QIF) was developed by domain experts from the manufacturing quality community representing a wide variety of industries and quality measurement needs. Specifically for the QIF Plans work, contributors include:

Main:

- Honeywell Federal Manufacturing & Technology,
- Lockheed Martin Missiles and Fire Systems,
- Mitutoyo America,
- National Institute of Standards and Technology,
- Origin International Inc.,
- Renishaw pfc

Support:

- Capvidia,
- DISCUS Software,
- Deere & Co.,
- Hexagon Metrology,
- Horst Engineering,
- IPI Solutions,
- ITI transenData,
- Metrosage LLC,
- PAS Technology,
- Rolls-Royce,
- Siemens,
- Validation Technologies

More information about DMSC's QIF effort can be found at [www.qifstandards.org](http://www.qifstandards.org).

This document was written by the QIF Plans Working Group, approved and revised as needed by the Quality Information Framework (QIF) Working Group, and given final approval for ANSI review 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 QIF Plans document was part of the inaugural QIF standard, version 1.0, 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 the introduction of four new Parts documents that did not exist in version 1.0.

The QIF standard, version 2.0 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 4-2014, is a revision and redesignation of a previous QIF standard designated “ANSI/QIF Part 3: QMPlans – 2013”. This Part 4 document cancels and replaces the 2013 version. Its 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 Plans 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 Plans 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

The Quality Information Framework (QIF) consists of a suite of information models that fit into one of two functional categories, QIF Library or QIF Applications. The QIF achieves system wide interoperability by designating a set of information models as part of a QIF Library. The QIF Library information models are common, reusable components. A QIF application area information model represents a unique application area, one of QIF model based definition (i.e., QIF Product), measurement resources (i.e., QIF Resources), measurement plans (i.e., QIF Plans), measurement rules (i.e., QIF Rules), measurement results (i.e., QIF Results), and measurement statistics (i.e., QIF Statistics). Because the QIF library components are referenced throughout the comprehensive QIF information model, it ensures interoperability and extensibility between any data producer and consumer that implements the QIF formats within their software.

Quality measurement plans are required by all quality departments to efficiently and effectively validate conformance of manufactured goods to design specifications. Unfortunately, there exists no single standard format for defining measurement plans at any level above measurement programs. Small, medium and enterprise manufacturers suffer from the need to transpose measurement information from one system to another. Current methodologies waste valuable time, allow for human mistakes and costs money. As a result, a common, standardized information definition for measurement planning to carry quality requirements information from one system to another is being requested by quality managers, quality measurement systems users, and their technology providers.

The objective of the QIF Plans information model is to communicate all the necessary feature definition, product characteristics and related quality information required to measure and verify product requirements. Although the scope of QIF Plans 2.0 places an emphasis on feature-based dimensional metrology and the dimensional measurement programs to be executed on dimensional measurement equipment, much attention was devoted toward addressing significant elements that support attribute and other types of validations.

A QIF Plan will consist of many categories of information. It will contain a list of features and an associated bill of characteristics (BoC) such as tolerances associated with features. The plan can reference additional product information such as datums, datum reference frames, and measurement resources, as well as traceability information. At a minimum, a QIF Plan will define one or more actions that specify “what” to measure or validate. These actions can be further organized in a hierarchical group of actions. Also within QIF Plans, each action may reference one or many action methods on “how” to perform a measure or validation. Furthermore, these methods may be generated based upon pre-determined measurement rules. The optional method could specify measurement resources and, dependent upon the method type, provide additional “how” to measure information that contributes toward facilitating a measurement execution. However, the optional method will not necessarily include all information necessary and sufficient to create a dimensional measurement part program for the purpose of numerically controlling a coordinate measurement machine (CMM). These are defined in other QIF 2.0 models. QIF Plans 2.0 specifically excludes CAD specific data (e.g., geometry and topology), and measurement rules. QIF Plans 2.0 references a basic definition of

measurement resources such as measurement devices, fixtures, and sensors. A QIF Plans 2.0 file is an XML instance file conforming to the QIF Document schema and having a **MeasurementPlan** *element* in the QIF Document root element.



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

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

### 1 Scope

#### 1.1 Contents of this document

This standard defines a QIF application information model called QIF Plans. 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 XML formatted information 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.

The XML schema definition language also allows for the definition of rules and checks that enforce constraints on the computer-to-computer writing and reading of instances of QIF Plans. The file that defines the top levels of the QIF Plans information model and contains some of the rules is the QIFPlan.xsd. The bulk of the model is defined in the files of the QIF library, many of which are used by the QIFPlan.xsd file. All QIF XML schema files are 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](http://www.qifstandards.org).

Figure 1 shows a high level view of the QIF information model architecture. The segments around the ring are the QIF application models. Enterprise information flow is generally clockwise around the circle starting with QIF MBD. At the core of the QIF architecture is the reusable QIF library which contains components that are referenced by the application models, thereby ensuring interoperability and extensibility. QIF Part 1: Overview provides a detailed description of the QIF information model. “QIF Execution” is not a component of the QIF 2.0 standard. It is a placeholder for a future standards effort that will eventually enhance the current ANSI/DMIS 105.2, Part 2 1-2009: Dimensional Measuring Interface Standard (DMIS) into the QIF.

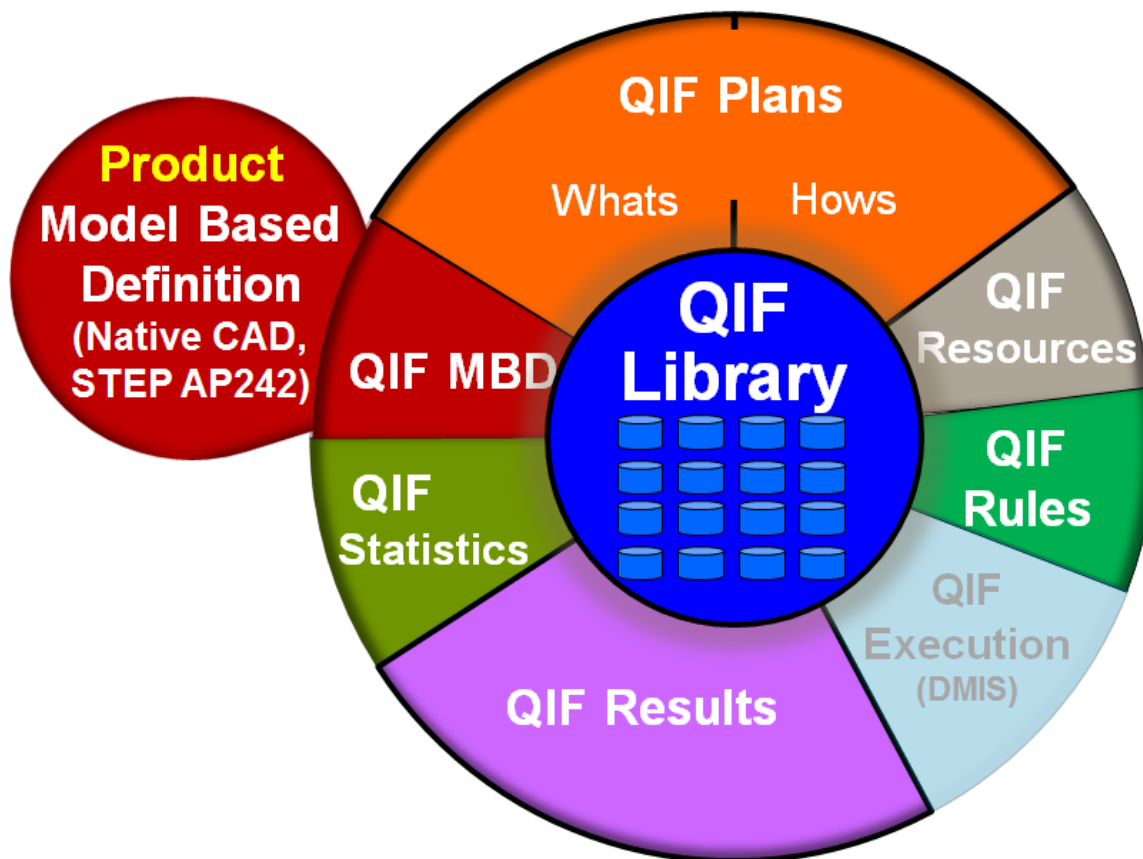


Figure 1 – QIF 2.0 information model architecture

## 1.2 Workflow of QIF Plans data for manufacturing quality

Figure 2 shows a Model Based Product Verification Workflow activity diagram flowing from a product definition as the primary input to the reporting and analysis of measurement results. The work flow activities for a Quality Metrology Enterprise are contained in the light blue box and consist of four major Quality Metrology Enterprise activities:

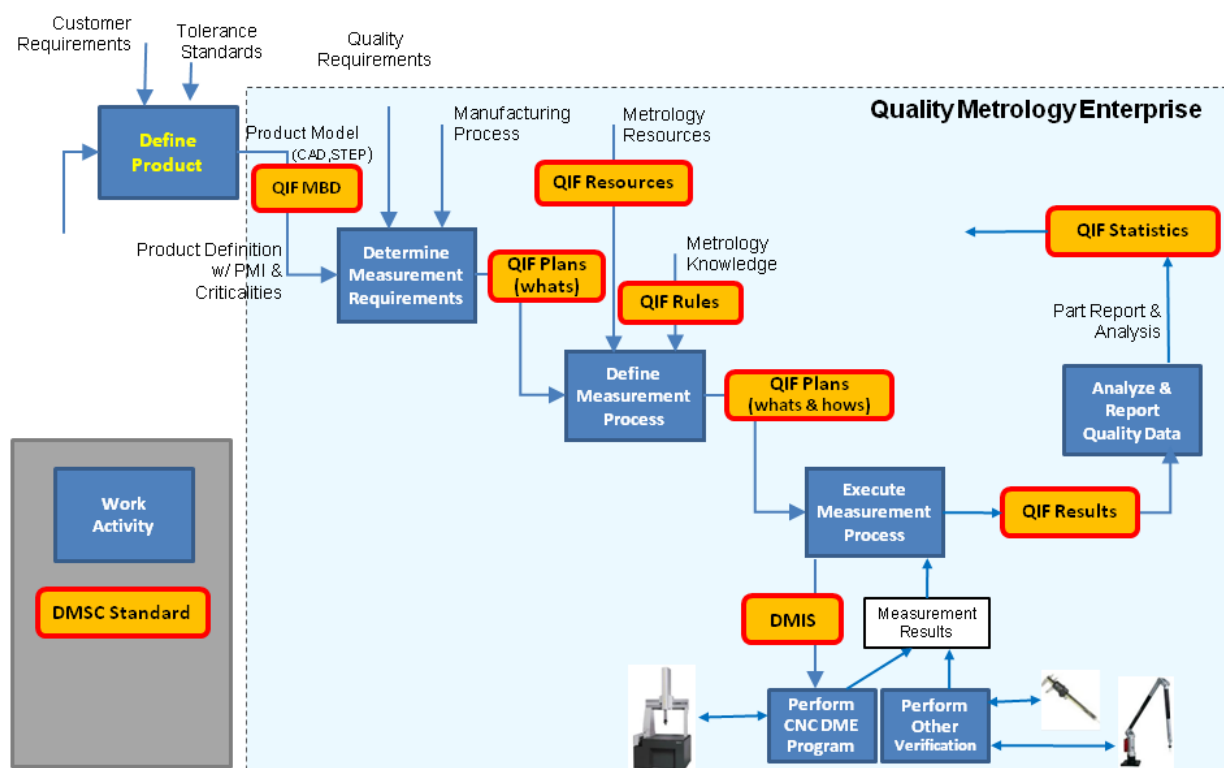
- Determine Measurement Requirements
- Define Measurement Process
- Execute Measurement Process
- Analyze & Report Quality Data

Between each work activity there exists an interface in which digital information must be exchanged.

From Figure 2, assuming that the activity of “*Define Product*” has already been performed, the metrology work activity of “*Determine Measurement Requirements*” receives product definition with Product and Manufacturing Information (PMI) and key characteristic criticalities as input. Then based upon known quality requirements and/or manufacturing process knowledge, measurement requirements are determined as a set of measurement criteria also known as a bill of characteristic items (BOC). A characteristic item is typically a tolerance or specification



applied to a feature or product that needs verification. This BOC may constitute as a high level quality plan of a list of “what” that needs to be inspected or verified. The list can be ordered or just a set of actions. Next, given metrology resources and metrology knowledge, the “*Define Measurement Process*” activity augments the set of measurement criteria by defining an inspection plan on “how” to inspect or verify the bill of characteristic items. The “hows” may reference one or many measurement resources and be specified by a measurement rule set. This inspection plan will then drive the activity of “*Execute Measurement Process*” via various measurement resources which produces measurement results. Finally, the measurement results are collected, analyzed, and reported via the activity of “*Analyze & Report Quality Data*” and then groups of work piece measurement results can be analyzed statistically.



**Figure 2 – QIF 2.0 Digital Product Verification Process Workflow**

The QIF Plans information model satisfies the data exchange needs from “*Determine Measurement Requirements*” by generating a measurement scope that lists all of the features and their characteristics and the actions required to measure/validate them. Furthermore the QIF Plans information model satisfies the data exchange needs from “*Define Measurement*”

*Process*” by generating an inspection plan that describes the methods on how to measure/validate the actions contained in the measurement scope.

### 1.3 QIF Plans information model

The QIF Plans 2.0 information model focuses on actions, the "what" of inspection, as well as introduces some essentials for action methods, the "how" to measure. The "what" defines the features of parts to be inspected and the corresponding characteristics that need to be evaluated. The "how" augments the "what" with additional information such as the measurement methods, with what measurement resources according to specified measurement rules. The QIF model of quality data workflow assumes that information about inspection equipment, and detailed methods of inspection, (the "how"), are generated at the time of initial QIF Plan generation or can be gradually augmented during further maturation of the QIF Plan. As a result, a QIF Plan has the advantage of specifying either only the actions (or "what") to be inspected, or it can be further augmented with different levels of detail on the action methods (or "how") to be inspected. This separation of "what" from "how" is viewed as permitting flexibility in configuring manufacturing computer aided quality systems. The work flow to the "what" stage is illustrated in Figure 3. The work flow through the "how" stage is shown in Figure 4.

### 1.4 QIF Plans scope

The QIF Plans version 2.0 information model was initiated with the following scope and out-of-scope requirements.

In scope:

- Feature-Based
- Dimensional Metrology
- Non-Dimensional Metrology
- Product (Part and/or Assembly)
- Characteristics
  - Dimensional Tolerances
  - Geometric Tolerances
  - User Defined Characteristic (attribute or variable)
  - Surface Textures
  - Thread Specifications
- Characteristics Designator (that is a unique identifier similar to the known practice of "ballooning")
- Key Characteristics Criticality Class Levels (for example Minor, Major, Criticality)
- Datums, Datum Targets, and Datum Reference Frames
- Traceability Information
- Work Instructions (document, image, text, video)
- Determine Measurement Scope (a list of actions of "what" to measure)
- Define Measurement Plan (a hierarchical list of actions of "what" to measure with associated methods on "how" to measure)
- Associations to Measurement Resources
- Consideration of Measurement Definitions that include accuracy statements and calibration statements
- Utilization of Measurement Rules

- Product Model and Model Entity Relationships
- Planning from a Model Based Product Definition Environment
- Planning from a Document/Drawing based Product Definition Environment

Out of scope:

- Reaction planning defining corrective action
- Sampling plans
- Low level execution plans or “DME Programming”

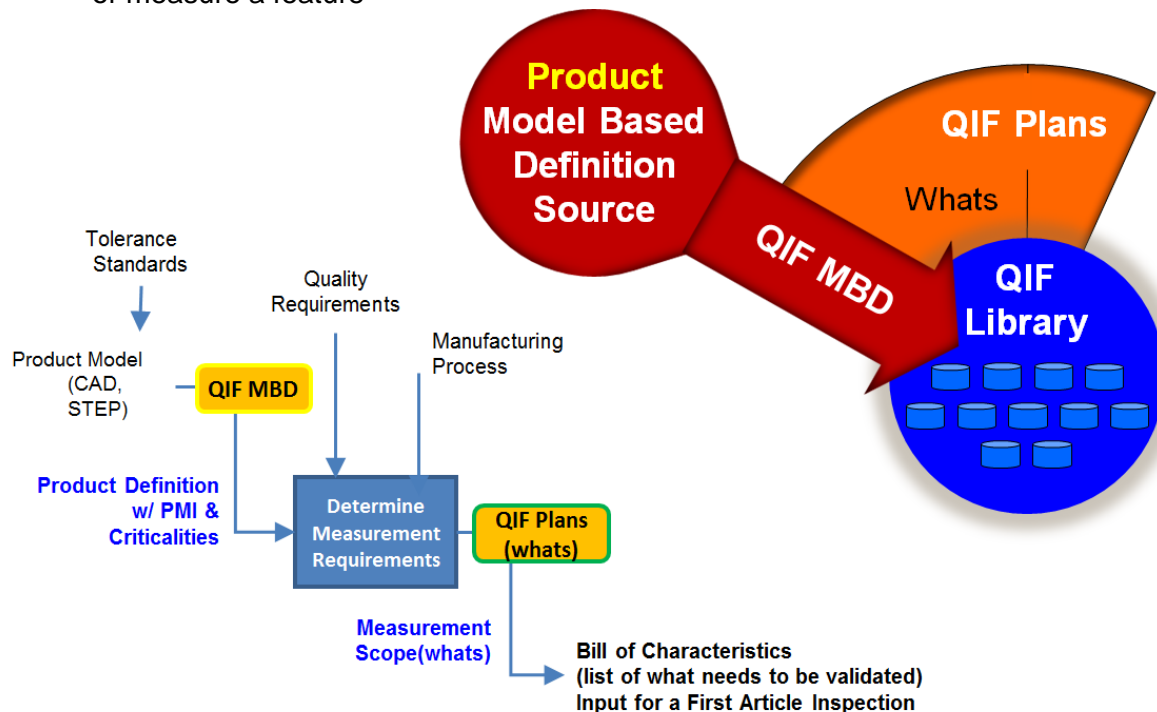
## 1.5 QIF Plans use cases

The QIF Plans 2.0 model was designed to support the following use cases.

### 1.5.1 Measurement Scope

The measurement scope use case, shown in Figure 3, defines “what” to measure. It can be per the following:

- Single Action: define a set of features and characteristics, then define one action stating Measure and Evaluate ALL defined Characteristics
- Specified Action Plan: define a set of features and characteristics, then define one action to measure and evaluate specified characteristics.
- Set of Actions Plan: define a set of features and characteristics, and then define an Action Group that contains Actions to measure and/or evaluate a specified characteristic or measure a feature



**Figure 3 – Measurement Scope (e.g., Bill of Characteristics) with QIF Plans**

### 1.5.2 Inspection Plan

The inspection plan use case, shown in Figure 4, defines “what” to measure with “how” to measure. It can be per the following:

- Unordered Plan of Actions with Methods.
- Directed Plan of Actions with Methods which specifies a hierarchical order of actions.

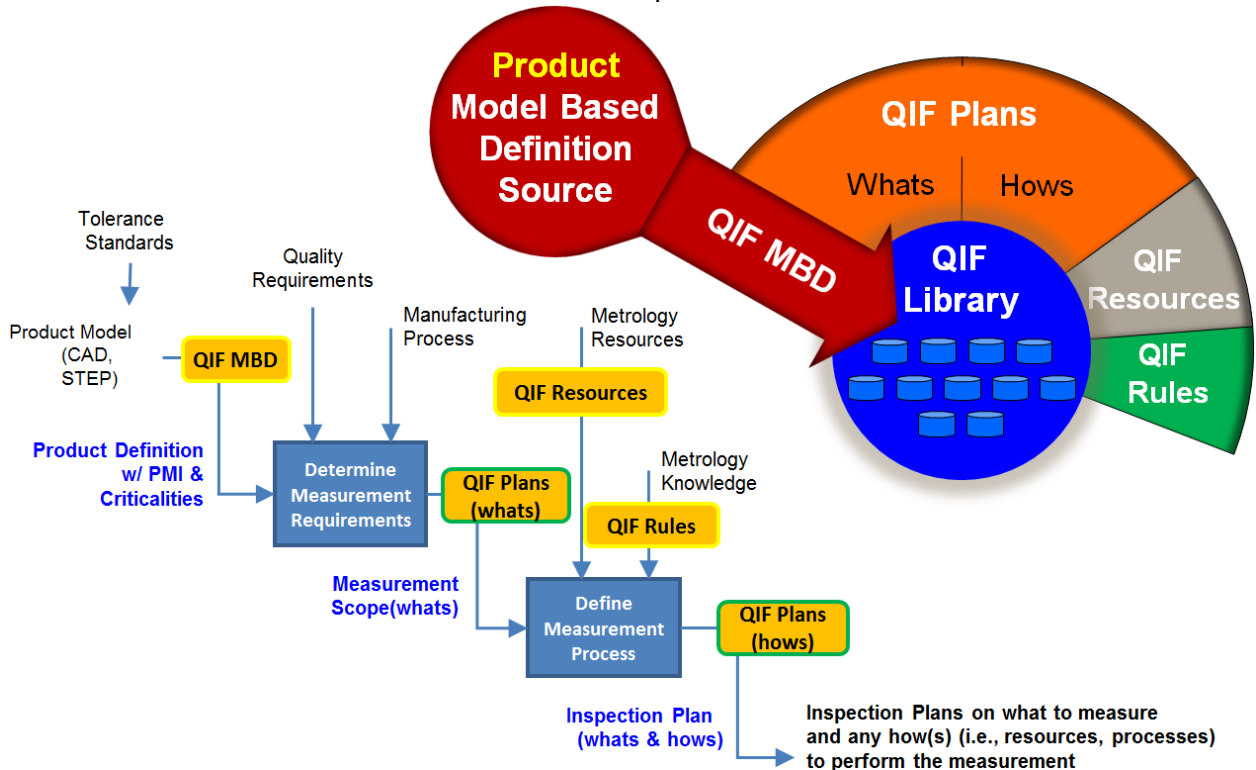


Figure 4 – Inspection Process Planning with QIF Plans

### 1.5.3 Application Use-Cases

- Plan for First Article Inspection (FAI)
- Plan for Sample (Partial) Inspection
- Plan for 100% Inspection
- Plan within a Technical Data Package (MIL-STD-31000A)
- Plan using supplied Measurement Rules Definition
- Plan from a Model Based Product Definition
- Plan from a Document/Drawing-Based Product Definition
- Plan for complete Plant-wide Product Inspection
- Plan for Enterprise-wide Product Inspection
- Plan for QIF Plans items Persistence with QIF Results items

## **1.6 QIF Plans product definition support**

The QIF information models support a digital engineering environment. The QIF is designed to support a workflow of quality data within a product definition environment that is either:

- Model based or
- Document/drawing-based

## 2 Conformance

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

- follow the rules of XML when writing QIF Plans XML instance files
- generate XML instance files that validate against the QIF Plan.xsd schema file
- 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 Plans files must:

- be able to read any valid QIF Plans 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 Y14.5M-1994 (reaffirmed 2004), *Dimensioning and Tolerancing – Engineering Drawing and Related Documentations Practices*

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

ASME Y14.41-2012: *Digital Product Definition Data Practices*

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)*

SME Aerospace Standard, AS9102a: *Aerospace First Article Inspection Requirement. 2004.*

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

*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**

For the purposes of this document, the following terms and definitions apply. All terms are defined in the Part 1 specification document. The first group is general QIF terms. The second group is terms defined to describe the information in the QIF Plans application area.

### **4.1 General QIF terms referenced in the QIF Plans application area**

The following general terms are referenced by the QIF Plans application area and defined in the QIF Part 1 document. The terms are repeated here for the convenience of the reader.

**assembly**

**bill of characteristics (BOC)**

**characteristic**

**characteristic item**

**coordinate system**

**datum definition**

**datum reference frame**

**datum target definition**

**feature**

**file unit**

**inspection note**

**inspection traceability**

**key characteristic**

**key characteristic criticality**

**key characteristic designator**

**measurement device**

**measurement resource**

**part**

**product**

**product geometries definition**

**product and manufacturing information (PMI)**



**QIF persistent identifier (QPId)**

**thread specification**

**transforms**

**version**

## **4.2 Terms defined for the QIF Plans application area**

The following terms are introduced by the QIF Plans application area and defined in the QIF Part 1 document. The definitions are repeated here for the convenience of the reader.

### **4.2.1 action**

a plan element that gives information about “what” to measure or validate

### **4.2.2 action group**

a plan element that organizes sets of actions

NOTE An action group can be an ordered group, unordered group, one-of group, partially ordered group, or pick-some group.

### **4.2.3 action method**

a prescription of “how” an action is to be performed

NOTE Actions with action methods form the core of a measurement plan.

### **4.2.4 measurand**

an object, quantity, property, or condition to be measured for a specific purpose

NOTE Two examples of a measurand are the measurement of a shape feature to evaluate a specified characteristic (for example tolerance) and the measurement of a shape feature to establish a datum (for example primary datum) within the context of a datum reference frame. One could measure the same feature differently or apply a different substitute feature data fitting algorithm.

### **4.2.5 measure feature method**

an action method for measuring a feature

### **4.2.6 measurement plan**

a complete plan that contains information on for what and how to measure

### **4.2.7 plan element**

an action or action group

NOTE A combination of actions and action groups can be structured in a directed hierarchical tree of actions.

**4.2.8 plan root**

the top level plan element (an action or action group) of a measurement plan

**4.2.9 work instruction**

information that provides instructions to about actions or action methods to be used in executing a measurement plan

## 5 Symbols and abbreviated terms

ASME	American Society of Mechanical Engineers
BOC	Bill of Characteristics
CAD	Computer-Aided Design
CMM	Coordinate Measuring Machine
DME	Dimensional Measuring Equipment
DRF	Datum Reference Frame
GPS	Geometrical Product Specifications
GUID	Globally Unique Identifier
MBD	Model Based Definition
PCS	Part Coordinate System
PDPMI	Product Definition with Product Manufacturing Information
PMI	Product Manufacturing Information
URI	Uniform Resource Identifier
UUID	Universally Unique Identifier
QIF	Quality Information Framework
QMS	Quality Measurement Standards (a DMSC committee)
QPId	QIF Persistent Identifier
STEP	Standard for the Exchange of Product model data (ISO 10303)
XML	eXtensible Markup Language
XSDL	XML Schema Definition Language

## 6 Requirements

### 6.1 QIF Plans requirements

The QIF Plans version 2.0 information model was developed from the following requirements;

- A measurement plan
  - has a unique persistent identifier
  - makes an association with a product definition (model based, document/drawing based),
  - has traceability information that describes the circumstances of the plan,
  - has one or many plan elements, and
  - may reference one or many rules to be used or that were used.
- A plan element can be
  - an action or
  - an action group.
- An action
  - defines “what” needs to be measured/validated,
  - may include instructions defining what to do,
  - may specify measurement resources, and
  - can be grouped as action groups.
- Action groups can be:
  - ordered groups,
  - unordered groups,
  - one of groups,
  - partially ordered groups, or
  - pick some groups.
- Action groups can optionally be functionally typed as:
  - routing plan,
  - operation sequence,
  - setup usage group,
  - sensor usage group,
  - carriage usage group,
  - PCS usage group,
  - evaluate characteristic action group, or
  - establish datum action group.
- An action
  - can measure and evaluate all characteristic items,
  - can measure and evaluate specified characteristics item(s),
  - can evaluate specified previously measured or constructed characteristic item(s),
  - can measure specified feature item(s), and
  - can measure and evaluate specified measurand(s).
- A measurand
  - is the object, quantity, property or condition to be measured for a specific purpose,
  - can be used to evaluate a characteristic item of a feature,
  - can be used to establish a datum instance within a datum reference frame, and
  - can be used to determine a particle/grain size within granular materials.
- An action
  - may have a preferred action method,

- may have a list of alternative action methods,
  - may have preferred measurement resources, and
  - may have work instructions.
- An action method
  - describes “how” an action is to be performed,
  - can be used by multiple actions,
  - may have chosen measurement resources,
  - may have work instructions, and
  - may be a measure feature method derived type.
- A measure feature method will be subtyped as one of
  - coordinate measure feature method (e.g., measure a feature with a DME),
  - gage measure feature method (e.g., measure a feature with a gage),
  - manual measure feature method (e.g., measure a feature by hand using a caliper, micrometer, or open set-up), or
  - other measure feature method.
- A work instruction can be
  - textual,
  - a document file,
  - an image file, or
  - a video file.

## 6.2 Tracking information through the product lifecycle

QIF is constructed to enable a seamless flow of information from upstream applications such as a QIF Plan to downstream applications such as a QIF Results and to enable tracking information through a product’s lifecycle. This can be enabled through separate or a common QIF documents and/or QPIs. The QIFDocument is used as a unique container that references applications such as the measurement plan and measurement results as well as other key elements.

## 6.3 QIF Plans data flow to results

QIF is constructed to enable a seamless flow of information from upstream applications such as QIF Products and/or QIF Plans to downstream applications such as QIF Results and to enable tracking information through a product’s lifecycle. QIF Results is downstream from QIF Plans. A QIF Document can contain a QIF Plan with multiple QIF Results. QIF Results data files can be generated in the absence of a previously built QIF Plans file. However, if a QIF Plans file exists prior to the measurement execution, then a significant portion of the contents of the corresponding QIF Results file can be obtained from the shared QIF Documents or from the QIF Plans’ QIF Document file.

The following items may normally be transcribed directly from a QIF Plan’s QIF Document file to a corresponding QIF Results file:

- file units
- datum definitions
- datum target definitions
- datum reference frames
- measurement resources
- product’s part and assembly definitions.

- feature definitions, nominals, and items
- characteristic definitions, nominals, and items.

## 6.4 QIF Results reference to QIF Plans

Within a QIF Results file, the **MeasurementResults** *element* has an **InspectionTraceability** *element* that provides a choice to explicitly record the QPId of the QIF Plans file that was executed to produce the QIF Results file through a **ReferencedQIFPlanInstance** *element* or to indicate that the QIF Plans file that was used in preparing this file is also contained in the QIF Document file as noted by **ReferencedQIFPlan** *element* set to “ThisFile”.

## 6.5 Item tracking and persistence between QIF Plans and QIF Results

Item by item tracking from a QIF Plans file to a QIF Results file can be accomplished with QIF Version 2.0. An application that wishes to connect multiple results items from QIF Results files with plan items from a QIF Plan file can accomplish this using the UUID like QIF persistent identifiers (QPId)s as described in Part 1 of this standard.

## 7 High level description of QIF Plans.xsd

### 7.1 High level structure of the QIF Plans schema

This section describes highest level *elements* of the QIF Plans information model. The QIF Plans schema model includes the information items from the QIFPlan.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 QIFPlan.xsd schema file. Roughly four fifths of the content of QIFPlan.xsd describes *key*, and *keyref constraints* on elements and relationships between elements. *Elements* in the figure with + signs at the right have substructure that is not shown in the figure. All substructures are defined in the QIF Library files. A complete description of all QIF Plans data definitions and elements is in the data dictionary in Annex C – QIF Plan data dictionary

The **MeasurementPlan** element is of type **MeasurementPlanType**, is the highest level *element* of the QIF Plans model. An XML instance file written in conformance with the *QIFPlan.xsd* schema file may contain one **MeasurementPlan** element. A **MeasurementPlanType's** top level components are described in Figure 5. They include:

- **Version** – this optional *element* gives version information about the measurement plan. The **VersionsType** includes the **VersionQPid** *element* which uniquely identifies this measurement plan.
- **RulesUsedQPid** – this optional *element* gives the QPid of the rules that were used in creating the plan. The rules may be in the same **QIFDocument** as the plan, or in a separate QIFDocument, or both (in which case the two sets of rules must be identical)
- **RulesToUseQPid** – this optional *element* gives the QPid of the rules to be used in making a more detailed plan from the plan or in generating a program from the plan (a DMIS program, for example). The rules may be in the same **QIFDocument** as the plan, or in a separate **QIFDocument**, or both (in which case the two sets of rules must be identical)
- **WorkInstructions** – this optional *element* captures any instructions necessary for executing the **MeasurementPlan**.
- **ActionMethods** - this optional *element* captures any action methods necessary for executing the **MeasurementPlan**.
- **Measurands** - this optional *element* captures any measurands used in the **MeasurementPlan**.
- **PlanRoot** - this *element* gives information about the activities to be carried out in executing the measurement plan and how execution of the measurement plan is to be controlled. Structurally, the **PlanRoot** is at the top of a plan tree of **PlanElements**. All **PlanElement** instances occur within this plan tree.

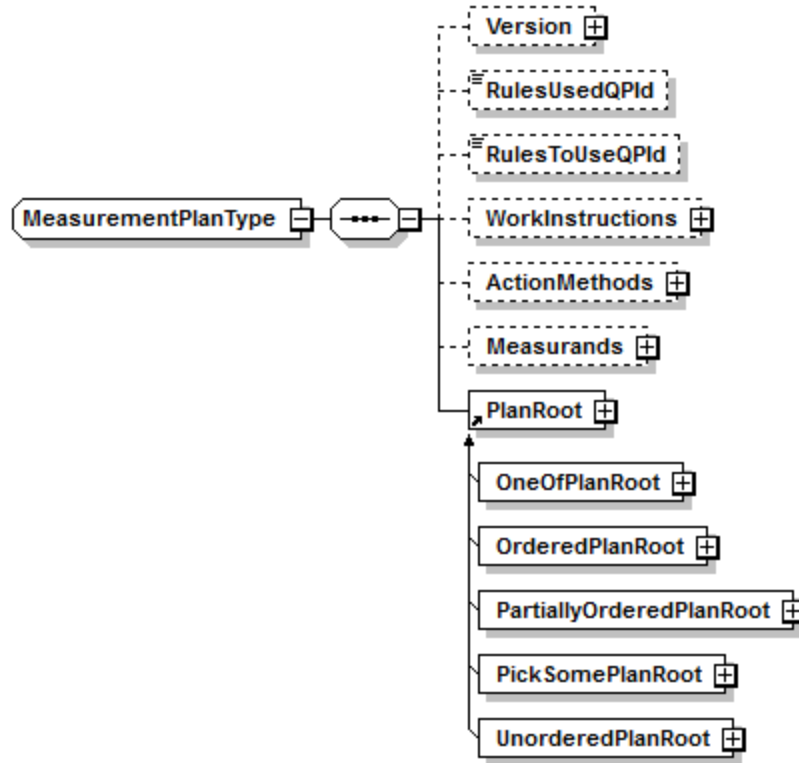


Figure 5 – Sub-elements of the MeasurementPlan data type

The global **PlanRoot** element, introduced in Figure 5, is of **ActionGroupBaseType** that may be replaced (as provided by substitution group declarations) by any of the following elements representing action groups:

- **OneOfPlanRoot** – A **PlanRoot** which is an **OneOfActionGroup** that defines an action group for which exactly one action must be executed.
- **OrderPlanRoot** – A **PlanRoot** which is an **OrderedActionGroup** that defines an action group for which all of the actions it contains must be executed in order.
- **PartiallyOrderedPlanRoot** – A **PlanRoot** which is a **PartiallyOrderedActionGroup** that defines an action group for which all of the actions it contains should be executed only after all of the predecessors of that action have been executed.
- **PickSomePlanRoot** - A **PlanRoot** which is a **PickSomeActionGroup** that defines an action group for which a specified number of actions it contains must be executed in any order.
- **UnorderedPlanRoot** - A **PlanRoot** which is an **UnorderedActionGroup** that defines an action group for which all of the actions it contains must be executed in any order of execution.



Figure 6 shows the major data elements introduced in the QIF Plan.xsd schema file with simplified relations between QIF Plans elements as well as with elements from the QIF library.

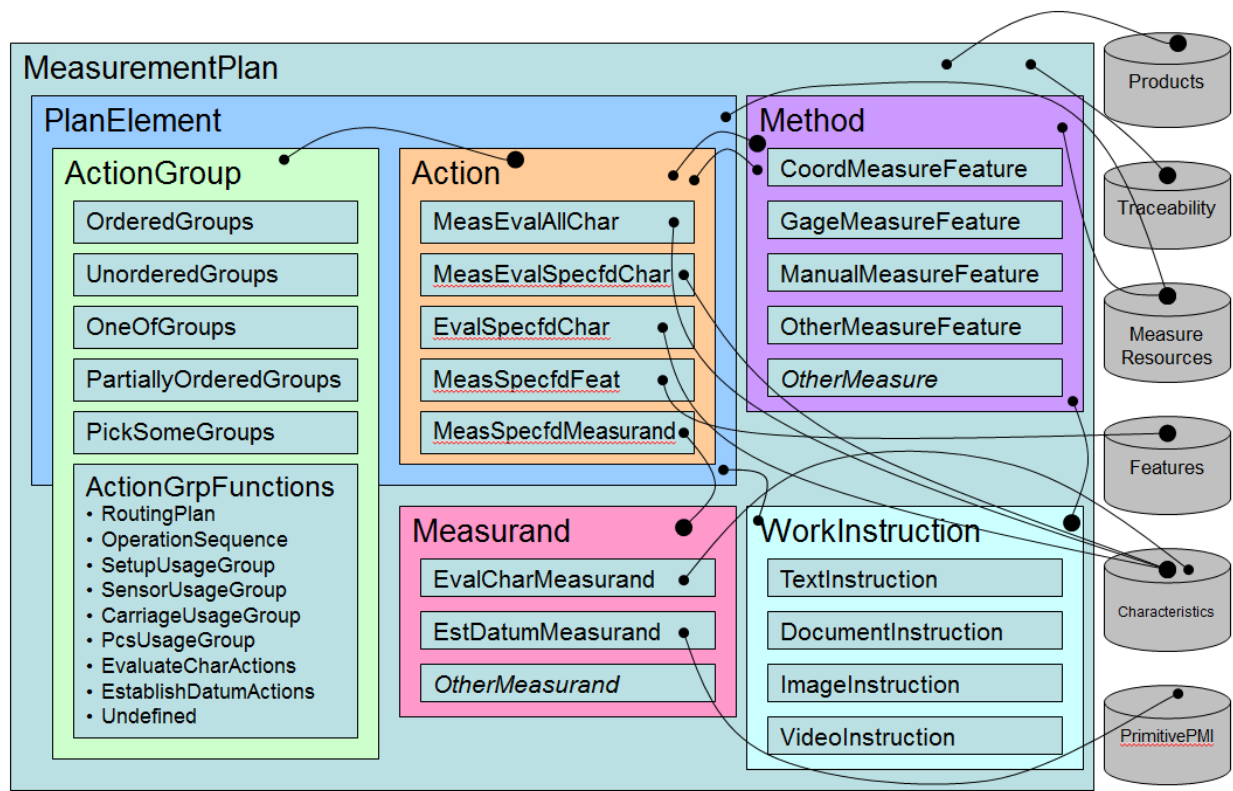


Figure 6 – QIF Plans Major Elements with Simplified Relations

## 7.2 Major elements

The major data elements of the QIF Plans information model are listed below and explained in both Section 4 and Section 6.1:

- measurement plan
- plan element
- action
- action group
- measurand
- method
- work instruction

## 7.3 Simplified relationships elements

The lines from a small dot to a larger dot signify a one-to-many relationship whereas the lines from a small dot to a small dot signify a one-to-one relationship. High level relationships include:

- A measurement plan may have product information
- A measurement plan has traceability Information
- A measurement plan has a top level plan element

- A plan element is an action or an action group
- An action group references zero to many work instructions
- An action group contains one to many actions
- An action references zero or one action method
- An action references zero to many preferred measurement resources
- An action references zero to many work instructions
- Some actions reference features
- Some actions reference characteristics
- Some actions reference measurands
- An action method references zero to many chosen measurement resources
- An action method references zero to many work instructions
- Some measurands reference a characteristic
- Some measurands reference a datum and a datum reference frame

## **8 Data dictionary: QIF Plan.xsd**

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

## **Annex A – Location of QIFPlan.xsd**

(normative)

The QIF Plans information model is expressed in XML schema definition language in the file “QIFPlan.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](http://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.

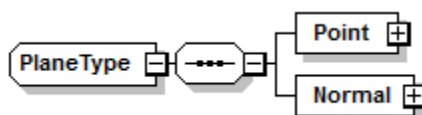


Figure B.1. Notation for a type definition, *PlaneType*.

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 there is no additional structure or *elements* below this node.

The beveled box with 3 dots on a line represents the XML "sequence of" 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*.

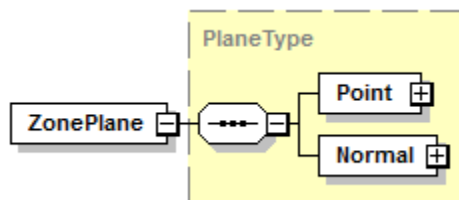


Figure B.2. Reuse of the type definition *PlaneType* to generate element *ZonePlane*.

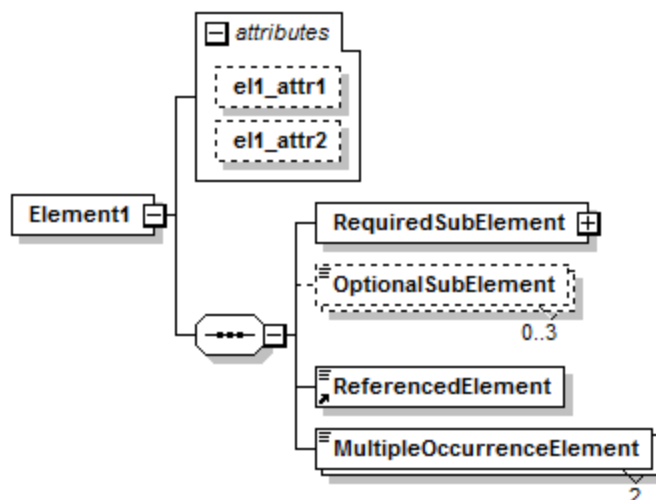


Figure B.3. Notation for *elements*, *sub-elements*, and *attributes*.

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**. Three bars in the upper left corner of an *element* box mean that the *element* is a primitive XML type, e.g., *xs:decimal*. Information elements can be instantiated in XML 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 (⎓) indicate the XML "choice of" structure. When **Element2** is instantiated in an XML instance file, it must have exactly one sub-*element* chosen among the three sub-elements shown.

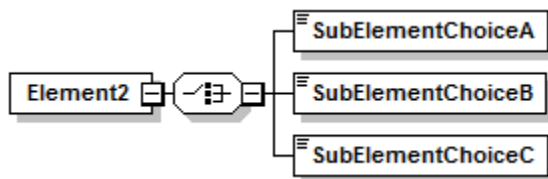


Figure B.4. The *choice of* notation.

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 Plan data dictionary

(normative)

This section graphically describes the QIF Plans data dictionary as instantiated as QIFPlan.xsd using XML Schema. The data dictionaries describe the structure of the information models and the manufacturing quality semantics of the data types. The graphical convention used to describe the QIF Plans data dictionary contains pictures and tables that show relationships of data objects in the QIF information model. For a more comprehensive explanation of the graphical conventions refer to Annex B – Graphical conventions of the data dictionary.

schema location:        ..
 attributeFormDefault:   unqualified  
 elementFormDefault:    qualified  
 targetNamespace:       http://qifstandards.org/xsd/qif2

### Complex types

[ActionBaseType](#)  
[ActionGroupBaseType](#)  
[ActionMethodBaseType](#)  
[ActionMethodsType](#)  
[CoordinateMeasureFeatureMethodType](#)  
[DocumentFileInstructionType](#)  
[EstablishDatumMeasurandType](#)  
[EvaluateCharacteristicMeasurandType](#)  
[EvaluateSpecifiedCharacteristicsActionType](#)  
[GageMeasureFeatureMethodType](#)  
[ImageInstructionType](#)  
[ManualMeasureFeatureMethodType](#)  
[MeasurandBaseType](#)  
[MeasurandsType](#)  
[MeasureActionGroupFunctionType](#)  
[MeasureEvaluateAllActionType](#)  
[MeasureEvaluateSpecifiedActionType](#)  
[MeasureFeatureMethodBaseType](#)  
[MeasurementPlanType](#)  
[MeasureSpecifiedFeaturesActionType](#)  
[MeasureSpecifiedMeasurandsActionType](#)  
[NumberedPlanElementsType](#)  
[NumberedPlanElementType](#)  
[OneOfActionGroupType](#)  
[OrderedActionGroupType](#)  
[OtherMeasureFeatureMethodType](#)  
[PartiallyOrderedActionGroupType](#)  
[PickSomeActionGroupType](#)  
[PlanElementBaseType](#)  
[PredecessorsType](#)  
[StepsWithPredecessorsType](#)  
[StepWithPredecessorsType](#)  
[TextInstructionType](#)

### Simple types

[MeasureActionGroupFunctionEnumType](#)

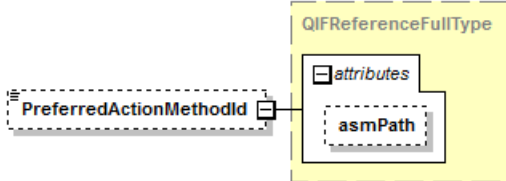


[UnnumberedPlanElementsType](#)  
[UnorderedActionGroupType](#)  
[VideoInstructionType](#)  
[WorkInstructionBaseType](#)  
[WorkInstructionsType](#)

## C.1 complexType ActionBaseType

diagram	
type	extension of <a href="#">PlanElementBaseType</a>
properties	base PlanElementBaseType abstract true
children	<a href="#">WorkInstructionIds</a> <a href="#">PreferredActionMethodId</a> <a href="#">AlternativeActionMethodIds</a> <a href="#">PreferredResourceIds</a>
used by	complexTypes <a href="#">EvaluateSpecifiedCharacteristicsActionType</a> <a href="#">MeasureEvaluateAllActionType</a> <a href="#">MeasureEvaluateSpecifiedActionType</a> <a href="#">MeasureSpecifiedFeaturesActionType</a> <a href="#">MeasureSpecifiedMeasurandsActionType</a>
annotation	documentation The ActionBaseType is the abstract base type that defines an action to be carried out.

## C.2 element ActionBaseType/PreferredActionMethodId

diagram						
type	QIFReferenceFullType					
properties	minOcc	0				
	maxOcc	1				
	content	complex				
attributes	Name	Type	Use	Default	Fixed	Annotation
	asmPath	QIFIdType				documentation The optional asmPath attribute is an id which must be used for locating of the assembly path within the AsmPaths. The assembly path (instantiation chain) unambiguously identifies a model entity within an assembly.
annotation	documentation The optional PreferredActionMethodId element is the QIF id of the preferred action method applicable to the action					

	being executed.
--	-----------------

### C.3 element ActionBaseType/AlternativeActionMethodIds

diagram						
type	<b>ArrayReferenceFullType</b>					
properties	minOcc	0	maxOcc	1	content	complex
children	<b>Id</b>					
attributes	Name N	Type <b>NaturalType</b>	Use required	Default	Fixed	Annotation documentation The required N attribute shows how many Id elements are present in this array.
annotation	documentation The optional AlternativeActionMethodIds element captures any possible alternative action methods applicable to the action being executed.					

### C.4 element ActionBaseType/PreferredResourceIds

diagram						
type	<b>ArrayReferenceFullType</b>					
properties	minOcc	0	maxOcc	1	content	complex
children	<b>Id</b>					
attributes	Name N	Type <b>NaturalType</b>	Use required	Default	Fixed	Annotation documentation The required N attribute shows how many Id elements are present in this array.
annotation	documentation The optional PreferredResourceIds element gives the QIF ids of resources preferred to perform the action, for example, one of the Fixtures in the MeasurementResources in the MeasurementPlan.					

### C.5 complexType ActionGroupBaseType

diagram	
type	extension of <a href="#">PlanElementBaseType</a>
properties	base PlanElementBaseType abstract true
children	<a href="#">WorkInstructionIds</a> <a href="#">MeasureActionGroupFunction</a>
used by	element <b>PlanRoot</b> complexType <a href="#">OneOfActionGroupType</a> <a href="#">OrderedActionGroupType</a> <a href="#">PartiallyOrderedActionGroupType</a> <a href="#">PickSomeActionGroupType</a> <a href="#">UnorderedActionGroupType</a>
annotation	documentation The ActionGroupBaseType is the abstract base type that defines an action group.

### C.6 element ActionGroupBaseType/MeasureActionGroupFunction

diagram	
type	<a href="#">MeasureActionGroupFunctionType</a>
properties	minOcc 0 maxOcc 1 content complex
children	<a href="#">MeasureActionGroupFunctionEnum</a> <a href="#">OtherMeasureActionGroupFunction</a>
annotation	documentation The optional MeasureActionGroupFunction element identifies the function of the action group.

### C.7 complexType ActionMethodBaseType

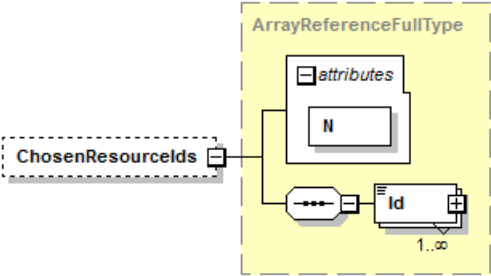
diagram	
properties	abstract true
children	<a href="#">ChosenResourceIds</a> <a href="#">WorkInstructionIds</a>
used by	element <b>ActionMethod</b>

	complexType	<a href="#">MeasureFeatureMethodBaseType</a>				
attributes	Name <a href="#">id</a>	Type <b>QIFIdType</b>	Use required	Default	Fixed	Annotation documentation The id attribute is the QIF id of the action method, used for referencing.
annotation	documentation The ActionMethodBaseType is the abstract base type that defines an action method. An action method describes how an action is to be performed. An action method will be a strategy or a set of parameters for the action (such as a search distance).					

### C.8 attribute ActionMethodBaseType/@id

type	<b>QIFIdType</b>
properties	use required
annotation	documentation The id attribute is the QIF id of the action method, used for referencing.

### C.9 element ActionMethodBaseType/ChosenResourceIds

diagram						
type	<b>ArrayReferenceFullType</b>					
properties	minOcc	0	maxOcc	1	content	complex
children	<b>Id</b>					
attributes	Name <b>N</b>	Type <b>NaturalType</b>	Use required	Default	Fixed	Annotation documentation The required N attribute shows how many Id elements are present in this array.
annotation	documentation The optional ChosenResourceIds element gives the QIF ids of resources to be used to perform the method, for example, one of the Fixtures in the MeasurementResources in the MeasurementPlan. The resources identified in this element by an instance of ActionMethodBaseType may be the same as or different from resources identified by the PreferredResourceIds element of an instance of ActionBaseType that contains the ActionMethodBaseType instance.					

## C.10 element ActionMethodBaseType/WorkInstructionIds

diagram						
type	<b>ArrayReferenceFullType</b>					
properties	minOcc	0	maxOcc	1	content	complex
children	<b>Id</b>					
attributes	Name N	Type <b>NaturalType</b>	Use required	Default	Fixed	Annotation documentation The required N attribute shows how many Id elements are present in this array.
annotation	documentation The optional WorkInstructionIds element gives the QIF ids of work instructions required to perform the action method.					

## C.11 complexType ActionMethodsType

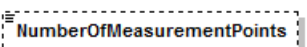
diagram	<pre>graph TD     subgraph ActionMethodsType [ActionMethodsType]         direction TB         C[CoordinateMeasureFeatureMe...]         G[GageMeasureFeatureMethod]         M[ManualMeasureFeatureMethod]         O[OtherMeasureFeatureMethod]     end     C --- G     G --- M     M --- O</pre>
children	<b>ActionMethod</b>
used by	element <a href="#">MeasurementPlanType/ActionMethods</a>
annotation	documentation The ActionMethodsType defines a set of action methods.

## C.12 complexType CoordinateMeasureFeatureMethodType

diagram						
type	extension of <a href="#">MeasureFeatureMethodBaseType</a>					
properties	base MeasureFeatureMethodBaseType					
children	<a href="#">ChosenResourceIds</a> <a href="#">WorkInstructionIds</a> <a href="#">NumberOfMeasurementPoints</a>					
used by	element <b>CoordinateMeasureFeatureMethod</b>					
attributes	Name <a href="#">id</a>	Type <b>QIFidType</b>	Use required	Default	Fixed	Annotation documentation The id attribute is the QIF id of the action method, used for referencing.
annotation	documentation The CoordinateMeasureFeatureMethodType defines the coordinate metrology method for measuring the feature.					

## C.13 element

### CoordinateMeasureFeatureMethodType/NumberOfMeasurementPoints

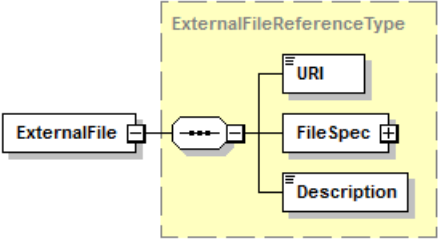
diagram	
type	<b>xs:positiveInteger</b>
properties	<div>minOcc0</div> <div>maxOcc1</div> <div>content simple</div>
annotation	<div>documentation</div> <div>The optional NumberOfMeasurementPoints element is the suggested number of a measurement points for measuring the designated feature.</div>

## C.14 complexType DocumentFileInstructionType

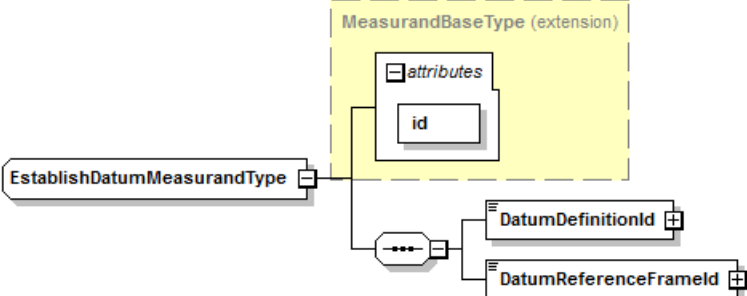
diagram						
---------	--	--	--	--	--	--

type	extension of <a href="#">WorkInstructionBaseType</a>					
properties	base WorkInstructionBaseType					
children	<a href="#">ExternalFile</a>					
used by	element DocumentFileInstruction					
attributes	Name <a href="#">id</a>	Type QIFIdType	Use required	Default	Fixed	Annotation documentation The id attribute is the QIF id of the work instruction, used for referencing.
annotation	documentation The DocumentFileInstructionType defines an external file that provides work instructions in a text file.					

### C.15 element DocumentFileInstructionType/ExternalFile

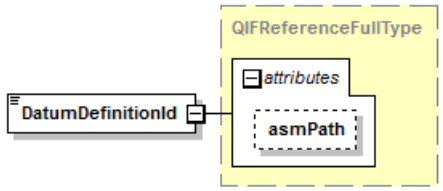
diagram						
type	ExternalFileReferenceType					
properties	content complex					
children	URI FileSpec Description					
annotation	documentation The ExternalFile element gives information about an external document instruction file.					

### C.16 complexType EstablishDatumMeasurandType

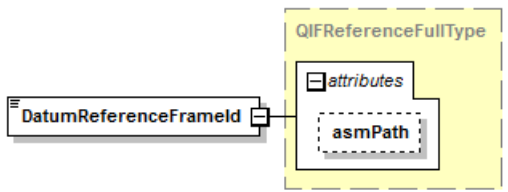
diagram						
type	extension of <a href="#">MeasurandBaseType</a>					
properties	base MeasurandBaseType					
children	<a href="#">DatumDefinitionId</a> <a href="#">DatumReferenceFrameId</a>					
used by	element EstablishDatumMeasurand					
attributes	Name <a href="#">id</a>	Type QIFIdType	Use required	Default	Fixed	Annotation documentation The id attribute is the QIF id

	of the measurand, used for referencing.
annotation	documentation The EstablishDatumMeasurandType defines a measurand to measure the features specified by a DatumDefinition in order to create a given DatumReferenceFrame.

### C.17 element EstablishDatumMeasurandType/DatumDefinitionId

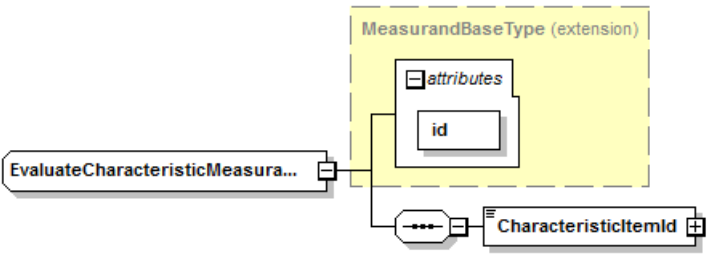
diagram						
type	<b>QIFReferenceFullType</b>					
properties	content    complex					
attributes	Name asmPath	Type <b>QIFIdType</b>	Use	Default	Fixed	Annotation documentation The optional asmPath attribute is an id which must be used for locating of the assembly path within the AsmPaths. The assembly path (instantiation chain) unambiguously identifies a model entity within an assembly.
annotation	documentation The DatumDefinitionId element is the QIF id of a datum definition that participates in the DatumReferenceFrame identified by the DatumReferenceFrameId.					

### C.18 element EstablishDatumMeasurandType/DatumReferenceFrameId

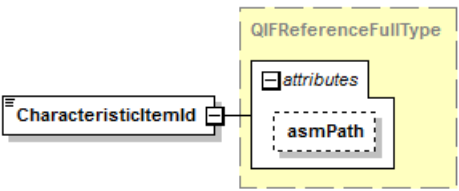
diagram						
type	<b>QIFReferenceFullType</b>					
properties	content    complex					
attributes	Name asmPath	Type <b>QIFIdType</b>	Use	Default	Fixed	Annotation documentation The optional asmPath attribute is an id which must be used for locating of the assembly path within the AsmPaths. The assembly path (instantiation chain) unambiguously identifies a model entity within an assembly.
annotation	documentation The DatumReferenceFrameId element is the QIF id of the datum reference frame for the specified DatumDefinitionId.					



## C.19 complexType EvaluateCharacteristicMeasurandType

diagram						
type	extension of <a href="#">MeasurandBaseType</a>					
properties	base MeasurandBaseType					
children	<a href="#">CharacteristicItemId</a>					
used by	element EvaluateCharacteristicMeasurand					
attributes	Name <a href="#">id</a>	Type <b>QIFIdType</b>	Use required	Default	Fixed	Annotation documentation The id attribute is the QIF id of the measurand, used for referencing.
annotation	documentation The EvaluateCharacteristicMeasurandType defines a measurand to measure a feature for evaluating a specified characteristic. A characteristic item provides both the characteristic and the feature item.					

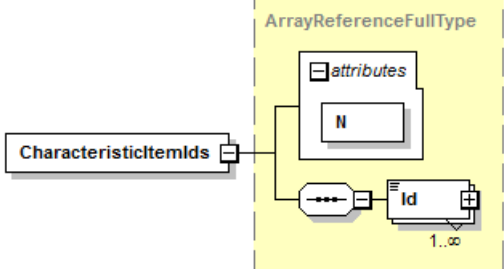
## C.20 element EvaluateCharacteristicMeasurandType/CharacteristicItemId

diagram						
type	<b>QIFReferenceFullType</b>					
properties	content complex					
attributes	Name asmPath	Type <b>QIFIdType</b>	Use	Default	Fixed	Annotation documentation The optional asmPath attribute is an id which must be used for locating of the assembly path within the AsmPaths. The assembly path (instantiation chain) unambiguously identifies a model entity within an assembly.
annotation	documentation The CharacteristicItemId element is the QIF id of the characteristic item.					

## C.21 complexType EvaluateSpecifiedCharacteristicsActionType

diagram	
type	extension of <a href="#">ActionBaseType</a>
properties	base ActionBaseType
children	<a href="#">WorkInstructionIds</a> <a href="#">PreferredActionMethodId</a> <a href="#">AlternativeActionMethodIds</a> <a href="#">PreferredResourceIds</a> <a href="#">CharacteristicItemIds</a>
used by	element <b>EvaluateSpecifiedCharacteristics</b>
annotation	<p>documentation</p> <p>The EvaluateSpecifiedCharacteristicsActionType defines an action that means: find CharacteristicActuals for the CharacteristicItems whose QIF ids are specified. Do not measure anything while performing this action. All features that need to be measured in order to evaluate the CharacteristicActuals must already be measured.</p>

## C.22 element EvaluateSpecifiedCharacteristicsActionType/CharacteristicItemIds

diagram						
type	ArrayReferenceFullType					
properties	content    complex					
children	Id					
attributes	Name N	Type NaturalType	Use required	Default	Fixed	Annotation documentation The required N attribute shows how many Id elements are present in this array.
annotation	documentation The CharacteristicItemIds element is a list of the QIF ids of characteristic items that are to be evaluated.					

### C.23 complexType GageMeasureFeatureMethodType

diagram						
type	extension of <a href="#">MeasureFeatureMethodBaseType</a>					
properties	base MeasureFeatureMethodBaseType					
children	<a href="#">ChosenResourceIds</a> <a href="#">WorkInstructionIds</a>					
used by	element <b>GageMeasureFeatureMethod</b>					
attributes	Name <a href="#">id</a>	Type <b>QIFIdType</b>	Use required	Default	Fixed	Annotation documentation The id attribute is the QIF id of the action method, used for referencing.
annotation	documentation The GageMeasureFeatureMethodType defines the gage metrology method for measuring the feature.					

### C.24 complexType ImageInstructionType

diagram						
type	extension of <a href="#">WorkInstructionBaseType</a>					
properties	base WorkInstructionBaseType					
children	<a href="#">ExternalFile</a>					
used by	element <b>ImageInstruction</b>					
attributes	Name <a href="#">id</a>	Type <b>QIFIdType</b>	Use required	Default	Fixed	Annotation documentation The id attribute is the QIF id of the work instruction, used for referencing.
annotation	documentation The ImageInstructionType defines an external file that provides work instructions in an image.					

## C.25 element ImageInstructionType/ExternalFile

diagram	
type	<b>ExternalFileReferenceType</b>
properties	content    complex
children	<b>URI FileSpec Description</b>
annotation	documentation The ExternalFile element gives information about an external image instruction file.

## C.26 complexType ManualMeasureFeatureMethodType

diagram	<pre>classDiagram     class ManualMeasureFeatureMethod...     class MeasureFeatureMethodBaseType {         +attributes         +id     }     ManualMeasureFeatureMethod... -- &gt; MeasureFeatureMethodBaseType     ManualMeasureFeatureMethod... .. ChosenResourceIds     ManualMeasureFeatureMethod... .. WorkInstructionIds</pre>					
type	extension of <a href="#">MeasureFeatureMethodBaseType</a>					
properties	base <b>MeasureFeatureMethodBaseType</b>					
children	<a href="#">ChosenResourceIds</a> <a href="#">WorkInstructionIds</a>					
used by	element <b>ManualMeasureFeatureMethod</b>					
attributes	Name <a href="#">id</a>	Type <b>QIFIdType</b>	Use required	Default	Fixed	Annotation documentation The id attribute is the QIF id of the action method, used for referencing.
annotation	documentation The ManualMeasureFeatureMethodType defines the manual metrology method (e.g., calipers, micrometers) for measuring the feature.					

## C.27 complexType MeasurandBaseType

diagram	
properties	abstract    true

used by	element complexTypes	<b>Measurand</b> <a href="#">EstablishDatumMeasurandType</a> <a href="#">EvaluateCharacteristicMeasurandType</a>				
attributes	Name <a href="#">id</a>	Type <b>QIFIdType</b>	Use required	Default	Fixed	Annotation documentation The id attribute is the QIF id of the measurand, used for referencing.
annotation	documentation The MeasurandBaseType is the abstract base type that defines an object, quantity, property, or condition to be measured and for a specific purpose. (Example measurands: Measure a shape feature to evaluate a specified characteristic(tolerance). Measure a shape feature to establish a datum within the context of a datum reference frame. Measure a grain feature to determine a grain size.) MeasurandTypes can be expanded in future QIF Plans versions.					

### C.28 attribute MeasurandBaseType/@id

type	<b>QIFIdType</b>
properties	use required
annotation	documentation The id attribute is the QIF id of the measurand, used for referencing.


### C.29 complexType MeasurandsType

diagram	
children	<b>Measurand</b>
used by	element <a href="#">MeasurementPlanType/Measurands</a>
annotation	documentation The MeasurandsType defines a set of measurands.

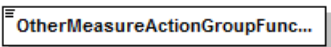
### C.30 complexType MeasureActionGroupFunctionType

diagram	<pre>classDiagram     class MeasureActionGroupFunctionType {         +MeasureActionGroupFunctionEnum         +OtherMeasureActionGroupFunction     }     class MeasureActionGroupFunctionEnum     class OtherMeasureActionGroupFunction</pre>
children	<a href="#">MeasureActionGroupFunctionEnum</a> <a href="#">OtherMeasureActionGroupFunction</a>
used by	element <a href="#">ActionGroupBaseType/MeasureActionGroupFunction</a>
annotation	documentation The MeasureActionGroupFunctionType defines the function of the action group within the context of a measurement plan.

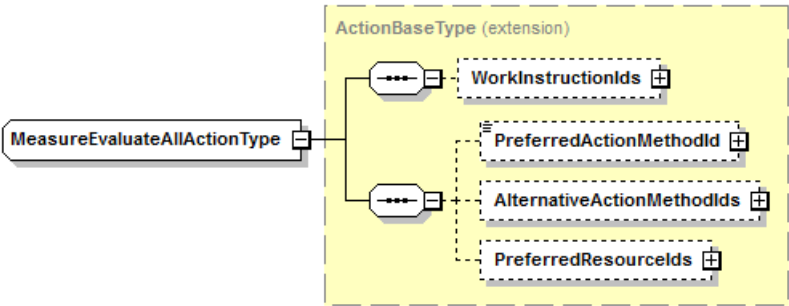
**C.31 element****MeasureActionGroupFunctionType/MeasureActionGroupFunctionEnum**

diagram			
type	<a href="#">MeasureActionGroupFunctionEnumType</a>		
properties	content simple		
facets	Kind	Value	Annotation
	enumeration	ROUTING_PLAN	
	enumeration	OPERATION_SEQUENCE	
	enumeration	SETUP_USAGE_GROUP	
	enumeration	SENSOR_USAGE_GROUP	
	enumeration	CARRIAGE_USAGE_GROUP	
	enumeration	PCS_USAGE_GROUP	
	enumeration	EVALUATE_CHAR_ACTIONS	
	enumeration	ESTABLISH_DATUM_ACTIONS	
	enumeration	UNDEFINED	
annotation	documentation The MeasureActionGroupFunctionEnum element describes an often-used function of the action group within the context of a measurement plan.		

**C.32 element****MeasureActionGroupFunctionType/OtherMeasureActionGroupFunction**

diagram			
type	<b>xs:string</b>		
properties	content simple		
annotation	documentation The OtherMeasureActionGroupFunction element describes the function of the action group within the context of a measurement plan.		

**C.33 complexType MeasureEvaluateAllActionType**

diagram			
type	extension of <a href="#">ActionBaseType</a>		
properties	base ActionBaseType		

children	<a href="#">WorkInstructionIds</a> <a href="#">PreferredActionMethodId</a> <a href="#">AlternativeActionMethodIds</a> <a href="#">PreferredResourceIds</a>
used by	element <b>MeasureEvaluateAll</b>
annotation	documentation The MeasureEvaluateAllActionType defines an action that means: measure whatever is necessary in order to find CharacteristicActuals for all CharacteristicItems, and find those actuals. For any FeatureItems that are measured, also populate the corresponding FeatureActuals with values.

### C.34 complexType MeasureEvaluateSpecifiedActionType

diagram	
type	extension of <a href="#">ActionBaseType</a>
properties	base <a href="#">ActionBaseType</a>
children	<a href="#">WorkInstructionIds</a> <a href="#">PreferredActionMethodId</a> <a href="#">AlternativeActionMethodIds</a> <a href="#">PreferredResourceIds</a> <a href="#">CharacteristicItemIds</a>
used by	element <b>MeasureEvaluateSpecified</b>
annotation	documentation The MeasureEvaluateSpecifiedActionType defines an action that means: measure whatever is necessary in order to find CharacteristicActuals for the CharacteristicItems whose QIF ids are specified, and find those actuals. For any FeatureItems that are measured, also populate the corresponding FeatureActuals with values.

### C.35 element MeasureEvaluateSpecifiedActionType/CharacteristicItemIds

diagram						
type	ArrayReferenceFullType					
properties	content    complex					
children	Id					
attributes	Name N	Type NaturalType	Use required	Default	Fixed	Annotation documentation The required N attribute

		shows how many Id elements are present in this array.
annotation	documentation The CharacteristicItemIds element is a list of the QIF ids of characteristic items that are to be evaluated.	

### C.36 complexType MeasureFeatureMethodBaseType

diagram	<p>The diagram illustrates the relationship between <b>MeasureFeatureMethodBaseType</b> and <b>ActionMethodBaseType</b>. <b>MeasureFeatureMethodBaseType</b> is shown as a specialization (extension) of <b>ActionMethodBaseType</b>. The <b>ActionMethodBaseType</b> box contains an <b>id</b> attribute. The <b>MeasureFeatureMethodBaseType</b> box is connected to the <b>ActionMethodBaseType</b> box via a line with an open circle at the <b>MeasureFeatureMethodBaseType</b> end. This line also connects to two dashed boxes representing <b>ChosenResourceIds</b> and <b>WorkInstructionIds</b>, which are also connected to the <b>ActionMethodBaseType</b> box.</p>					
type	extension of <a href="#">ActionMethodBaseType</a>					
properties	base	ActionMethodBaseType				
	abstract	true				
children	<a href="#">ChosenResourceIds</a> <a href="#">WorkInstructionIds</a>					
used by	complexType	<a href="#">CoordinateMeasureFeatureMethodType</a> <a href="#">GageMeasureFeatureMethodType</a> <a href="#">ManualMeasureFeatureMethodType</a> <a href="#">OtherMeasureFeatureMethodType</a>				
attributes	Name	Type	Use	Default	Fixed	Annotation
	<a href="#">id</a>	QIFIdType	required			documentation The id attribute is the QIF id of the action method, used for referencing.
annotation	documentation The MeasureFeatureMethodBaseType is the abstract base type that defines a feature measurement method.					



### C.37 complexType MeasurementPlanType

diagram	
children	<a href="#">Version</a> <a href="#">RulesUsedQPid</a> <a href="#">RulesToUseQPid</a> <a href="#">WorkInstructions</a> <a href="#">ActionMethods</a> <a href="#">Measurands</a> <a href="#">PlanRoot</a>
used by	element <b>MeasurementPlan</b>
annotation	documentation The MeasurementPlanType defines information about a measurement plan.

### C.38 element MeasurementPlanType/Version

diagram	
type	<b>VersionType</b>
properties	minOcc 0 maxOcc 1 content complex
children	<b>TimeCreated SignOffs ThisInstanceQPid</b>
annotation	documentation The optional Version element gives version information about the measurement plan.

**C.39 element MeasurementPlanType/RulesUsedQPid**

diagram	
type	<b>QPIdFullReferenceType</b>
properties	minOcc 0 maxOcc 1 content complex
children	<b>ItemQPId DocumentQPId</b>
annotation	documentation The optional RulesUsedQPid element gives the QPid of the rules that were used in creating the plan. The rules may be in the same QIFDocument as the plan, or in a separate QIFDocument, or both (in which case the two sets of rules must be identical).

**C.40 element MeasurementPlanType/RulesToUseQPid**

diagram	
type	<b>QPIdFullReferenceType</b>
properties	minOcc 0 maxOcc 1 content complex
children	<b>ItemQPId DocumentQPId</b>
annotation	documentation The optional RulesToUseQPid element gives the QPid of the rules to be used in making a more detailed plan from the plan or in generating a program from the plan (a DMIS program, for example). The rules may be in the same QIFDocument as the plan, or in a separate QIFDocument, or both (in which case the two sets of rules must be identical).

### C.41 element MeasurementPlanType/WorkInstructions

diagram	
type	<a href="#">WorkInstructionsType</a>
properties	minOcc 0 maxOcc 1 content complex
children	<b>WorkInstruction</b>
annotation	documentation The optional WorkInstructions element captures any instructions necessary for executing the MeasurementPlan.

### C.42 element MeasurementPlanType/ActionMethods

diagram	
type	<a href="#">ActionMethodsType</a>
properties	minOcc 0 maxOcc 1 content complex
children	<b>ActionMethod</b>
annotation	documentation The optional ActionMethods element captures any action methods necessary for executing the MeasurementPlan.

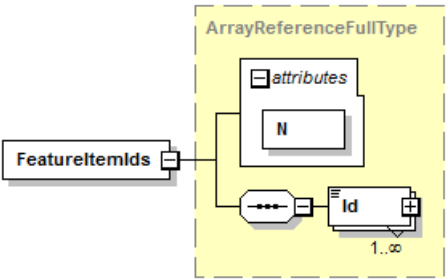
### C.43 element MeasurementPlanType/Measurands

diagram	
type	<a href="#">MeasurandsType</a>
properties	minOcc 0 maxOcc 1 content complex
children	<b>Measurand</b>
annotation	documentation The optional Measurands element captures any measurands used in the MeasurementPlan.

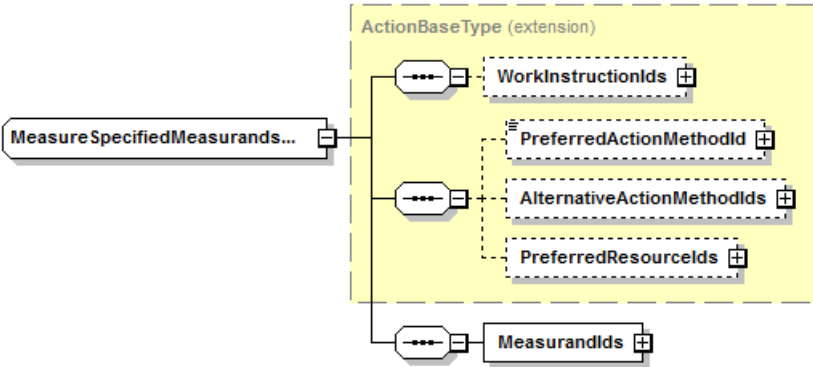
### C.44 complexType MeasureSpecifiedFeaturesActionType

diagram	
type	extension of <a href="#">ActionBaseType</a>
properties	base ActionBaseType
children	<a href="#">WorkInstructionIds</a> <a href="#">PreferredActionMethodId</a> <a href="#">AlternativeActionMethodIds</a> <a href="#">PreferredResourceIds</a> <a href="#">FeatureItemIds</a>
used by	element <b>MeasureSpecifiedFeatures</b>
annotation	documentation The MeasureSpecifiedFeaturesActionType defines an action that means: measure the FeatureItems whose QIF ids are specified, and populate the corresponding FeatureActuals with values.

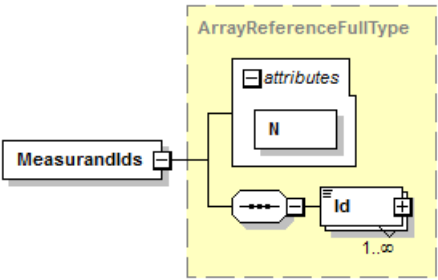
### C.45 element MeasureSpecifiedFeaturesActionType/FeatureItemIds

diagram						
type	<b>ArrayReferenceFullType</b>					
properties	content complex					
children	<b>Id</b>					
attributes	Name N	Type <b>NaturalType</b>	Use required	Default	Fixed	Annotation documentation The required N attribute shows how many Id elements are present in this array.
annotation	documentation The FeatureItemIds element is a list of the QIF ids of feature items that are to be measured.					

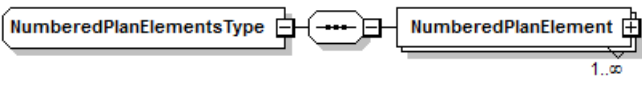
### C.46 complexType MeasureSpecifiedMeasurandsActionType

diagram						
type	extension of <a href="#">ActionBaseType</a>					
properties	base ActionBaseType					
children	<a href="#">WorkInstructionIds</a> <a href="#">PreferredActionMethodId</a> <a href="#">AlternativeActionMethodIds</a> <a href="#">PreferredResourceIds</a> <a href="#">MeasurandIds</a>					
used by	element <b>MeasureSpecifiedMeasurands</b>					
annotation	documentation The MeasureSpecifiedMeasurandsActionType defines an action that means: measure the Measurands whose QIF ids are given, and populate the corresponding FeatureActuals with values.					

**C.47 element MeasureSpecifiedMeasurandsActionType/MeasurandIds**

diagram						
type	<b>ArrayReferenceFullType</b>					
properties	content complex					
children	<b>Id</b>					
attributes	Name N	Type <b>NaturalType</b>	Use required	Default	Fixed	Annotation documentation The required N attribute shows how many Id elements are present in this array.
annotation	documentation The MeasurandIds element is a list of the QIF ids of measurands that are to be measured.					

**C.48 complexType NumberedPlanElementsType**

diagram						
children	<a href="#">NumberedPlanElement</a>					
used by	elements <a href="#">OrderedActionGroupType/Steps</a> <a href="#">OneOfActionGroupType/Steps</a>					
annotation	documentation The NumberedPlanElementsType defines a set of numbered plan elements.					

### C.49 element NumberedPlanElementsType/NumberedPlanElement

diagram	
type	<a href="#">NumberedPlanElementType</a>
properties	minOcc 1 maxOcc unbounded content complex
children	<a href="#">SequenceNumber</a> <a href="#">PlanElement</a>
annotation	documentation Each NumberedPlanElement element is one member of the set of numbered plan elements.

### C.50 complexType NumberedPlanElementType

diagram	
children	<a href="#">SequenceNumber</a> <a href="#">PlanElement</a>
used by	elements <a href="#">NumberedPlanElementsType/NumberedPlanElement</a> <a href="#">StepWithPredecessorsType/Step</a>
annotation	documentation The NumberedPlanElementType defines a single ordered plan element.

### C.51 element NumberedPlanElementType/SequenceNumber

diagram	
type	<b>xs:positiveInteger</b>
properties	content simple
annotation	documentation The SequenceNumber element is a positive integer used in determining either the order within a set of PlanElements in which a plan element should be executed or which plan element in the set should be executed.



### C.52 complexType OneOfActionGroupType

diagram	
type	extension of <a href="#">ActionGroupBaseType</a>
properties	base <a href="#">ActionGroupBaseType</a>
children	<a href="#">WorkInstructionIds</a> <a href="#">MeasureActionGroupFunction</a> <a href="#">Steps</a>
used by	elements <a href="#">OneOfActionGroup</a> <a href="#">OneOfPlanRoot</a>
annotation	<p>documentation</p> <p>The OneOfActionGroupType defines an action group for which exactly one of the steps it contains must be executed. Any step in the list will do. The SequenceNumbers of the Steps in an instance of OneOfActionGroupType are not required to be distinct. The SequenceNumbers indicate a preference for which step is executed, with 1 the most preferred, 2 the second most preferred, and so on. Steps with the same SequenceNumber are equally preferred.</p>

### C.53 element OneOfActionGroupType/Steps

diagram	
type	<a href="#">NumberedPlanElementsType</a>
properties	content <a href="#">complex</a>
children	<a href="#">NumberedPlanElement</a>
annotation	<p>documentation</p> <p>The Steps element is a list of numbered plan elements.</p>

### C.54 complexType OrderedActionGroupType

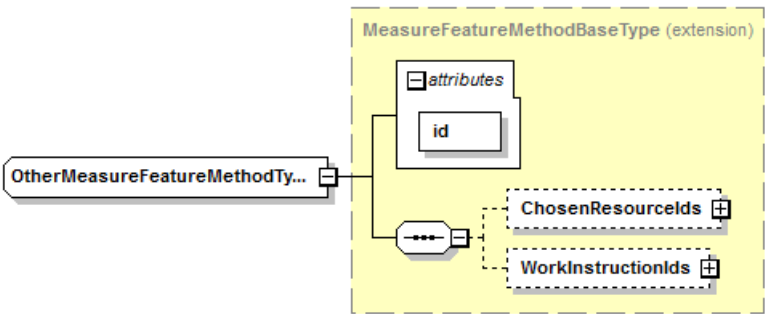
diagram	
type	extension of <a href="#">ActionGroupBaseType</a>
properties	base <a href="#">ActionGroupBaseType</a>

children	<a href="#">WorkInstructionIds</a> <a href="#">MeasureActionGroupFunction</a> <a href="#">Steps</a>
used by	elements <b>OrderedActionGroup</b> <b>OrderedPlanRoot</b>
annotation	documentation The OrderedActionGroupType defines an action group for which the all the steps it contains must be executed in order of increasing sequence number. The SequenceNumbers of the Steps in an instance of OrderedActionGroupType must be present, must be assigned 1, 2, 3, ..., and must be executed in that order.

### C.55 element OrderedActionGroupType/Steps

diagram	
type	<a href="#">NumberedPlanElementsType</a>
properties	content complex
children	<a href="#">NumberedPlanElement</a>
annotation	documentation The Steps element is a set of numbered plan elements.

### C.56 complexType OtherMeasureFeatureMethodType

diagram						
type	extension of <a href="#">MeasureFeatureMethodBaseType</a>					
properties	base    MeasureFeatureMethodBaseType					
children	<a href="#">ChosenResourceIds</a> <a href="#">WorkInstructionIds</a>					
used by	element <b>OtherMeasureFeatureMethod</b>					
attributes	Name <a href="#">id</a>	Type <b>QIFIdType</b>	Use required	Default	Fixed	Annotation documentation The id attribute is the QIF id of the action method, used for referencing.
annotation	documentation The OtherMeasureFeatureMethodType defines the other metrology method for measuring the feature.					

### C.57 complexType PartiallyOrderedActionGroupType

diagram	
type	extension of <a href="#">ActionGroupBaseType</a>
properties	base <a href="#">ActionGroupBaseType</a>
children	<a href="#">WorkInstructionIds</a> <a href="#">MeasureActionGroupFunction</a> <a href="#">StepsWithPredecessors</a>
used by	elements <a href="#">PartiallyOrderedActionGroup</a> <a href="#">PartiallyOrderedPlanRoot</a>
annotation	<p>documentation</p> <p>The PartiallyOrderedActionGroupType defines an action group for which all of the steps it contains should be executed, but each step may be executed only after all of the predecessors of that step have been executed. If more than one step meets that condition, any order of executing those steps will work, and no particular order is required by the plan. The SequenceNumbers of the Steps in the StepsWithPredecessors in an instance of PartiallyOrderedActionGroupType must be assigned 1, 2, 3, ... but usually will not be executed in that order.</p>

### C.58 element PartiallyOrderedActionGroupType/StepsWithPredecessors

diagram	
type	<a href="#">StepsWithPredecessorsType</a>
properties	content complex
children	<a href="#">StepWithPredecessors</a>
annotation	<p>documentation</p> <p>The StepsWithPredecessors element is a list of PlanElements with predecessors.</p>

### C.59 complexType PickSomeActionGroupType

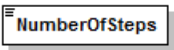
diagram	
type	extension of <a href="#">ActionGroupBaseType</a>

properties	base    ActionGroupBaseType
children	<a href="#">WorkInstructionIds</a> <a href="#">MeasureActionGroupFunction</a> <a href="#">Steps</a> <a href="#">NumberOfSteps</a>
used by	elements <b>PickSomeActionGroup</b> <b>PickSomePlanRoot</b>
annotation	documentation The PickSomeActionGroupType defines an action group for which a specified number of the steps it contains must be executed; they may be executed in any order.


## C.60 element PickSomeActionGroupType/Steps

diagram	
type	<a href="#">UnnumberedPlanElementsType</a>
properties	content    complex
children	<b>PlanElement</b>
annotation	documentation The Steps element is a list of unnumbered plan elements.

### C.61 element PickSomeActionGroupType/NumberOfSteps

diagram	
type	<b>xs:positiveInteger</b>
properties	content simple
annotation	documentation The NumberOfSteps element is the number of steps from the Steps list to be executed. This must be at least one and must not be larger than the number of Steps.

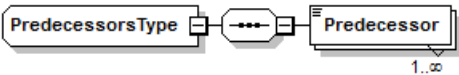
### C.62 complexType PlanElementBaseType

diagram	
properties	abstract true
children	<a href="#">WorkInstructionIds</a>
used by	element <b>PlanElement</b> complexType <a href="#">ActionBaseType</a> <a href="#">ActionGroupBaseType</a>
annotation	documentation The PlanElementBaseType defines the abstract base type that defines plan element types. Plan elements are of two types: actions and action groups.

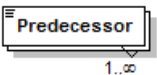
### C.63 element PlanElementBaseType/WorkInstructionIds

diagram						
type	ArrayReferenceFullType					
properties	minOcc	0				
	maxOcc	1				
	content	complex				
children	Id					
attributes	Name N	Type NaturalType	Use required	Default	Fixed	Annotation documentation The required N attribute shows how many Id elements are present in this array.
annotation	documentation The optional WorkInstructionIds element gives the QIF ids of work instructions required to execute the plan element.					

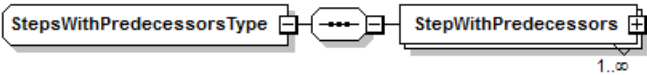
## C.64 complexType PredecessorsType

diagram	
children	<a href="#">Predecessor</a>
used by	element <a href="#">StepWithPredecessorsType/Predecessors</a>
annotation	documentation The PredecessorsType defines a list of the numbers of predecessor steps.

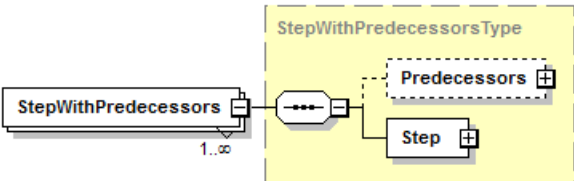
## C.65 element PredecessorsType/Predecessor

diagram	
type	xs:positiveInteger
properties	minOcc 1 maxOcc unbounded content simple
annotation	documentation Each Predecessor element is a single member of the list. It is a positive integer that is the number of a step and is different from any other member of the list.

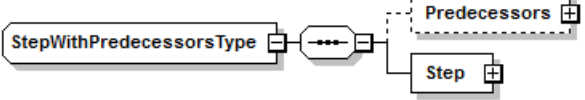
## C.66 complexType StepsWithPredecessorsType

diagram	
children	<a href="#">StepWithPredecessors</a>
used by	element <a href="#">PartiallyOrderedActionGroupType/StepsWithPredecessors</a>
annotation	documentation The StepsWithPredecessorsType defines a list of StepWithPredecessors/s.

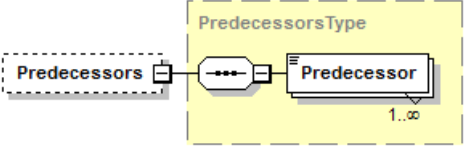
## C.67 element StepsWithPredecessorsType/StepWithPredecessors

diagram	
type	<a href="#">StepWithPredecessorsType</a>
properties	minOcc 1 maxOcc unbounded content complex
children	<a href="#">Predecessors</a> <a href="#">Step</a>
annotation	documentation Each StepWithPredecessors element is a single member of the list.

## C.68 complexType StepWithPredecessorsType

diagram	
children	<a href="#">Predecessors</a> <a href="#">Step</a>
used by	element <a href="#">StepsWithPredecessorsType/StepWithPredecessors</a>
annotation	documentation The StepWithPredecessorsType defines information about a single PlanElement that has predecessors.

## C.69 element StepWithPredecessorsType/Predecessors

diagram	
type	<a href="#">PredecessorsType</a>
properties	minOcc 0 maxOcc 1 content complex
children	<a href="#">Predecessor</a>
annotation	documentation The optional Predecessors element is a list of the numbers of steps that must be executed before this step is executed. Care should be taken that no step has itself as a predecessor and that there are no loops of predecessors, as when step 1 is a predecessor of step 2 and step 2 is a predecessor of step 1.

### C.70 element StepWithPredecessorsType/Step

diagram	
type	<a href="#">NumberedPlanElementType</a>
properties	content complex
children	<a href="#">SequenceNumber</a> <a href="#">PlanElement</a>
annotation	documentation The Step element is a numbered PlanElement.

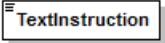
### C.71 complexType TextInstructionType

diagram	<p>The diagram illustrates the relationship between <b>TextInstructionType</b> and <b>WorkInstructionBaseType</b>. <b>TextInstructionType</b> is an extension of <b>WorkInstructionBaseType</b>, indicated by a dashed line with an open arrow. <b>TextInstructionType</b> has an attribute <b>id</b> of type <b>QIFIdType</b>. The <b>TextInstruction</b> element is connected to the <b>id</b> attribute, showing its role in the data model.</p>					
type	extension of <a href="#">WorkInstructionBaseType</a>					
properties	base <a href="#">WorkInstructionBaseType</a>					
children	<a href="#">TextInstruction</a>					
used by	element <b>TextInstruction</b>					
attributes	Name <a href="#">id</a>	Type <b>QIFIdType</b>	Use required	Default	Fixed	Annotation documentation



		The id attribute is the QIF id of the work instruction, used for referencing.
annotation	documentation The TextInstructionType defines work instructions that consist of text.	

## C.72 element TextInstructionType/TextInstruction

diagram		
type	<b>xs:string</b>	
properties	content	simple
annotation	documentation The TextInstruction element provides instructions in text.	

### C.73 complexType UnnumberedPlanElementsType

diagram	
children	<b>PlanElement</b>
used by	elements <a href="#">UnorderedActionGroupType/Steps</a> <a href="#">PickSomeActionGroupType/Steps</a>
annotation	documentation The UnnumberedPlanElementsType defines a set of plan elements without sequence numbers.

### C.74 complexType UnorderedActionGroupType

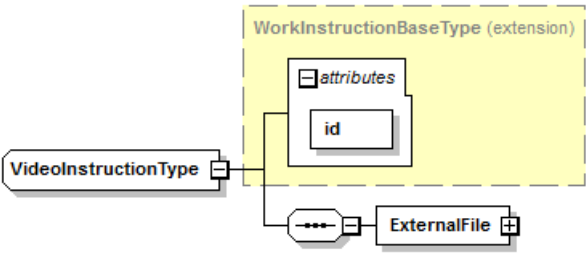
diagram	
type	extension of <a href="#">ActionGroupBaseType</a>
properties	base <a href="#">ActionGroupBaseType</a>

children	<a href="#">WorkInstructionIds</a> <a href="#">MeasureActionGroupFunction</a> <a href="#">Steps</a>
used by	elements <b>UnorderedActionGroup</b> <b>UnorderedPlanRoot</b>
annotation	documentation The UnorderedActionGroupType defines an action group for which all of the steps it contains should be executed, but any order of executing them will work, and no particular order of execution is required.

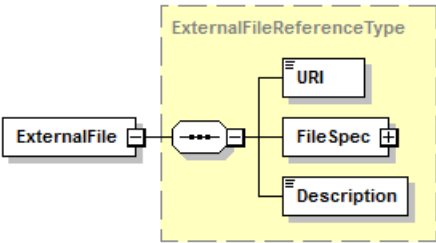
## C.75 element UnorderedActionGroupType/Steps

diagram	<pre> classDiagram     class Steps     class PlanElement     class EvaluateSpecifiedCharacteristics     class MeasureEvaluateAll     class MeasureEvaluateSpecified     class MeasureSpecifiedFeatures     class MeasureSpecifiedMeasurands     class OneOfActionGroup     class OrderedActionGroup     class PartiallyOrderedActionGroup     class PickSomeActionGroup     class UnorderedActionGroup      Steps --&gt; PlanElement     PlanElement --&gt; EvaluateSpecifiedCharacteristics     PlanElement --&gt; MeasureEvaluateAll     PlanElement --&gt; MeasureEvaluateSpecified     PlanElement --&gt; MeasureSpecifiedFeatures     PlanElement --&gt; MeasureSpecifiedMeasurands     PlanElement --&gt; OneOfActionGroup     PlanElement --&gt; OrderedActionGroup     PlanElement --&gt; PartiallyOrderedActionGroup     PlanElement --&gt; PickSomeActionGroup     PlanElement --&gt; UnorderedActionGroup     </pre>
type	<a href="#">UnnumberedPlanElementsType</a>
properties	content complex
children	<b>PlanElement</b>
annotation	documentation The Steps element is a list of plan elements without numbers.

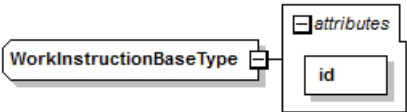
## C.76 complexType VideoInstructionType

diagram						
type	extension of <a href="#">WorkInstructionBaseType</a>					
properties	base WorkInstructionBaseType					
children	<a href="#">ExternalFile</a>					
used by	element <b>VideoInstruction</b>					
attributes	Name <a href="#">id</a>	Type <b>QIFidType</b>	Use required	Default	Fixed	Annotation documentation The id attribute is the QIF id of the work instruction, used for referencing.
annotation	documentation The VideoInstructionType defines an external file that provides work instructions in a video.					

## C.77 element VideoInstructionType/ExternalFile

diagram						
type	<b>ExternalFileReferenceType</b>					
properties	content complex					
children	<b>URI FileSpec Description</b>					
annotation	documentation The ExternalFile element gives information about an external video instruction file.					

## C.78 complexType WorkInstructionBaseType

diagram						
properties	abstract true					

used by	element complexType	<b>WorkInstruction</b> <a href="#">DocumentFileInstructionType</a> <a href="#">ImageInstructionType</a> <a href="#">TextInstructionType</a> <a href="#">VideoInstructionType</a>				
attributes	Name <a href="#">id</a>	Type <b>QIFIdType</b>	Use required	Default	Fixed	Annotation documentation The id attribute is the QIF id of the work instruction, used for referencing.
annotation	documentation The WorkInstructionBaseType is the abstract base type that defines the specific media types that provide instructions that have meaning in an application context.					

### C.79 attribute WorkInstructionBaseType/@id

type	<b>QIFIdType</b>
properties	use required
annotation	documentation The id attribute is the QIF id of the work instruction, used for referencing.

### C.80 complexType WorkInstructionsType

diagram	<pre>graph TD     WIT[WorkInstructionsType] -- "1" --&gt; S((...))     S -- "1" --&gt; WI[WorkInstruction]     WI -- "1..∞" --&gt; DFI[DocumentFileInstruction]     DFI -- "1..∞" --&gt; II[ImageInstruction]     II -- "1..∞" --&gt; TI[TextInstruction]     TI -- "1..∞" --&gt; VI[VideoInstruction]</pre>
children	<b>WorkInstruction</b>
used by	element <a href="#">MeasurementPlanType/WorkInstructions</a>
annotation	documentation The WorkInstructionsType defines a set of sets of work instructions.

### C.81 simpleType MeasureActionGroupFunctionEnumType

type	restriction of <b>xs:NMTOKEN</b>					
properties	base	xs:NMTOKEN				
used by	element	<a href="#">MeasureActionGroupFunctionType/MeasureActionGroupFunctionEnum</a>				
facets	Kind enumeration	Value ROUTING_PLAN	Annotation			
	enumeration	OPERATION_SEQUENCE				

	<p>enumeration SETUP_USAGE_GROUP</p> <p>enumeration SENSOR_USAGE_GROUP</p> <p>enumeration CARRIAGE_USAGE_GROUP</p> <p>enumeration PCS_USAGE_GROUP</p> <p>enumeration EVALUATE_CHAR_ACTIONS</p> <p>enumeration ESTABLISH_DATUM_ACTIONS</p> <p>enumeration UNDEFINED</p>
annotation	<p>documentation</p> <p>The MeasureActionGroupFunctionEnumType enumerates values that describe the functions of action groups within the context of a measurement plan.</p> <ul style="list-style-type: none"> <li>- Routing Plan is a group of actions that may route the product from one measurement work cell to another.</li> <li>- Operation Sequence is a group of actions that are performed at one work cell, typically referencing a measurement device resource.</li> <li>- Setup Usage Group is a group of actions that are performed at one part setup, typically referencing a fixture resource.</li> <li>- Sensor Usage Group is a group of actions that are performed at one sensor tool change, typically referencing a sensor resource.</li> <li>- Carriage Usage Group is a group of actions that are performed at one carriage, typically referencing a carriage of a measurement device resource.</li> <li>- PCS Usage Group is a group of actions that are performed at one active part coordinate system which usually corresponds with a datum reference frame.</li> <li>- Evaluate Characteristic Actions is a group of actions that are performed to evaluate a characteristic.</li> <li>- Establish Datum Actions is a group of actions that are performed to establish a datum with a datum reference frame.</li> </ul>

~~ end data dictionary for QIFPlans.xsd ~~

## Bibliography

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

[2] Walmsley, Priscilla., 2002. *Definitive XML Schema*. Prentice Hall, Upper Saddle River, NJ, USA.

[3] ASME B89.7.2 – 1999, Dimensional Measurement Planning