

*Dimensional Metrology
Standards Consortium*

DMSC

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

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



QIF Version 2.0

ANSI/QIF Part 8–2014

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Foreword

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

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

Main:

- Mitutoyo America
- Origin International Inc.
- Honeywell
- National Institute of Standards and Technology

Support:

- Lockheed Martin
- Deere and Co.
- InfinityQS
- University of North Carolina - Charlotte

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

This document was written by the QIF Working Group, and given final approval for ANSI balloting by the DMSC's Quality Measurement Standards (QMS) Committee.

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 Design (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*

Parts 1 and 2 describe the overview and central concepts of the QIF standard. Parts 3 through 8 describe information models for the six *application areas* of QIF, namely MBD, Plans, Resources, Rules, Results, and Statistics.

The inaugural QIF standard, version 1.0, was published in 2013. This document is a component of the second release of the QIF suite of standards, denoted version 2.0. The QIF version 2.0 documents cancel and replace all documents of version 1.0. QIF version 2.0 is solely a product of the DMSC and its committees and working groups.

Each major release of the QIF standard is composed of several *Parts* documents. Individual *Parts* are designated with the version number of the major QIF revision, even when the document is new. QIF version 2.0 includes revisions of the version 1.0 documents Part 1 (Overview), Part 2 (QIF Library), Part 3 (Plans) and Part 4 (Results), and 4 new Parts that did not exist in version 1.0. Also, QIF Part 3 – 2013 was redesignated as Part 4 and its name was changed from QMPlans to QIF Plans. QIF Part 4 – 2013 was redesignated as Part 7 and its name was changed from QMResults to QIF Results.

Its scope was expanded to cover the new application areas of MBD, Resources, Rules, and Statistics. Its content was revised to reflect changes made to the QIF information model.

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

Statistics is an extension of the Quality Information Framework data model designed to carry information to transport statistical quality control plans, corrective action plans and detailed summary quality statistics. It builds on the QIF Results framework through supporting multi-part measurement results that can apply to a number of quality study types beyond single or first article inspection. It is designed to haul information in an unambiguous form for pre-production, capability, and production quality studies. In addition it supports the full extent of measurement systems analysis studies including Gage R&R.

The benefits will be easily understood by the intended audience for this standard – all those who are already engaged in Quality measurement planning or the associated inspection process. So here is a summary of the benefits of standardization:

- Eliminates wasted resource, money, and time in measurement planning and execution tasks.
- Redirects these savings to value-added activities, enhancements, etc.
- Allows manufacturers and measurement solutions providers to redirect more energy to new development.
- Enables inspection systems to communicate with more measurement planning systems making them both more useful.
- Permits customers to focus more on core business.
- Uses standard identifiable tags, yet with provision for familiar user-defined names.
- Moves away from proprietary schemas that require significantly more technical support.

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

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

1 Scope

The scope of this Standard consists of quality measurements of variable and attribute characteristics. Measurement results not only include observed measurement values, but also summary statistical or derived results (e.g., individuals, averages, standard deviations, max, min, etc.). All necessary nominal (as designed) target values are also included to allow reanalysis, if required. Any other traceability information relevant to one or more measurements are also in scope, information such as the shift, data source, equipment operator's name, the ID and feature of the item measured, the date and time of the measurement, etc.

QIF Statistics is designed to support single or multiple work piece studies. QIF Statistics applies to First Article Inspection, Process Capability studies, Production Runs, Gage R&R studies, etc.

Applicable software classifications that can make use of this interoperability standard include: Enterprise Resource Planning (ERP), Manufacturing Execution Systems (MES), Statistical Quality Control (SQC), Statistical Process Control (SPC), Gage Repeatability and Reproducibility (Gage R&R), Measurement Systems Analysis (MSA) and Advanced Statistical Analysis.

1.1 Contents of this document

This standard defines a QIF application information model for a portion of the QIF manufacturing quality information model designated QIF Statistics.

The information model consists of definitions for data types, elements, the logical relationships between them, and the semantics of the quality information. The information model, defined using the XML Schema Definition (XSDL) Language, 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 QIF Statistics information model is expressed in the file "QIFStatistics.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.

XSDL also supports the definition of rules and checks for validation of QIF instance files.

This document describes the several business use cases for the QIF Statistics data model for interoperability and details the various aspects of the Study Plans, Results and Corrective Action Plans.

The data model is described using simplified practical examples of each study type. The examples illustrate how the QIF Document structure provides for an integrated platform to combine Measurement Resources, Part Definition, Measurement Plans, Measurement Results and Measurement Statistics into a single package.

This document does not describe detailed Statistical theories or the calculation methods associated with them.

1.2 QIF information model application architecture

Figure 1 shows a high level view of the QIF information model for version 2.0 standardization. At the core of the QIF architecture is the reusable QIF library which contains definitions and components that are referenced by the application areas, thereby ensuring interoperability and extensibility. Around the QIF library core Figure 1 shows the six QIF application area information models, MBD, Plans, Resources, Rules, Results, and Statistics. The “QIF Execution” model is a placeholder for a future DMSC standard that is not a part of QIF 2.0. Each QIF application model reuses the QIF Library. The order of generation of QIF data in an enterprise generally proceeds clockwise around the diagram, beginning with QIF MBD and ending with QIF Statistics. Use of the QIF information model does not place any requirements on a user’s workflow architecture.

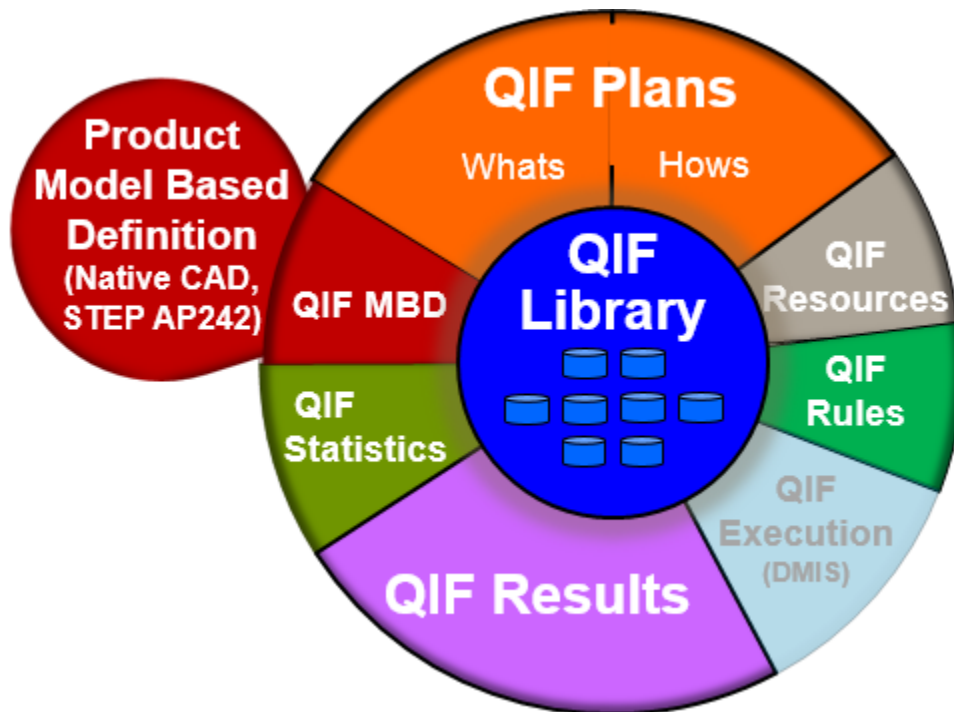


Figure 1 – QIF version 2.0 information model architecture

The general flow of QIF data starts with generation of CAD + PMI data exported as QIF MBD application data. Quality planning solutions import the MBD and generate Plans (whats), then import Resources and Rules information and export Plans (whats and hows). Programming

solutions import Plans to generate DME-specific programs, or general instructions to guide inspection. Dimensional measurement equipment executes programs and evaluates characteristics of a single manufactured part or assembly and exports the measurements as Results. Analysis solutions, typically performing statistical process control, import single parts Results and generate analysis of multiple part batches as QIF Statistics data.

Users of the QIF information model are not required to implement the entire model. Any of the six application models may be used singly for exchange of quality data between software solutions. Further, other data models and exchange formats can coexist in an enterprise with QIF data.

2 Conformance

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

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

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

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

3 Normative references

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

AIAG/QMD 1.0 – Automotive Industry Action Group Quality Measurement Data Specification, 2009

AIAG MSA Reference Manual 4th Edition, Automotive Industry Action Group Measurement Systems Analysis

AIAG SPC – Automotive Industry Action Group Statistical Process Control 2nd Edition

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

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

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

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

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

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

ISO/IEC JCGM 200 – *International vocabulary of metrology – Basic and general concepts and associated terms* (VIM)

SAE AS9102 Specification: Aerospace First Article Inspection Requirement, January, 2004

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 8 specification document. The first group is general QIF terms. The second group is terms defined to describe the information in the Statistics application area.

4.1 General QIF terms referenced in the QIF Statistics application area

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

4.1.1 characteristic

that which is to be measured. Characteristics can either be variables (length, diameter, etc.) or attributes (scratches, burrs, etc.) Variable characteristics can be associated with Features (faces, holes) on a given CAD model. Similar to Measurand as an object to be measured.

nominal

a variable characteristic nominal is the target value of the dimension based on the as designed engineering criteria.

tolerance

a variable tolerance gives the upper and lower specification of the characteristic dimension that provide the allowable range for part acceptance bases on the designed engineering criteria for fit and function.

measurement resource

measurement resources are defined as the dimensional metrology equipment that can be used to measure characteristics on a manufactured workpiece

measurement result

measurement results are the actual measurement values that are obtained by measuring characteristics with a measurement resource in the case of variables. Other sensors such as go/no-go gages are used for attribute measurements.

traceability

parameters as identified and associated with the history, location or conditions of manufacturing and measuring processes.

4.2 Terms defined for the QIF Statistics application area

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

4.2.1 assignable cause

those causes of variation in a process which are not random and have some source which can be determined and perhaps eliminated.

4.2.2 bias

a measure of a gage's tendency toward specific values when compared to a master value

4.2.3 capability

the measure of a process's stability and centralization against a nominal value and tolerance values, also, the ability of a process to produce acceptable parts

4.2.4 control limits

statistical limits that represent boundary conditions of a process that is in control.

NOTE Processes that are out of control are said to have unnatural causes or assignable causes of variation

4.2.5 corrective action

a countermeasure that can be applied to an assignable cause of variation in order to reduce the likelihood of recurrence

4.2.6 corrective action plan

information related to the establishment of lists of assignable causes of variation and associated corrective actions in the manufacturing process

NOTE In production statistical studies, a key aspect of manufacturing process control is the identification of assignable causes of variation that can occur. These special causes of variation are typically associated with corrective action plans that help the manufacturing operator with the ability to adjust processes to eliminate these unnatural causes of variation from occurring again thereby bringing the manufacturing process into a greater state of stability and control.

4.2.7 gage repeatability and reproduceability (gage R&R)

a source of measurement variation based on the ability of a gage to repeat measurements on the same parts and the ability of two or more inspectors using this gage to achieve the same measurement results

4.2.8 linearity

the ability of a gage to accurately measure across a range of values

4.2.9 process variation

the variation of a process in achieving the same characteristic values across time

4.2.10 production

a manufacturing process or operation designed to produce goods

4.2.11 sampling method

a statistical method of grouping manufactured products for measurement

NOTE Key concepts include sample size (how many) and sampling frequency (how often).

4.2.12 stability

the ability of a gage to arrive at the same measurements against a master value over time

4.2.13 standard deviation

a measure of the dispersion or frequency distribution around a population mean or average

4.2.14 statistical study plan

information, defined in the QIF Statistics model, that provides a method for establishing the quality approach and criteria for data studies associated with measurement in manufacturing

NOTE Statistical study plans provide a method for establishing the quality approach and criteria for data studies associated with measurement in manufacturing. A supplier may be provided with these plans from a customer in order to ensure the expectation that correct quality control information will be supplied with each manufactured lot.

NOTE Statistical Study plans can contain the number of expected products to be inspected. They can also contain the expected quality conformance thresholds such as the characteristics to be measured and monitored, sample size, process capability, and gage repeatability and reproduceability requirements.

4.2.15 statistical study results

information that contains the actual summary data that provides an overview of measured product quality

NOTE Statistical study results contain the actual summary data that provides an overview of product quality. From single first article inspection, to capability and production studies, statistical study information can include the actual process capability and performance quality indices that are commonly accepted in manufacturing.

5 Symbols and abbreviated terms

AIAG	Automotive Industry Action Group
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
CAD	Computer Aided Design
CAIPP	Computer Aided Inspection Process Planning

CAM	Computer-Aided Machining, or Computer-Aided Manufacturing
CAQ	Computer Aided Quality
CAX	Computer-Aided Technologies
CMM	Coordinate Measuring Machine
DME	Dimensional Measuring Equipment
DMSC	Dimensional Metrology Standards Consortium
ERP	Enterprise Resource Planning
GD&T	Geometric Dimensioning and Tolerancing
GPS	Geometrical Product Specifications
GUID	Globally Unique Identifier
ISO	International Organization for Standardization
MES	Manufacturing Execution Systems
MRP	Materials Resource Planning
MSA	Measurement Systems Analysis
PDPMI	Product Definition with Product Manufacturing Information
PLM	Product Lifecycle Management
PMI	Product Manufacturing Information
QIF	Quality Information Framework
QMS	Quality Measurement Standards (a DMSC Committee)
QMS	Quality Management Systems
QPId	QIF Persistent Identifier
R&R	Repeatability and Reproducibility
SI	The International Systems of Units
SPC	Statistical Process Control
SQC	Statistical Quality Control
XML	eXtensible Markup Language

XSDL

XML Schema Definition Language

6 Requirements

QIF Statistics is designed to carry information between a wide variety of manufacturing and enterprise applications. This section describes the simple workflow from measurement result collection and Statistical Process Control applications to aggregate Statistics and how this information can be archived or consumed by downstream applications such as PLM (Product Lifecycle Management) and ERP (Enterprise Resource Planning) systems.

6.1 QIF Statistics quality metrology activity diagram

The following diagram represents the purpose of QIF Statistics in the overall Quality Information workflow.

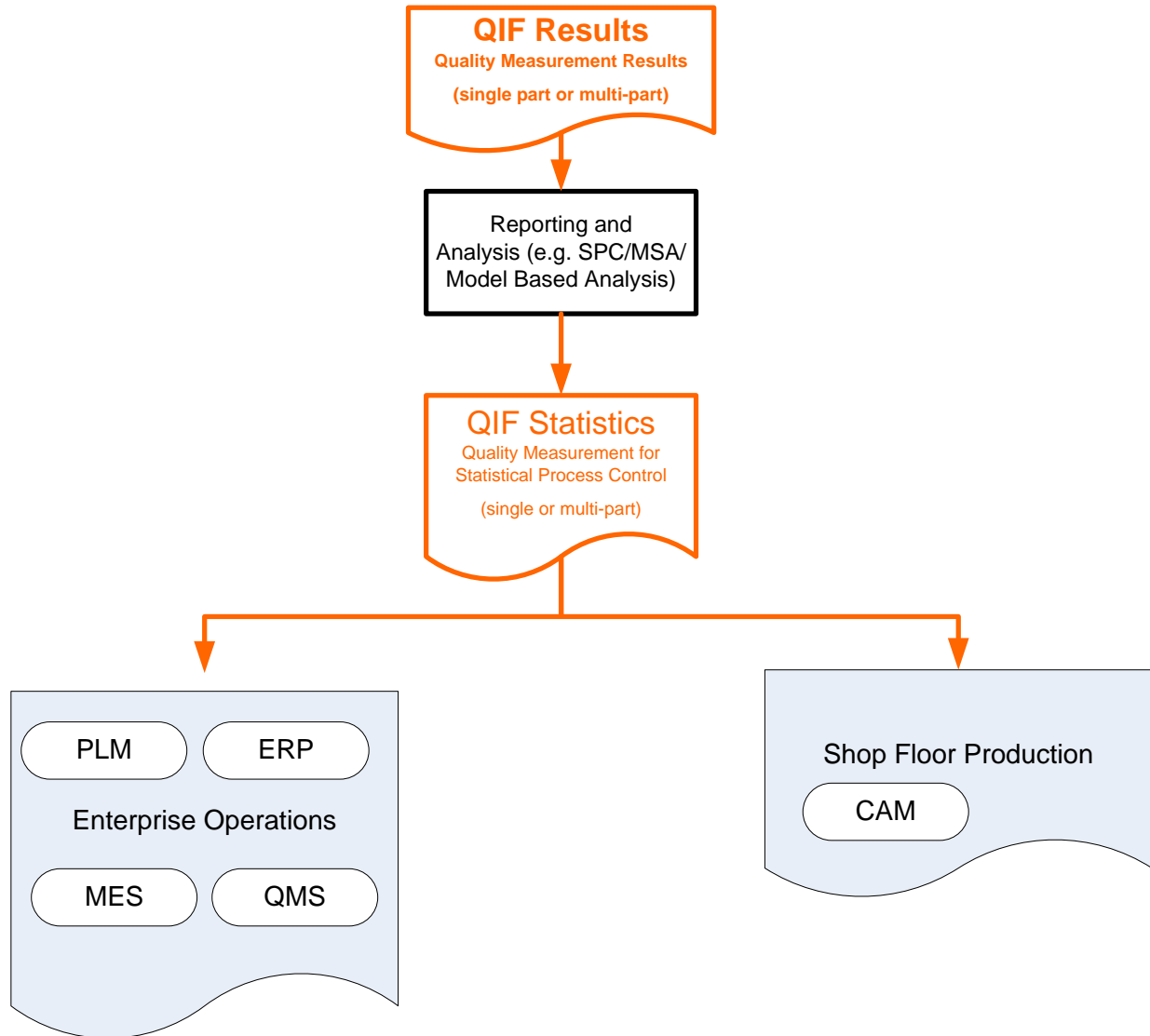


Figure 2 – QIF Statistics workflow

6.1.1 Manufacturing package type definition

QIF Statistics can serve as a data hauling format for quality measurements and statistics from and to the following types of manufacturing packages:

6.1.1.1 ERP – Enterprise Resource Planning

Enterprise Resource Planning (ERP) is a company-wide computer software system used to manage and coordinate all the resources, information, and functions of a business from shared data stores.

An ERP system has a service-oriented architecture with modular hardware and software units or "services" that communicate on a local area network. The modular design allows a business

to add or reconfigure modules (perhaps from different vendors) while preserving data integrity in one shared database that may be centralized or distributed.

6.1.1.2 MRP II – Manufacturing Resource Planning

Manufacturing Resource Planning (MRP II) is a method for the effective planning of all resources of a manufacturing company. Ideally, it addresses operational planning in units, financial planning in dollars, and has a simulation capability to answer "what-if" questions and extension of closed-loop MRP.

6.1.1.3 MES – Manufacturing Execution System

Manufacturing Execution Systems (MES) manage and monitor work-in-process on the factory floor including manual or automatic labor and production reporting, as well as on-line inquiries and links to tasks that take place on the production floor. Manufacturing Execution Systems may include one or more links to work orders, receipt of goods, shipping, quality control, maintenance, scheduling or other related tasks.

6.1.1.4 CAQ – Computer Aided Quality

Computer-Aided Quality (CAQ) assurance is the engineering application of computers and computer controlled machines for the definition and inspection of the quality of products.

6.1.1.5 SPC – Statistical Process Control

Statistical Process Control (SPC) is an effective method of monitoring a process through the use of control charts. Control charts enable the use of objective criteria for distinguishing background variation from events of significance based on statistical techniques. By collecting data from samples at various points within the process, variations in the process that may affect the quality of the end product or service can be detected and corrected, thus reducing waste as well as the likelihood that problems will be passed on to the customer. With its emphasis on early detection and prevention of problems, SPC has a distinct advantage over quality methods, such as inspection, that apply resources to detecting and correcting problems in the end product or service.

6.1.1.6 SQC – Statistical Quality Control

Statistical Quality Control (SQC) is a method of quality control that uses statistical sampling of units produced by a production process. These are checked for defectives (variances) to determine whether or not the process is in control. If not, corrective action is taken. In the field of statistical quality control, the statistical control chart is used as a basic tool to formally distinguish between normal and abnormal variances.

6.1.1.7 APQP – Advanced Product Quality Planning

Advanced Product Quality Planning (or APQP) is a framework of procedures and techniques used to develop products in industry, particularly the automotive industry. It is quite similar to the concept of Design for Six Sigma (DFSS).

It is a defined process for a product development system for General Motors, Ford, Chrysler and their suppliers. According to the Automotive Industry Action Group (AIAG), the purpose of

APQP is "to produce a product quality plan which will support development of a product or service that will satisfy the customer."

6.1.1.8 MSA – Measurement Systems Analysis

Measurement System Analysis (or MSA), is a specially designed experiment that seeks to identify the components of variation in the measurement.

Just as processes that produce a product may vary, the process of obtaining measurements and data may have variation and produce defects. A Measurement Systems Analysis evaluates the test method, measuring instruments, and the entire process of obtaining measurements to ensure the integrity of data used for analysis (usually quality analysis) and to understand the implications of measurement error for decisions made about a product or process. MSA is an important element of Six Sigma methodology and of other quality management systems.

MSA analyzes the collection of equipment, operations, procedures, software and personnel that affects the assignment of a number to a measurement characteristic.

6.1.2 Sample QIF Statistics business scenarios

This section describes examples of real world business cases where QIF Statistics may be applicable for interoperability.

6.1.2.1 MES to SQC

A manufacturer has configured all critical variable and attribute checks for each operation in a multi-stage process. The plans are issued to the shop floor workstations through a local area network. The company will use the SQC system to acquire and analyze the data and the MES system for long term retention and look ups.

6.1.2.2 ERP to MES

A large multi-national corporation has developed their global quality control plan within a centralized ERP system. Each manufacturing plant has chosen a different MES system and uses them to collect quality control information.

6.1.2.3 SPC to PLM

A global manufacturer has multiple production facilities that manufacture the same part. Each plant has developed its own statistical process control programs for quality control. In addition each plant uses a different SPC software vendor. The company wishes to store all measurement data, including statistical values in PLM for engineering analysis.

7 The QIF Statistics data model

7.1 Design principles of QIF Statistics

The data model relies on the QIF shared library for the storage of nominal feature and characteristic information and on the QIF Results data model for the optional storage of actual feature and characteristic information. The elements of the QIF Statistics data model augment

the information contained in the QIF Plans and QIF Results data models for the purposes of statistical evaluations involving more than one measurement.

The QIF Statistics data model includes elements for statistical evaluations on a per-characteristic basis and for summary information over multiple characteristics. The directives defining the various statistical evaluations to be collected reside in a light-weight, mnemonic-based list. The association between a statistical quantity and its mnemonic is defined in the annotation describing each individual data element and is shown in Table 1 below.

7.2 QIF Statistics data sets

QIF Statistics naturally divides into two aspects: those elements of the data model that are used to define the requirements of a statistical study, and those elements that are used to define the results of a statistical study. The results of a statistical study can be used to alter measurement or production processes and activities, often in real time. The third aspect of QIF Statistics: contains information particular to the assignable causes and corrective actions related to events and thresholds encountered in the course of a statistical study.

At the highest level a QIF document containing QIF Statistics can contain any or all of the following sets of data:

- Statistical Study Plans (**StatisticalStudyPlans** *element*)
- Statistical Study Results (**StatisticalStudiesResults** *element*)
- Corrective Action Plans (**CorrectiveActionPlans** *element*)

QIF Statistics defines a variety of statistical study types. The criteria for determining the status (pass or fail) for each statistical study type can be defined as well as the statistical quantities particular to that study type.

7.2.1 Statistical study plans

Statistical Study Plans contain information that specifies the parameters of various quality study types. Each Statistical Study Plan can include the following types of information:

- Feature Item Ids
- Characteristic Item Ids
- Pre-Inspection Traceability
- Corrective Action Plan Ids

The following Statistical Study Plan types are supported:

- Bias Study Plan
- Capability Study Plan
- First Article Study Plan
- Gage R & R Study Plan
- Linearity Study Plan
- Process Difference Study Plan

- Product Study Plan
- Simple Study Plan
- Stability Study Plan

The statistical study plan data set types are:

- Bias Study Plan (**BiasStudyPlan** *element*) where the bias (expected measured value versus actual value) of a measurement system is determined.
- Capability Study Plan (**CapabilityStudyPlan** *element*) where a number of part samples are measured to establish the capability of a manufacturing process (e.g. Cp, Cpk, etc.).
- First Article Study Plan (**FirstArticleStudyPlan** *element*) where the number and severity of non-conforming characteristics determines product acceptance.
- Gage R&R Study Plan (**GageRandRStudyPlan** *element*) where a number of part samples are repeatedly measured by two or more appraisers to establish the repeatability and reproducibility of a measurement process.
- Linearity Study Plan (**LinearityStudyPlan** *element*) where an artifact or artifacts are measured to determine the linearity of a measurement system.
- Process Difference Study Plan (**ProcessDifferenceStudyPlan** *element*) where the same part is measured before and after a manufacturing process to determine any part distortion caused by that process.
- Production Study Plan (**ProductionStudyPlan** *element*) where samples are measured for statistical process control to ensure the ongoing stability or capability of a manufacturing process.
- Simple Study Plan (**SimpleStudyPlan** *element*) where multiple samples are measured for the purpose of averaging features for process adjustment or reverse engineering.
- Stability Study Plan (**StabilityStudyPlan** *element*) where the same part or artifact is measured over time to assess the stability of a measurement system.

More than one study plan of a given type may be instantiated in a single QIF document. Similarly, two or more study plans of different types may be instantiated in a single QIF document.

7.2.2 Statistical study results

Statistical Study Results contain information related to the output of various quality study types. Each Statistical Study Result can include the following types of information:

- Status
- Assignable Cause Ids
- Corrective Action Ids
- Characteristic Ids
- Traceability
- Characteristic Statistics
- Actual Ids (reference to measured characteristic)

The above plan data sets have corresponding results data sets:

- Bias Study Results (**BiasStudyResults** *element*) where the bias (expected measured value versus actual value) of a measurement system was determined.
- Capability Study Results (**CapabilityStudyResults** *element*) where a number of part samples were measured to establish the capability of a manufacturing process.
- First Article Study Results (**FirstArticleStudyResults** *element*) where the number and severity of non-conforming characteristics determined product acceptance.
- Gage R&R Study Results (**GageRandRStudyResults** *element*) where a number of part samples were repeatedly measured by two or more appraisers to establish the repeatability and reproducibility of a measurement process.
- Linearity Study Results (**LinearityStudyResults** *element*) where an artifact or artifacts were measured to determine the linearity of a measurement system.
- Process Difference Study Results (**ProcessDifferenceStudyResults** *element*) where the same part was measured before and after a manufacturing process to determine any part distortion caused by that process.
- Production Study Results (**ProductionStudyResults** *element*) where samples were measured for statistical process control to ensure the ongoing stability or capability of a manufacturing process.
- Simple Study Results (**SimpleStudyResults** *element*) where multiple samples were measured for the purpose of averaging features for process adjustment or reverse engineering.
- Stability Study Results (**StabilityStudyResults** *element*) where the same part or artifact was measured over time to assess the stability of a measurement system.

A QIF Statistics study result does not need a QIF-defined study plan but can optionally reference an associated QIF-defined study plan by its QIF id if it exists.

More than one study result of a given type may be instantiated in a single QIF document. Similarly, two or more study plans of different types may be instantiated in a single QIF document.

7.2.3 Corrective action plans

Corrective Action Plans contain information related to the establishment of lists of assignable causes of variation and associated corrective actions. Each Corrective Action Plan can include the following types of information:

- Assignable Causes
- Corrective Actions

A corrective action plan has a single data set type (**CorrectiveActionPlan** *element*). More than one corrective action plan may be defined in the **CorrectiveActionPlans** *element*.

A corrective action plan consists of a list of assignable causes and a list of corrective actions. The connection between the assignable causes and corrective actions is made by referencing the QIF id of the corrective action via the optional **CorrectiveActionIds** *element*.

More than one corrective action may be associated with a single assignable cause. Because the assignable cause and corrective action list are independent, the same corrective action may be associated with more than one assignable cause.

7.3 Statistical and summary values

7.3.1 Hierarchy of statistical information

A variety of statistical quantities can be derived from a set of data. The number and type of meaningful statistical quantities grows with the information available for a set of data.

- At the very lowest level a set of data of any type will define quantities like the total number of samples.
- If the data set is numerical, then quantities like the average value, the maximum and the minimum, or the standard deviation (and many others) become available.
- If a numerical data set has specification limits or tolerance values then even more quantities become available such as Cp and Cpk, the number out of tolerance, and the equipment variation relative to the tolerance zone.

7.3.2 Statistical values and their associated mnemonics

A statistical study plan will need to define the various statistical values that are to be collected, evaluated, and reported on a per characteristic basis. This is done via the **StatsValuesPerChar** *element* defined in the **StatisticalStudyBaseType**. This *element* is a simple list of mnemonics defining all statistical quantities available for collection and reporting. Unlike the containers for statistical evaluation quantities, the **StatsValuesPerChar** *element* does not differentiate based on the hierarchy of the preceding section. Therefore, the list of mnemonics may include references to statistical quantities that are meaningless or which may not be calculated given the size and type of the data set. If a statistical study plan requests a quantity which is unavailable then the associated results container *element* should not be included in the statistical study results.

The mnemonics used in the **StatsValuesPerChar** *element* are defined in the **StatsValueEnumType**.

The following table lists the various mnemonics and their associated statistical value elements. A checkmark in the **Num** column signifies that a data set must be numeric for the statistical value to make sense. A checkmark in the **Tol** column signifies that a data set must have a specification limit (either numerical or non-numerical) for the statistical value to make sense. The **Size** column shows the number of samples needed for simple statistical quantities to be calculated. The sample sizes for gage R&R studies are defined by best practices and not the minimum number necessary to calculate a value. The **Size** column entries for these rows are intentionally left blank.

Mnemonic	Statistical Value	Num	Tol	Size
TOTNUM	Total number of samples			≥1
EFFNUM	Effective number of samples			≥1
NUMSUB	Number of subgroups			≥2
AVG	Average	✓		≥2
DIFF	Difference between exactly two samples	✓		=2
RMS	Root mean square	✓		≥2
MAX	Maximum value	✓		≥2
MIN	Minimum value	✓		≥2
RANGE	Range	✓		≥2
AVGRNG	Average range over subgroups	✓		≥3
STDDEV	Standard deviation	✓		≥2
SKEW	Skew	✓		≥3
KURT	Kurtosis	✓		≥4
NORM	Normality	✓		≥3
PROVAR	Process variation (6σ)	✓		≥2
ESTSTDV	Estimate standard deviation from average range over subgroups	✓		≥2
UCL	Upper control limit			≥2
LCL	Lower control limit			≥2
UCLRNG	Upper control limit for subgroup range	✓		≥3
LCLRNG	Lower control limit for subgroup range	✓		≥3
NUMOOC	Number of samples out of control			≥2
NUMOOT	Number of samples out of tolerance		✓	≥1
NOOTHI	Number of samples above upper tolerance limit		✓	≥1
NOOTLO	Number of samples below lower tolerance limit		✓	≥1

CP	Cp	✓	✓	≥2
CPK	Cpk	✓	✓	≥2
PP	Pp	✓	✓	≥2
PPK	Ppk	✓	✓	≥2
CM	Cm (like Cp but using 8σ instead of 6σ)	✓	✓	≥2
CMK	Cmk (like Cpk but using 8σ instead of 6σ)	✓	✓	≥2
AV	Appraiser variation	✓		
REL_AV	Relative appraiser variation	✓	✓	
EV	Equipment variation	✓		
REL_EV	Relative equipment variation	✓	✓	
INTERACTION	Appraiser/equipment interaction	✓		
REL_INTERACTION	Relative appraiser/equipment interaction	✓	✓	
RANDR	Gage R&R	✓		
REL_RANDR	Relative gage R&R	✓	✓	
PV	Part variation	✓		
REL_PV	Relative part variation	✓	✓	
TV	Total variation	✓		
REL_TV	Relative total variation	✓	✓	
LNRTY	Linearity	✓		≥3
REL_LNRTY	Relative Linearity	✓	✓	≥3
BIAS	Bias	✓		≥1
REL_BIAS	Relative Bias	✓	✓	≥1
R_SQR	R ² goodness of fit	✓		≥3
SLOPE	Slope of best-fit line (m in Y=mX+b)	✓		≥2
INTCPT	Y-intercept of best fit line (b in Y=mX+b)	✓		≥2

UPRCONFLIM	Upper confidence limit	✓		≥ 2
LWRCONFLIM	Lower confidence limit	✓		≥ 2
TDIST	T-distribution value	✓		≥ 2

Table 1 – Statistical values and their associated mnemonics.

For example, the study plan below requests that the average value and the Cp and Cpk be evaluated for each characteristic defined in the **CharacteristicItemIds** element.

```
<CapabilityStudyPlan>
  <NumberOfSamples>6</NumberOfSamples>
  <CharacteristicItemIds N="2">
    <Id>7</Id>
    <Id>8</Id>
  </CharacteristicItemIds>
  <StatsValuesPerChar>AVG CP CPK</StatsValuesPerChar>
  ...
</CapabilityStudyPlan>
```

After measurement and statistical evaluation the statistical results might look like:

```
<CapabilityStudyResults>
  ...
  <DiameterCharacteristicStats>
    <ActualIds>
      <Ids N="6">
        <Id>42</Id>
        <Id>44</Id>
        <Id>46</Id>
        <Id>48</Id>
        <Id>50</Id>
        <Id>52</Id>
      </Ids>
    </ActualIds>
    <ValueStats>
      <Average>10.07</Average>
      <Cp>2.04</Cp>
      <Cpk>1.83</Cpk>
    </ValueStats>
  </DiameterCharacteristicStats>
  <DiameterCharacteristicStats>
    <ActualIds>
      <Ids N="6">
        <Id>43</Id>
        <Id>45</Id>
        <Id>47</Id>
        <Id>49</Id>
        <Id>51</Id>
        <Id>53</Id>
      </Ids>
    </ActualIds>
    <ValueStats>
```

```

    <Average>9.86</Average>
    <Cp>1.89</Cp>
    <Cpk>1.47</Cpk>
  </ValueStats>
</DiameterCharacteristicStats>
...
<CapabilityStudyResults>

```

7.3.3 Summary values and their associated mnemonics

In addition to collecting statistical values for individual characteristics, summary information for the whole statistical study can be collected. Examples include: the minimum Cpk over all characteristics, the maximum range over all characteristics, or the average gage R&R over all characteristics.

The summary values to be collected are defined by a list of **StatsValuesSummary** *elements* defined in the **StatisticalStudyBaseType**. This element has two sub-elements: the SummaryType element uses a mnemonic to define which statistical value type is to be summarized, and the SummaryStats element is a simple list of mnemonics defining all statistical summary quantities to be collected and reported. The available summary values are shown in the table below.

Mnemonic	Statistical Value
AVG	Average over all values
MAX	Maximum of all values
MIN	Minimum of all values
RANGE	Range over all values
STDDEV	Standard deviation of all values

Table 2 – Statistical summary values and their associated mnemonics.

For example, a study plan might request the average of average values and the minimum Cpk over all characteristics in the study:

```

<CapabilityStudyPlan>
  <NumberOfSamples>6</NumberOfSamples>
  <CharacteristicItemIds N="2">
    <Id>7</Id>
    <Id>8</Id>
  </CharacteristicItemIds>
  <StatsValuesPerChar>AVG CP CPK</StatsValuesPerChar>
  <SummaryStatsValues>
    <SummaryType>AVG</SummaryType>
    <SummaryStats>AVG</SummaryStats>
  </SummaryStatsValues>
</CapabilityStudyPlan>

```

```

</SummaryStatsValues>
<SummaryStatsValues>
  <SummaryType>CPK</SummaryType>
  <SummaryStats>MIN</SummaryStats>
</SummaryStatsValues>
...
<CapabilityStudyPlan>

```

After measurement and statistical evaluation the statistical results will contain additional information summarizing the statistical evaluations:

```

<CapabilityStudyResults>
...
  <DiameterCharacteristicStats>
    <ActualIds>
      <Ids N="6">
        <Id>42</Id>
        <Id>44</Id>
        <Id>46</Id>
        <Id>48</Id>
        <Id>50</Id>
        <Id>52</Id>
      </Ids>
    </ActualIds>
    <ValueStats>
      <Average>10.07</Average>
      <Cp>2.04</Cp>
      <Cpk>1.83</Cpk>
    </ValueStats>
  </DiameterCharacteristicStats>
  <DiameterCharacteristicStats>
    <ActualIds>
      <Ids N="6">
        <Id>43</Id>
        <Id>45</Id>
        <Id>47</Id>
        <Id>49</Id>
        <Id>51</Id>
        <Id>53</Id>
      </Ids>
    </ActualIds>
    <ValueStats>
      <Average>9.86</Average>
      <Cp>1.89</Cp>
      <Cpk>1.47</Cpk>
    </ValueStats>
  </DiameterCharacteristicStats>
  <LinearStatsSummary>
    <SummaryType>AVG</SummaryType>
    <Average>9.965</Average>
  </LinearStatsSummary>
  <StatsSummary>
    <SummaryType>CPK</SummaryType>
    <Minimum>1.47</Minimum>
  </StatsSummary>

```


...
<CapabilityStudyResults>

Statistical values may have the same units as the set of values from which they are calculated (average, minimum, standard deviation, etc.) or they may be unit-less (Cp, Cpk, etc.). Statistical values with units can only be summarized over characteristics that share the same units. It is reasonable to average the standard deviations of a set of linear dimensions but not of a mixed set of linear and angular dimensions. Therefore there are separate statistical summary elements for each unit type: **LinearStatsSummary**, **AngularStatsSummary**, etc. Unit-less statistical values can be summarized over characteristics with differing units. There is a single unit-less statistical summary element: **StatsSummary**.

7.4 Statistical study criteria

The pass/fail criteria of a statistical study are defined as various criterion types. There is a criterion type for each type of units and the CriterionDecimalType which is unit-less and from which all other types derive.

A pass/fail criterion for a statistical value has three basic components:

- A limit value, above or below which a failure condition exists
- An optional number of allowed exceptions defining the number or fraction of characteristics which may have statistical values above or below the limit without causing a failure condition
- An optional refinement to the above number defining an extreme limit, different from the limit value, above or below which no characteristic statistical value is allowed.

Whether the limit and extreme limit are upper or lower bounds is taken in the context of the statistical value type and is explicitly stated in the criterion element's annotation.

Here are several examples of pass/fail criteria for the Cpk value (for Cpk the limit and extreme limit are lower bounds).

An example where any characteristic in a capability study with a Cpk value below the criterion limit of 1.66 will cause a failure condition:

```
<CapabilityStudyPlan>
...
  <CpkThreshold>
    <Limit>1.66</Limit>
  </CpkThreshold>
...
</CapabilityStudyPlan>
```

An example where 95% of the characteristics must achieve a Cpk value above 1.66, or in other words where 5% of the characteristics are allowed to have a Cpk value below the limit of 1.66 by using the optional **NumberAllowedExceptions** *element*:

```
<CapabilityStudyPlan>
...
```

```

<CpkThreshold>
  <Limit>1.66</Limit>
  <NumberAllowedExceptions>
    <Fraction>0.05</Fraction>
  </NumberAllowedExceptions>
</CpkThreshold>
...
<CapabilityStudyPlan>

```

In the above example there is no lower limit to the Cpk value of the 5% of characteristics allowed to have a Cpk value below 1.66. To enforce an absolute lower limit of 1.33, the **ExtremeLimit** *element* is used:

```

<CapabilityStudyPlan>
...
<CpkThreshold>
  <Limit>1.66</Limit>
  <NumberAllowedExceptions>
    <Fraction>0.05</Fraction>
  </NumberAllowedExceptions>
  <ExtremeLimit>1.33</ExtremeLimit>
</CpkThreshold>
...
<CapabilityStudyPlan>

```

In the above example no Cpk values may be below 1.33 and up to 5% of characteristics may have values between 1.33 and 1.66, and the remainder of Cpk values must be 1.66 or greater.

7.5 Data groups and subgroups

Statistical evaluations are done on a set of data. Some statistical calculations require the data set to be split into a number of subgroups.

In a statistical plan, the total number of samples to be included is defined by the **NumberOfSamples** *element*. If these samples are to be grouped then the optional **SubgroupSize** *element* is to be used. The number of samples must be an even multiple of the subgroup size.

For example, a capability study requiring 6 samples over 2 subgroups would require a subgroup size of 3:

```

<CapabilityStudyPlan>
  <NumberOfSamples>6</NumberOfSamples>
  <SubgroupSize>3</SubgroupSize>
  <CharacteristicItemIds N="2">
    <Id>7</Id>
    <Id>8</Id>
  </CharacteristicItemIds>
...
<CapabilityStudyPlan>

```

The actual characteristics included in the evaluation of a statistical value are stored as a list of ids referencing the characteristic actuals stored in the **MeasurementsResults** *element*. The optional **ActualIds** *element* is used when all actuals are in one set and the optional **Subgroup** *element* is used, one instance for each subgroup, when the actuals are grouped into subgroups.

The results of the capability study with 6 samples with a subgroup size of 3 might look like:

```
<CapabilityStudyResults>
...
  <DiameterCharacteristicStats>
    <Subgroup id="20">
      <ActualIds>
        <Ids N="3">
          <Id>42</Id>
          <Id>44</Id>
          <Id>46</Id>
        </Ids>
      </ActualIds>
    </Subgroup>
    <Subgroup id="21">
      <ActualIds>
        <Ids N="3">
          <Id>48</Id>
          <Id>50</Id>
          <Id>52</Id>
        </Ids>
      </ActualIds>
    </Subgroup>
  ...
</CapabilityStudyResults>
```

Each actual subgroup has a unique QIF id so that it may be referenced in the same manner as a characteristic actual.

7.5.1 Exclusion

Sometimes a measurement can be excluded because its value is known to be meaningless or suspect. There may have been an equipment error causing an obviously erroneous value like a 10 mm hole measured as 100 mm. The feature may have been reworked so that it is no longer a member of the raw production set.

To exclude a characteristic from a statistical calculation the optional **Exclusion** *sub-element* of the **ActualIds** *element*. The id of the characteristic appears normally in the **Ids** *sub-element* list but is then marked as excluded by including the same id in the **Exclusion** *sub-element* with a reason for the exclusion.

For example, a single measurement is excluded from a single data set evaluation because it was reworked:

```
<CapabilityStudyResults>
...
```

```

<DiameterCharacteristicStats>
  <ActualIds>
    <Ids N="6">
      <Id>42</Id>
      <Id>44</Id>
      <Id>46</Id>
      <Id>48</Id>
      <Id>50</Id>
      <Id>52</Id>
    </Ids>
    <Exclusion>
      <Id>44</Id>
      <Reason>
        <ExclusionReasonEnum>REWORK</ExclusionReasonEnum>
      </Reason>
    </Exclusion>
  </ActualIds>
...
</DiameterCharacteristicStats>
...
<CapabilityStudyResults>

```

Similarly, measurements can be excluded from subgroups using the **Exclusion** *element*. For example, two measurements are excluded from two different subgroups for different reasons:

```

<CapabilityStudyResults>
...
  <DiameterCharacteristicStats>
    <Subgroup id="20">
      <ActualIds>
        <Ids N="3">
          <Id>42</Id>
          <Id>44</Id>
          <Id>46</Id>
        </Ids>
        <Exclusion>
          <Id>44</Id>
          <Reason>
            <ExclusionReasonEnum>REWORK</ExclusionReasonEnum>
          </Reason>
        </Exclusion>
      </ActualIds>
    </Subgroup>
    <Subgroup id="21">
      <ActualIds>
        <Ids N="3">
          <Id>48</Id>
          <Id>50</Id>
          <Id>52</Id>
        </Ids>
        <Exclusion>
          <Id>52</Id>
          <Reason>
            <OtherExclusionReason>Grit on caliper</OtherExclusionReason>
          </Reason>
        </Exclusion>
      </ActualIds>
    </Subgroup>
  </DiameterCharacteristicStats>

```

```

    </Exclusion>
    </ActualIds>
  </Subgroup>
...
</CapabilityStudyResults>

```

7.5.2 Subgroup statistics

Some statistical values can be accumulated on a per-sub-group basis. Like study statistical values and study summary values these values are identified by a mnemonic.

Mnemonic	Subgroup Statistical Value
TOTNUM	Total number of samples
EFFNUM	Effective number of samples
AVG	Average over all subgroup values
DIFF	Difference between exactly two subgroup values
MAX	Maximum of all subgroup values
MIN	Minimum of all subgroup values
RANGE	Range over all subgroup values
NUMOOT	Number of out-of-tolerance subgroup samples
NOOTHI	Number of subgroup samples above upper tolerance limit
NOOTLO	Number of subgroup samples below lower tolerance limit

Table 3 – Subgroup statistical values and their associated mnemonics.

For a statistical plan the statistical values to be evaluated for each subgroup are listed in the **StatsValuesPerSubgroup** *element*.

For example, the study plan below requests that the average value and the Cp and Cpk be evaluated for each characteristic defined in the **CharacteristicItemIds** *element* and that the average and range be evaluated for each subgroup of size 3:

```

<CapabilityStudyPlan>
  <NumberOfSamples>6</NumberOfSamples>
  <SubgroupSize>3</SubgroupSize>
  <CharacteristicItemIds N="2">
    <Id>7</Id>
    <Id>8</Id>
  </CharacteristicItemIds>
  <StatsValuesPerChar>AVG CP CPK</StatsValuesPerChar>
  <StatsValuesPerSubgroup>AVG RANGE</StatsValuesPerSubgroup>

```

```
...
<CapabilityStudyPlan>
```

After measurement and statistical evaluation the statistical results might look like:

```
<CapabilityStudyResults>
...
  <DiameterCharacteristicStats>
    <Subgroup id="20">
      <ActualIds>
        <Ids N="3">
          <Id>42</Id>
          <Id>44</Id>
          <Id>46</Id>
        </Ids>
      </ActualIds>
    </Subgroup>
    <Subgroup id="21">
      <ActualIds>
        <Ids N="3">
          <Id>48</Id>
          <Id>50</Id>
          <Id>52</Id>
        </Ids>
      </ActualIds>
    </Subgroup>
    <ValueStats>
      <Average>10.07</Average>
      <SubgroupAverage subgroupId="20">10.04</SubgroupAverage>
      <SubgroupAverage subgroupId="21">10.1</SubgroupAverage>
      <SubgroupRange subgroupId="20">0.02</SubgroupRange>
      <SubgroupRange subgroupId="21">0.03</SubgroupRange>
      <Cp>2.04</Cp>
      <Cpk>1.83</Cpk>
    </ValueStats>
  </DiameterCharacteristicStats>
  <DiameterCharacteristicStats>
    <Subgroup id="22">
      <ActualIds>
        <Ids N="3">
          <Id>43</Id>
          <Id>45</Id>
          <Id>47</Id>
        </Ids>
      </ActualIds>
    </Subgroup>
    <Subgroup id="23">
      <ActualIds>
        <Ids N="3">
          <Id>49</Id>
```

```

    <Id>51</Id>
    <Id>53</Id>
  </Ids>
</ActualIds>
</Subgroup>
<ValueStats>
  <Average>9.86</Average>
  <SubgroupAverage subgroupId="22">9.81</SubgroupAverage>
  <SubgroupAverage subgroupId="23">9.91</SubgroupAverage>
  <SubgroupRange subgroupId="22">0.04</SubgroupRange>
  <SubgroupRange subgroupId="23">0.07</SubgroupRange>
  <Cp>1.89</Cp>
  <Cpk>1.47</Cpk>
</ValueStats>
</DiameterCharacteristicStats>
...
<CapabilityStudyResults>

```

This example illustrates how the subgroup id is used to associate values with individual subgroups.

7.6 High level structure of the QIF Statistics schema

The QIF Statistics schema model includes the information items from the QIFStatistics.xsd schema file and ten 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 Statistics.xsd schema file.

The **Statistics** *element*, is the root of the QIF Statistics model, as shown in Figure 3.

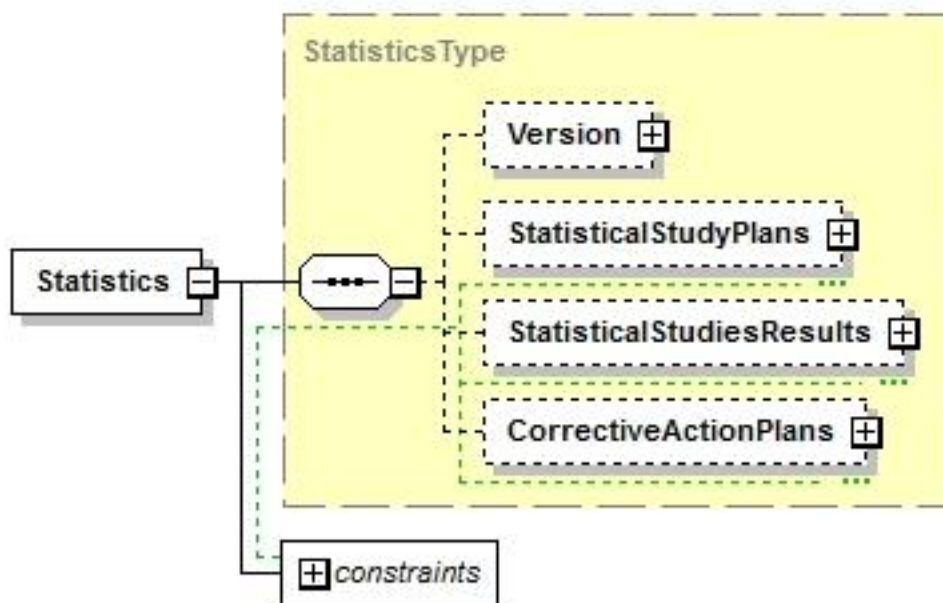


Figure 3 – High level view of QIF Statistics highest level elements.

The optional **StatisticalStudyPlans** *element* contains one or more statistical study plans *elements* of the types listed in section 7.2.1 using the substitution group mechanism for the **StatisticalStudyPlan** *element*.

Similarly, the optional **StatisticalStudyResults** *element* contains one or more statistical study results *elements* of the types listed in section 7.2.2 using the substitution group mechanism for the **StatisticalStudyResult** *element*.

By contrast, the optional **CorrectiveActionPlans** *element* is a simple list of one or more **CorrectiveActionPlan** *elements* all of the same type.

7.7 Tracking information through the product lifecycle

QIF is constructed to enable a seamless flow of information from upstream applications to downstream applications and to enable tracking information through a product's lifecycle.

7.7.1 UUIDs and QPIDs

The primary mechanism used by QIF for identifying the same information in different places is the use of a persistent universally unique identifier (UUID), as standardized in ISO/IEC 9834-8. UUIDs have that name because the chances of generating two that are the same anywhere in our part of the universe are vanishingly small. Computer libraries for generating UUIDs conforming to the standard are widely available in many computer languages.

Using UUIDs, non-communicating systems can identify information uniquely. That information can be combined later into a single application or database without needing to resolve identifier conflicts.

As a number, a UUID is a 128 bit unsigned integer. As a text string in an instance file, a UUID is represented by 32 hexadecimal digits displayed in five groups separated by hyphens in the form 8-4-4-4-12 for a total of 36 characters (32 alphanumeric characters and four hyphens). An example of a UUID string is 550e8400-e29b-0518-a716-445664449c0b. The letters a through e are hexadecimal digits representing the numbers 10 through 15. Either lower case letters or upper case letters may be used in QIF for those digits.

The null UUID, which is equivalent in practice to no UUID since it is not unique, is one that has all 128 bits set to zero. In text form, that is written 00000000-0000-0000-0000-000000000000.

UUIDS used in QIF are called QPIDs (pronounced “cupids”), a short form of QIF Persistent Identifier. Where a QPID is used to identify a file or *element*, its data type is **QPIDType**, and it must be created by a well known UUID generator. Where a QPID is used to reference a file or *element*, its data type is **QPIDReferenceType**, and it must match an existing QPID.

7.7.2 QIF data flow

Version 2.0 of QIF has six application areas. A **QIFDocument** instance file can contain any one of the applications or any combination of them. The most natural combinations in a single instance file are those that contain a sequence along the workflow shown in Figure 2 – QIF Statistics workflow, for example a **Product** *element* from the Define Product activity, a **QIFPlan**

element from the Define Measurement Process activity, and a **MeasurementsResults** *element* from the Execute Measurement Process activity. Those *elements* would reference information common to all three of them contained elsewhere in the **QIFDocument** such as:

- file units
- datum definitions and datum reference frames
- measurement resources
- feature definitions, nominals, and items
- characteristic definitions, nominals, and items.

At the time a downstream process is started (measurements are starting to be taken, for example), a **QIFDocument** instance file containing the output of the upstream process is very likely to exist (a **QIFDocument** with **Product** and **MeasurementPlan** *elements*, for example); call it the QIFPlan file. When measurements are taken and it is desired to put the data in a **QIFDocument** instance file, the data must not simply be added to the QIFPlan file. A new **QIFDocument** instance file (call it the QIFResults file) should be created containing a **MeasurementsResults** *element*. Most *elements* of the **QIFDocument** in the QIFPlan file may be copied without change into the **QIFDocument** in the QIFResults file, but any **Version**, or **Header** *element* must be new.

The way in which local identifiers (ids) are handled when a new downstream file is created from an old upstream file is up to the application building the new file. The local identifiers from the upstream process might be preserved or they might be changed. In any event, no system processing QIF instance files should rely on local identifiers remaining the same between files.

7.7.3 Using QPIDs in QIF

To provide a method of uniquely identifying QIFDocument instance files and objects in them, QPIDs may optionally be assigned as shown in Figure 4. To avoid confusing QPIDs with ids, QPIDs are always given as *elements*, and ids are always given as *attributes*. The figure shows the *element* name. The value of each of the *elements* listed is of **QPidType**. Where the *element* is in a base type, all of the derived types (which is very many for features and characteristics) will also have the *element*.

QIFDocument.xsd

ThisInstanceQPid in the **Version** *element* of the **QIFDocumentType**

QIFMeasurementResources.xsd

ThisInstanceQPid in the **Version** *element* of the **MeasurementResourcesType**

QIFPlan.xsd

ThisInstanceQPid in the **Version** *element* of the **MeasurementPlanType**

QIFProduct.xsd

QPid in **ProductDefinitionBaseType**

QPid in **ComponentType**

ThisInstanceQPid in the **Version** *element* of the **File** *element* of the **Header** *element* of the **ProductType**

QIFResults.xsd

ThisResultsInstanceQPid in **MeasurementResultsType**

ThisInstanceQPid in the **Version** *element* of the **MeasurementsResultsType**

QIFRules.xsd

ThisInstanceQPid in the **Version** *element* of the **QIFRulesType**

QIFStatistics.xsd

ThisStatisticalStudyPlanInstanceQPid in **StatisticalStudyPlanBaseType**

ThisStatisticalStudyResultsInstanceQPid in **StatisticalStudyResultsBaseType**

ThisInstanceQPid in the **Version** *element* of the **StatisticsType**

Features.xsd

QPid in **FeatureItemBaseType**

Characteristics.xsd

QPid in **CharacteristicItemBaseType**

Figure 4 – QPidType Elements

All uses of QPIDs are optional. Using QPIDs, however, is the only reliable method of connecting files across the workflow shown in Figure 2 – QIF Statistics workflow. It is strongly recommended that QPIDs be used. A *key/keyref* pair in QIFDocument.xsd checks that all instances of **QPidType** in an instance file have the correct format and are unique within the file.

When a downstream QIF instance file is created from an upstream QIF instance file, although the **ThisInstanceQPid** must change, if *elements* such as **characteristics**, **features**, and **product** are copied into the downstream file, the QPIDs should be copied as is. If any part of a file section identified by a QPid (other than local ids) is changed after copying, the QPid should be changed, too. A changed local id should result in a changed QPid only if the local id change results in a change in the structure obtained when all local id references have been resolved.

QPIDs uniquely identify QIF instance files and objects in the files. In addition, QPIDs may be used to connect sections of QIF instance files (in different files or in the same file) as shown in Figure 5. Where QPIDs are used in QIFPlan.xsd they indicate the rules that were used in developing the plan and/or the rules to be used in refining the plan. Where QPIDs are used in IntermediatesPMI.xsd, they serve to identify different versions of QIF instance files. Where QPIDs are used in Traceability.xsd they serve to identify the plan that was used for **MeasurementResults** and for **Statistics**.

QIFPlan.xsd
RulesToUseQPid in <i>MeasurementPlanType</i>
RulesUsedQPid in <i>MeasurementPlanType</i>
QIFStatistics.xsd
ResultsQPid in <i>StatisticalStudyResultsBaseType</i>
Traceability.xsd
ReferencedQIFPlanInstance in <i>InspectionTraceabilityType</i>
ReferencedQIFPlanInstance in <i>PreInspectionTraceabilityType</i>

Figure 5 – QPidReferenceType Elements

7.8 Referencing measurement results

A QIF document containing QIF Statistics study results can reference the measurement results used in statistical calculations at two levels.

At a very low level, actual results can be referenced by characteristic and feature summaries as seen in examples above. The **ActualsIds** *element* found in the **CharacteristicStatsEvalBaseType** and the **ActualSubgroupType** can reference individual characteristic actual instances in the QIF document via their QIF id. Similarly, the **ActualsIds** *element* found in the **AverageFeatureType** can reference individual feature actual instances in the QIF document via their QIF id.

At a higher level, whole measurement results can be referenced by any of three mechanisms:

1. Each **ResultsId** *element* of **StatisticalStudyResultsBaseType** can reference a measurement results contained within the QIF document via the QIF id of each **MeasurementResults** *element*.
2. Each **ResultsQPid** *element* of **StatisticalStudyResultsBaseType** can reference a measurement results contained in another QIF document or documents via the QPid of the measurement results found in the **ThisResultsInstanceQPid** *element* in the other QIF document. The QPid of each measurement results is referenced rather than the QPid of the QIF document itself because a QIF document can contain more than one measurement results.
3. Each **ResultsFile** *element* of **StatisticalStudyResultsBaseType** can reference a measurement results contained within an electronic document of any type via its URI (Uniform Resource Identifier).

8 QIF Statistics samples

8.1 Typical quality data examples

The QIF Statistics specification is designed to carry all types of quality information. The schema supports Variable measurement data, Attribute measurement data, Binary measurement data and various combinations of these.

This guideline details typical examples for implementing QIF Statistics XML files that carry these different quality data types.

All examples use the following sample part (i.e. widget), shown in Figure 6, as a basis for inspection.

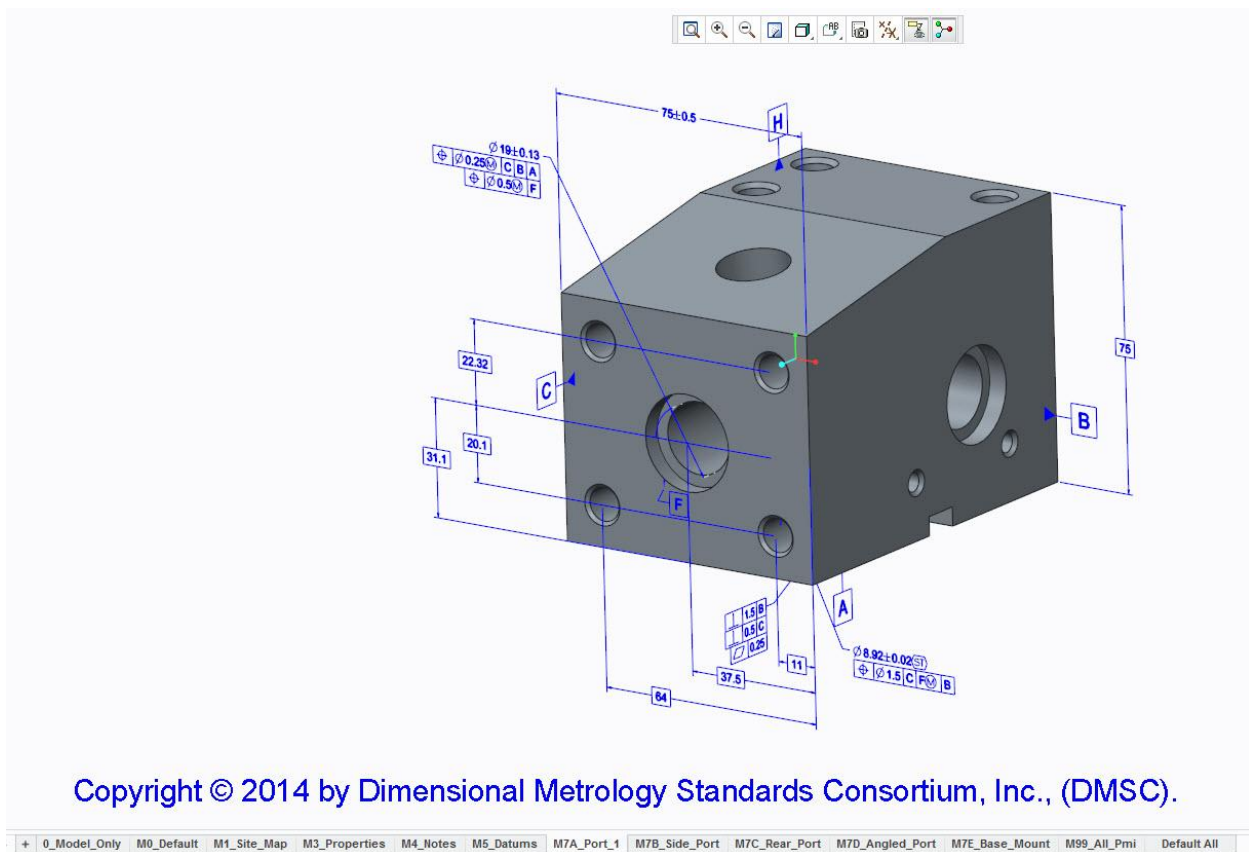


Figure 6 – Sample QIF widget

This sample part has defined variable characteristic data (Diameter, Flatness, etc.), and may also be inspected for Attribute data (Pass/Fail, Scratches, Dents, Burrs, etc.) The next section describes examples of how this inspection data can be carried with QIF Documents.

8.1.1 Variable data example

Variable data is defined as quantitative data where measurements are used for analysis. Diameter and Flatness are examples of variable characteristics. As an example, XBar and R, XBar and s, and Individual and Moving Range Control charts are used for variables data.

The following QIF document structure is an example that contains two QIF Results blocks for a variable inspection of a diameter:

```
<QIFDocument xmlns="http://qifstandards.org/xsd/qif2" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" versionQIF="2.0" xsi:schemaLocation="http://qifstandards.org/xsd/qif2
../Applications/QIFDocument.xsd">
```

```
<Product>
  <PartSet N="1">
    <Part id="1">
      <Name>QIF Widget</Name>
    </Part>
  </PartSet>
</Product>
<Characteristics>
  <FormalStandard>
    <FormalStandardEnum>ASME-Y14.5-2009</FormalStandardEnum>
  </FormalStandard>
  <CharacteristicDefinitions>
    <DiameterCharacteristicDefinition id="1">
      <Name>Diameter #1</Name>
      <Tolerance>
        <MaxValue>2.200</MaxValue>
        <MinValue>1.800</MinValue>
        <DefinedAsLimit>true</DefinedAsLimit>
      </Tolerance>
    </DiameterCharacteristicDefinition>
  </CharacteristicDefinitions>
  <CharacteristicNominals>
    <DiameterCharacteristicNominal id="2">
      <CharacteristicDefinitionId>1</CharacteristicDefinitionId>
      <TargetValue>2.000</TargetValue>
    </DiameterCharacteristicNominal>
  </CharacteristicNominals>
  <CharacteristicItems>
    <DiameterCharacteristicItem id="3">
      <Name>Diameter #1</Name>
      <CharacteristicNominalId>2</CharacteristicNominalId>
    </DiameterCharacteristicItem>
  </CharacteristicItems>
</Characteristics>
<MeasurementsResults>
  <MeasurementResults id="1">
    <MeasuredCharacteristics>
      <CharacteristicActuals>
        <DiameterCharacteristicActual id="1">
          <Status>
            <CharacteristicStatusEnum>PASS</CharacteristicStatusEnum>
          </Status>
        </DiameterCharacteristicActual>
      </CharacteristicActuals>
    </MeasuredCharacteristics>
  </MeasurementResults>
</MeasurementsResults>
```

```

    <Value>1.987</Value>
  </DiameterCharacteristicActual>
</CharacteristicActuals>
</MeasuredCharacteristics>
<InspectionStatus>
  <InspectionStatusEnum>PASS</InspectionStatusEnum>
</InspectionStatus>
</MeasurementResults>
<MeasurementResults id="2">
  <MeasuredCharacteristics>
    <CharacteristicActuals>
      <DiameterCharacteristicActual id="2">
        <Status>
          <CharacteristicStatusEnum>PASS</CharacteristicStatusEnum>
        </Status>
        <CharacteristicItemId>3</CharacteristicItemId>
        <Value>2.123</Value>
      </DiameterCharacteristicActual>
    </CharacteristicActuals>
  </MeasuredCharacteristics>
  <InspectionStatus>
    <InspectionStatusEnum>PASS</InspectionStatusEnum>
  </InspectionStatus>
</MeasurementResults>
</MeasurementsResults>
<Statistics>
  <StatisticalStudiesResults>
    <SimpleStudyResults id="1">
      <Status>
        <StatsEvalStatusEnum>INFORMATIONAL</StatsEvalStatusEnum>
      </Status>
      <CharacteristicsStats>
        <DiameterCharacteristicStats>
          <ActualIds>
            <Ids N="2">
              <Id>1</Id>
              <Id>2</Id>
            </Ids>
          </ActualIds>
          <Status>
            <StatsEvalStatusEnum>INFORMATIONAL</StatsEvalStatusEnum>
          </Status>
          <ValueStats>
            <TotalNumber>2</TotalNumber>
            <NumberSubgroups>2</NumberSubgroups>
            <Maximum>2.123</Maximum>
            <Minimum>1.987</Minimum>
            <Range>0.002</Range>
            <NumberOutOfTolerance>0</NumberOutOfTolerance>
            <Cpk>0.553</Cpk>
            <Ppk>0.401</Ppk>
          </ValueStats>
        </DiameterCharacteristicStats>
      </CharacteristicsStats>
      <NumberOfSamples>2</NumberOfSamples>
    </SimpleStudyResults>
  </StatisticalStudiesResults>
</Statistics>

```

```

</StatisticalStudiesResults>
</Statistics>
</QIFDocument>

```

The structure above can be logically described as follows:

1. The Part Id is identified in the **Product** *element*.
2. The characteristic name (Diameter) and tolerance is defined in the **CharacteristicDefinitions** *element*.
3. The characteristic target value is defined in the **CharacteristicNominals** *element* with a reference to the characteristic definition.
4. The characteristic name is further expressed in the **DiameterCharacteristicItem** *element* with a reference to the characteristic nominal
5. The actual measurement values are identified in the **MeasurementResults** section with reference to the characteristic Items.
6. The **SimpleStudyResults** section defines the study type and references the actual Ids from the measurements section and further describes the detailed statistical values.

8.1.2 Attribute data example

Attribute data is defined as qualitative data that can be counted for recording and analysis. Examples include characteristics such as the presence of a required label, the installation of all required fasteners, and the absence of errors on an expense report. Other examples are characteristics that are inherently measurable (i.e. could be treated as variables data), but where the results were recorded in a simple yes/no fashion, such as the acceptability of a shaft diameter when checked on a go/no-go gage, or the presence of any engineering changes on a drawing. Attributes data are usually gathered in the form of nonconforming units or of nonconformities; they are analyzed by p, np, c and u control charts.

The following QIF document structure is an example that contains three QIF Results blocks for attribute inspection the QIF Widget (e.g. scratches):

```

<QIFDocument xmlns="http://qifstandards.org/xsd/qif2" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance" versionQIF="2.0" xsi:schemaLocation= "http://qifstandards.org/xsd/qif2
../Applications/QIFDocument.xsd">
  <Product>
    <PartSet N="1">
      <Part id="2">
        <Name>QIF Widget</Name>
      </Part>
    </PartSet>
  </Product>
  <Characteristics>
    <FormalStandard>
      <FormalStandardEnum>COMPANY</FormalStandardEnum>
    </FormalStandard>
    <CharacteristicDefinitions>
      <UserDefinedAttributeCharacteristicDefinition id="1">
        <Name>Scratched</Name>
      </UserDefinedAttributeCharacteristicDefinition>
    </CharacteristicDefinitions>

```

```

<CharacteristicNominals>
  <UserDefinedAttributeCharacteristicNominal id="2">
    <CharacteristicDefinitionId>1</CharacteristicDefinitionId>
    <PassValues>
      <StringValue>0</StringValue>
    </PassValues>
    <FailValues>
      <StringValue>1 or more</StringValue>
    </FailValues>
  </UserDefinedAttributeCharacteristicNominal>
</CharacteristicNominals>
<CharacteristicItems>
  <UserDefinedAttributeCharacteristicItem id="3">
    <Name>Scratched</Name>
    <CharacteristicNominalId>2</CharacteristicNominalId>
  </UserDefinedAttributeCharacteristicItem>
</CharacteristicItems>
</Characteristics>
<MeasurementsResults>
  <MeasurementResults id="1">
    <MeasuredCharacteristics>
      <CharacteristicActuals>
        <UserDefinedAttributeCharacteristicActual id="100">
          <Status>
            <CharacteristicStatusEnum>BASIC</CharacteristicStatusEnum>
          </Status>
          <CharacteristicItemId>3</CharacteristicItemId>
          <Value>0</Value>
        </UserDefinedAttributeCharacteristicActual>
      </CharacteristicActuals>
    </MeasuredCharacteristics>
    <InspectionStatus>
      <InspectionStatusEnum>PASS</InspectionStatusEnum>
    </InspectionStatus>
  </MeasurementResults>
  <MeasurementResults id="2">
    <MeasuredCharacteristics>
      <CharacteristicActuals>
        <UserDefinedAttributeCharacteristicActual id="101">
          <Status>
            <CharacteristicStatusEnum>PASS</CharacteristicStatusEnum>
          </Status>
          <CharacteristicItemId>3</CharacteristicItemId>
          <Value>0</Value>
        </UserDefinedAttributeCharacteristicActual>
      </CharacteristicActuals>
    </MeasuredCharacteristics>
    <InspectionStatus>
      <InspectionStatusEnum>PASS</InspectionStatusEnum>
    </InspectionStatus>
  </MeasurementResults>
  <MeasurementResults id="3">
    <MeasuredCharacteristics>
      <CharacteristicActuals>
        <UserDefinedAttributeCharacteristicActual id="102">
          <Status>

```



```

        <CharacteristicStatusEnum>FAIL</CharacteristicStatusEnum>
    </Status>
    <CharacteristicItemId>3</CharacteristicItemId>
    <Value>1</Value>
</UserDefinedAttributeCharacteristicActual>
</CharacteristicActuals>
</MeasuredCharacteristics>
<InspectionStatus>
    <InspectionStatusEnum>FAIL</InspectionStatusEnum>
</InspectionStatus>
</MeasurementResults>
</MeasurementsResults>
<Statistics>
    <StatisticalStudiesResults>
        <SimpleStudyResults id="7">
            <Status>
                <StatsEvalStatusEnum>INFORMATIONAL</StatsEvalStatusEnum>
            </Status>
            <CharacteristicsStats>
                <UserDefinedAttributeCharacteristicStats>
                    <ActualIds>
                        <Ids N="3">
                            <Id>100</Id>
                            <Id>101</Id>
                            <Id>102</Id>
                        </Ids>
                    </ActualIds>
                    <Status>
                        <StatsEvalStatusEnum>INFORMATIONAL</StatsEvalStatusEnum>
                    </Status>
                    <AttributeStats>
                        <TotalNumber>3</TotalNumber>
                        <FailurePercentage>33</FailurePercentage>
                    </AttributeStats>
                </UserDefinedAttributeCharacteristicStats>
            </CharacteristicsStats>
            <NumberOfSamples>3</NumberOfSamples>
            <SubGroupSize>1</SubGroupSize>
        </SimpleStudyResults>
    </StatisticalStudiesResults>
</Statistics>
</QIFDocument>

```

The structure above can be logically described as follows:

1. The **Part** id is identified in the **Product** *element*.
2. The characteristic name (Scratched) is defined in the **CharacteristicDefinitions** *element*.
3. The characteristic pass/fail condition is defined in the **CharacteristicNominals** *element* with a reference to the characteristic definition.
4. The characteristic name is further expressed in the **UserDefinedAttributeCharacteristicItem** *element* with a reference to the characteristic nominal.
5. The actual measurement values are identified in the **MeasurementResults** section with reference to the characteristic items.

6. The **SimpleStudyResults** section defines the study type and references the actual Ids from the measurements section and further describes the detailed statistical values.

8.2 Typical quality study type examples

In addition to these different quality measurement data types, the specification supports specific Quality Study types. Examples include Capability studies, SPC studies, Gage Repeatability and Reproducibility studies, Gage Linearity studies, Gage Bias studies, etc.

This section describes in detail typical examples for implementation of QIF Statistics XML files that carry information from these different quality study types.

8.2.1 First article inspection study example

A First Article Inspection Report (FAIR) is a formal method of providing a measurement report for a given manufacturing process. The method consists of measuring characteristics of an initial sample item against given specification, for example a drawing. Despite the name, the inspected article may not necessarily be the 'first' produced. First article inspection is typically called for in a contract between the producer and buyer of some manufactured article, to ensure that the production process reliably produces what is intended and is widely used in the aerospace industry.

The following QIF Document structure represents a sample first article inspection for two diameters on a widget.

```
<QIFDocument xmlns="http://qifstandards.org/xsd/qif2" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance" versionQIF="2.0" xsi:schemaLocation="http://qifstandards.org/xsd/qif2
../Applications/QIFDocument.xsd">
  <Product>
    <PartSet N="1">
      <Part id="1">
        <Name>Widget</Name>
        <ModelNumber>9876543</ModelNumber>
        <DefinitionExternal id="1">
          <PrintedDrawing id="1">
            <Name>Widget Drawing</Name>
            <Version>2</Version>
            <Description>Widget Drawing rev02</Description>
            <DrawingNumber>12345</DrawingNumber>
            <Location>Engineering</Location>
          </PrintedDrawing>
        </DefinitionExternal>
      </Part>
    </PartSet>
  </Product>
  <Characteristics>
    <FormalStandard>
      <FormalStandardEnum>ASME-Y14.5-2009</FormalStandardEnum>
    </FormalStandard>
    <CharacteristicDefinitions>
      <DiameterCharacteristicDefinition id="1">
        <Name>Diameter #1</Name>
        <Tolerance>
```

```

    <MaxValue>2.200</MaxValue>
    <MinValue>1.800</MinValue>
    <DefinedAsLimit>true</DefinedAsLimit>
  </Tolerance>
</DiameterCharacteristicDefinition>
<DiameterCharacteristicDefinition id="2">
  <Name>Diameter #2</Name>
  <Tolerance>
    <MaxValue>3.200</MaxValue>
    <MinValue>2.800</MinValue>
    <DefinedAsLimit>true</DefinedAsLimit>
  </Tolerance>
</DiameterCharacteristicDefinition>
</CharacteristicDefinitions>
<CharacteristicNominals>
  <DiameterCharacteristicNominal id="3">
    <CharacteristicDefinitionId>1</CharacteristicDefinitionId>
    <TargetValue>2.000</TargetValue>
  </DiameterCharacteristicNominal>
  <DiameterCharacteristicNominal id="4">
    <CharacteristicDefinitionId>2</CharacteristicDefinitionId>
    <TargetValue>3.000</TargetValue>
  </DiameterCharacteristicNominal>
</CharacteristicNominals>
<CharacteristicItems>
  <DiameterCharacteristicItem id="5">
    <Name>Diameter #1</Name>
    <KeyCharacteristic>
      <Designator>C</Designator>
    </KeyCharacteristic>
    <CharacteristicNominalId>3</CharacteristicNominalId>
    <LocationOnDrawing>
      <DrawingId>1</DrawingId>
      <SheetNumber>1</SheetNumber>
      <DrawingZone>A</DrawingZone>
    </LocationOnDrawing>
  </DiameterCharacteristicItem>
  <DiameterCharacteristicItem id="6">
    <Name>Diameter #2</Name>
    <KeyCharacteristic>
      <Designator>C</Designator>
    </KeyCharacteristic>
    <CharacteristicNominalId>4</CharacteristicNominalId>
    <LocationOnDrawing>
      <DrawingId>1</DrawingId>
      <SheetNumber>1</SheetNumber>
      <DrawingZone>A</DrawingZone>
    </LocationOnDrawing>
  </DiameterCharacteristicItem>
</CharacteristicItems>
</Characteristics>
<MeasurementsResults>
  <MeasurementResults id="1">
    <MeasuredCharacteristics>
      <CharacteristicActuals>
        <DiameterCharacteristicActual id="3001">

```

```

        <Status>
          <CharacteristicStatusEnum>PASS</CharacteristicStatusEnum>
        </Status>
        <CharacteristicItemId>5</CharacteristicItemId>
        <ManufacturingProcessId>1</ManufacturingProcessId>
        <NonConformanceDesignator>0</NonConformanceDesignator>
        <Value>2.001</Value>
      </DiameterCharacteristicActual>
    </CharacteristicActuals>
  </MeasuredCharacteristics>
</InspectionStatus>
  <InspectionStatusEnum>PASS</InspectionStatusEnum>
</InspectionStatus>
<ActualComponentIds N="1">
  <Id>1</Id>
</ActualComponentIds>
</MeasurementResults>
<MeasurementResults id="2">
  <MeasuredCharacteristics>
    <CharacteristicActuals>
      <DiameterCharacteristicActual id="3002">
        <Status>
          <CharacteristicStatusEnum>PASS</CharacteristicStatusEnum>
        </Status>
        <CharacteristicItemId>6</CharacteristicItemId>
        <ManufacturingProcessId>2</ManufacturingProcessId>
        <NonConformanceDesignator>1</NonConformanceDesignator>
        <Value>3.004</Value>
      </DiameterCharacteristicActual>
    </CharacteristicActuals>
  </MeasuredCharacteristics>
  <InspectionStatus>
    <InspectionStatusEnum>PASS</InspectionStatusEnum>
  </InspectionStatus>
  <ActualComponentIds N="1">
    <Id>1</Id>
  </ActualComponentIds>
</MeasurementResults>
<ActualComponentSet N="1">
  <ActualComponent id="1">
    <SerialNumber>1ABC-DEFG</SerialNumber>
    <Status>
      <InspectionStatusEnum>PASS</InspectionStatusEnum>
    </Status>
  </ActualComponent>
</ActualComponentSet>
</MeasurementsResults>
<Statistics>
<StatisticalStudiesResults>
  <FirstArticleStudyResults id="1">
    <Status>
      <StatsEvalStatusEnum>PASS</StatsEvalStatusEnum>
    </Status>
  </FirstArticleStudyResults>
</StatisticalStudiesResults>
<InspectionTraceability>
  <InspectingOrganization>
    <Name>Supplier Corporation, Inc.</Name>
  </InspectingOrganization>
</InspectionTraceability>

```

```

    <Address>
      <StreetNumber>1234</StreetNumber>
      <Street>Main Street</Street>
      <Town>Anywhere</Town>
      <PostalCode>90120</PostalCode>
      <Country>USA</Country>
    </Address>
  </InspectingOrganization>
  <CustomerOrganization>
    <Name>Customer Corporation, Inc.</Name>
    <Address>
      <StreetNumber>4321</StreetNumber>
      <Street>Tower Street</Street>
      <Town>Somewhere</Town>
      <PostalCode>012345</PostalCode>
      <Country>USA</Country>
    </Address>
    <CustomerNumber>0001-0000</CustomerNumber>
  </CustomerOrganization>
  <PurchaseOrderNumber>1</PurchaseOrderNumber>
  <ReportNumber>0001-00002</ReportNumber>
  <InspectionStart>2014-06-03T13:47:30Z</InspectionStart>
  <ReportPreparer>
    <Name>John Smith</Name>
  </ReportPreparer>
  <ReportPreparationDate>2014-06-03T13:47:30Z</ReportPreparationDate>
  <PlantLocation id="1">
    <LocationDescription>QA</LocationDescription>
    <Address>
      <TelephoneNumber>800-555-1212</TelephoneNumber>
      <ElectronicMailAddress>john.smith@supplier.com</ElectronicMailAddress>
    </Address>
  </PlantLocation>
  </InspectionTraceability>
  <InSpecRatio>1.00</InSpecRatio>
  </FirstArticleStudyResults>
</StatisticalStudiesResults>
</Statistics>
<ManufacturingProcessTraceabilities>
  <ManufacturingProcessTraceability id="1">
    <Description>CNC Machining</Description>
    <MachineManufacturerName>MC Hammer</MachineManufacturerName>
    <MachineIdentifier>214-West</MachineIdentifier>
    <Shift>1</Shift>
    <Department>Mill</Department>
    <PlantSector>West Building</PlantSector>
    <ProcessParameter>
      <ParameterType>Drill</ParameterType>
      <ParameterValue>Tool # 1</ParameterValue>
    </ProcessParameter>
  </ManufacturingProcessTraceability>
  <ManufacturingProcessTraceability id="2">
    <Description>CNC Machining</Description>
    <MachineManufacturerName>MC Hammer</MachineManufacturerName>
    <MachineIdentifier>214-West</MachineIdentifier>
    <Shift>1</Shift>

```

```

<Department>Mill</Department>
<PlantSector>West Building</PlantSector>
<ProcessParameter>
  <ParameterType>Drill</ParameterType>
  <ParameterValue>Tool # 2</ParameterValue>
</ProcessParameter>
</ManufacturingProcessTraceability>
</ManufacturingProcessTraceabilities>
</QIFDocument>

```

The structure above can be logically described as follows:

1. The **Part** id is identified in the **Product** *element*.
2. The printed drawing Information is identified in the **DefinitionExternal** *element*.
3. The characteristic name (Diameter) and the tolerance are defined in the **CharacteristicDefinitions** *element*.
4. The characteristic target value is defined in the **CharacteristicNominals** *element* and the tolerance is indicated by a reference to the characteristic definition.
5. The characteristic name is further expressed in the **DiameterCharacteristicItem** *element* with a reference to the characteristic nominal.
6. The actual measurement values are identified in the **MeasurementsResults** *element* with reference to the characteristic Items.
7. The **StudyResults** *element* defines the study type and references the actual Ids from the **MeasurementsResults** section and further describes the detailed statistical values.
8. This example makes extensive use of the **InspectionTraceability** and **ManufacturingProcessTraceability** *elements*.

8.2.2 Process capability study example

The definition of a Process Capability study is a “set of measurements against characteristics of a manufactured part that are compared to the nominal and tolerance in order to determine whether the process is capable of producing conforming parts”. The results of a process capability study usually can be interpreted through a control chart (XBarR) and various quality indices such as Cp, Cpk, Pp, Ppk.

A Process Capability study is typically derived from 20-30 samples from an initial launch from a production line. It is also used when a manufacturing process has been changed or adjusted.

The following QIF document structure represents a 30 piece capability study for a single diameter that has a sample size of 3 for a total of 10 subgroups. The Statistical plan and results are identified and referenced at the bottom of the sample. Note: Measurement blocks have been removed in the middle to save space.

```

<QIFDocument xmlns="http://qifstandards.org/xsd/qif2" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" versionQIF="2.0" xsi:schemaLocation="http://qifstandards.org/xsd/qif2
../Applications/QIFDocument.xsd">
  <Product>
    <PartSet N="1">
      <Part id="1">
        <Name>QIF Widget</Name>
      </Part>

```

```

</PartSet>
</Product>
<Characteristics>
  <FormalStandard>
    <FormalStandardEnum>ASME-Y14.5-2009</FormalStandardEnum>
  </FormalStandard>
  <CharacteristicDefinitions>
    <DiameterCharacteristicDefinition id="1">
      <Name>Diameter_2.000</Name>
      <Tolerance>
        <MaxValue>2.200</MaxValue>
        <MinValue>1.800</MinValue>
        <DefinedAsLimit>true</DefinedAsLimit>
      </Tolerance>
    </DiameterCharacteristicDefinition>
  </CharacteristicDefinitions>
  <CharacteristicNominals>
    <DiameterCharacteristicNominal id="1001">
      <CharacteristicDefinitionId>1</CharacteristicDefinitionId>
      <TargetValue>2.000</TargetValue>
    </DiameterCharacteristicNominal>
  </CharacteristicNominals>
  <CharacteristicItems>
    <DiameterCharacteristicItem id="2001">
      <Name>Top_Diameter_2.000</Name>
      <MeasurementDeviceIds N="1">
        <Id>1</Id>
      </MeasurementDeviceIds>
      <CharacteristicNominalId>1001</CharacteristicNominalId>
    </DiameterCharacteristicItem>
  </CharacteristicItems>
</Characteristics>
<MeasurementsResults>
  <MeasurementResults id="1">
    <MeasuredCharacteristics>
      <CharacteristicActuals>
        <DiameterCharacteristicActual id="3001">
          <Status>
            <CharacteristicStatusEnum>PASS</CharacteristicStatusEnum>
          </Status>
          <CharacteristicItemId>2001</CharacteristicItemId>
          <Value>2.001</Value>
        </DiameterCharacteristicActual>
      </CharacteristicActuals>
    </MeasuredCharacteristics>
    <InspectionStatus>
      <InspectionStatusEnum>PASS</InspectionStatusEnum>
    </InspectionStatus>
  </MeasurementResults>
  <MeasurementResults id="2">
    <MeasuredCharacteristics>
      <CharacteristicActuals>
        <DiameterCharacteristicActual id="3002">
          <Status>
            <CharacteristicStatusEnum>PASS</CharacteristicStatusEnum>
          </Status>

```

```

        <CharacteristicItemId>2001</CharacteristicItemId>
        <Value>1.999</Value>
    </DiameterCharacteristicActual>
</CharacteristicActuals>
</MeasuredCharacteristics>
<InspectionStatus>
    <InspectionStatusEnum>PASS</InspectionStatusEnum>
</InspectionStatus>
* * *
<MeasurementResults id="30">
    <MeasuredCharacteristics>
        <CharacteristicActuals>
            <DiameterCharacteristicActual id="30030">
                <Status>
                    <CharacteristicStatusEnum>PASS</CharacteristicStatusEnum>
                </Status>
                <CharacteristicItemId>2001</CharacteristicItemId>
                <Value>2.000</Value>
            </DiameterCharacteristicActual>
        </CharacteristicActuals>
    </MeasuredCharacteristics>
    <InspectionStatus>
        <InspectionStatusEnum>PASS</InspectionStatusEnum>
    </InspectionStatus>
</MeasurementResults>
</MeasurementsResults>
<Statistics>
<StatisticalStudyPlans>
    <CapabilityStudyPlan id="1">
        <NumberOfSamples>10</NumberOfSamples>
        <CpkThreshold>
            <Limit>1.33</Limit>
        </CpkThreshold>
    </CapabilityStudyPlan>
</StatisticalStudyPlans>
<StatisticalStudiesResults>
    <CapabilityStudyResults id="1">
        <Status>
            <StatsEvalStatusEnum>INFORMATIONAL</StatsEvalStatusEnum>
        </Status>
        <CharacteristicsStats>
            <DiameterCharacteristicStats>
                <Subgroup id="1">
                    <ActualIds>
                        <Ids N="1">
                            <Id>3001</Id>
                            <Id>3002</Id>
                            <Id>3003</Id>
                        </Ids>
                    </ActualIds>
                </Subgroup>
                * * *
                <Subgroup id="10">
                    <ActualIds>
                        <Ids N="1">
                            <Id>30028</Id>

```



```

    <Id>30029</Id>
    <Id>30030</Id>
  </Ids>
</ActualIds>
</Subgroup>
<Status>
  <StatsEvalStatusEnum>INFORMATIONAL</StatsEvalStatusEnum>
</Status>
<ValueStats>
  <TotalNumber>30</TotalNumber>
  <NumberSubgroups>10</NumberSubgroups>
  <Average>1.984</Average>
  <Maximum>2.156</Maximum>
  <Minimum>1.764</Minimum>
  <StandardDeviation>0.078690898</StandardDeviation>
  <NumberOutOfTolerance>1</NumberOutOfTolerance>
  <Cp>1.678</Cp>
  <Cpk>1.345</Cpk>
</ValueStats>
</DiameterCharacteristicStats>
</CharacteristicsStats>
<NumberOfSamples>10</NumberOfSamples>
</CapabilityStudyResults>
</StatisticalStudiesResults>
</Statistics>
</QIFDocument>

```

The structure above can be logically described as follows:

1. The **Part** id is identified in the **Product** *element*.
2. The characteristic name (Diameter) and the tolerance are defined in the **CharacteristicDefinitions** *element*.
3. The characteristic target value is defined in the **CharacteristicNominals** *element* and the tolerance is indicated by a reference to the characteristic definition.
4. The characteristic name is further expressed in the **DiameterCharacteristicItem** *element* with a reference to the characteristic nominal.
5. The actual measurement values are identified in the **MeasurementsResults** *element* with reference to the characteristic Items.
6. The **StudyResults** section defines the study type and references the actual Ids from the **MeasurementsResults** section and further describes the detailed statistical values.

8.2.3 SPC production study example

SPC (Statistical Process Control) is defined as the use of statistical techniques such as control charts to analyze a process or its outputs so as to take appropriate actions to achieve and maintain a state of statistical control and to improve the process capability. The data used in an SPC study derives from the control or sampling plan in which characteristics are measured in subgroups from a larger production population. The subgroup measurements are statistically extrapolated to identify the overall quality of a batch of product. This is in addition to identifying “special causes” of variation that can be addressed through corrective action.

The following QIF document structure is an example that represents a 30 piece production study for a single diameter that has a sample size of 3 for a total of 10 subgroups. This sample

also provides the application of Serial Number assigned to each inspected part. Assignable Causes and Corrective Action are also identified (associated as a Study Issue with Subgroup Id #3). The Statistical results are identified and referenced at the bottom of the sample. Note: Measurement and Serialization blocks have been removed in the middle to save space.

```
<QIFDocument xmlns="http://qifstandards.org/xsd/qif2" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" versionQIF="2.0" xsi:schemaLocation="http://qifstandards.org/xsd/qif2
../Applications/QIFDocument.xsd">
```

```
  <Product>
    <PartSet N="1">
      <Part id="1">
        <Name>Widget</Name>
      </Part>
    </PartSet>
  </Product>
  <Characteristics>
    <FormalStandard>
      <FormalStandardEnum>ASME-Y14.5-2009</FormalStandardEnum>
    </FormalStandard>

    <CharacteristicDefinitions>
      <DiameterCharacteristicDefinition id="1">
        <Name>Diameter_2.000</Name>
        <Tolerance>
          <MaxValue>2.200</MaxValue>
          <MinValue>1.800</MinValue>
          <DefinedAsLimit>true</DefinedAsLimit>
        </Tolerance>
      </DiameterCharacteristicDefinition>
    </CharacteristicDefinitions>
    <CharacteristicNominals>
      <DiameterCharacteristicNominal id="1001">
        <CharacteristicDefinitionId>1</CharacteristicDefinitionId>
        <TargetValue>2.000</TargetValue>
      </DiameterCharacteristicNominal>
    </CharacteristicNominals>
    <CharacteristicItems>
      <DiameterCharacteristicItem id="2001">
        <Name>Top_Diameter_2.000</Name>
        <MeasurementDeviceIds N="1">
          <Id>1</Id>
        </MeasurementDeviceIds>
        <CharacteristicNominalId>1001</CharacteristicNominalId>
      </DiameterCharacteristicItem>
    </CharacteristicItems>
  </Characteristics>
  <MeasurementsResults>
    <MeasurementResults id="1">
      <MeasuredCharacteristics>
        <CharacteristicActuals>
          <DiameterCharacteristicActual id="3001">
            <Status>
              <CharacteristicStatusEnum>PASS</CharacteristicStatusEnum>
            </Status>
          <CharacteristicItemId>2001</CharacteristicItemId>
        </DiameterCharacteristicActual>
      </CharacteristicActuals>
    </MeasurementResults>
  </MeasurementsResults>
</QIFDocument>
```

```

        <ManufacturingProcessId>1</ManufacturingProcessId>
        <Value>2.001</Value>
    </DiameterCharacteristicActual>
</CharacteristicActuals>
</MeasuredCharacteristics>
<InspectionStatus>
    <InspectionStatusEnum>PASS</InspectionStatusEnum>
</InspectionStatus>
<ActualComponentIds N="1">
    <Id>1</Id>
</ActualComponentIds>
</MeasurementResults>
<MeasurementResults id="2">
    <MeasuredCharacteristics>
        <CharacteristicActuals>
            <DiameterCharacteristicActual id="3002">
                <Status>
                    <CharacteristicStatusEnum>PASS</CharacteristicStatusEnum>
                </Status>
                <CharacteristicItemId>2001</CharacteristicItemId>
                <ManufacturingProcessId>1</ManufacturingProcessId>
                <Value>1.999</Value>
            </DiameterCharacteristicActual>
        </CharacteristicActuals>
    </MeasuredCharacteristics>
    <InspectionStatus>
        <InspectionStatusEnum>PASS</InspectionStatusEnum>
    </InspectionStatus>
    <ActualComponentIds N="1">
        <Id>2</Id>
    </ActualComponentIds>
</MeasurementResults>
* * *
<MeasurementResults id="30">
    <MeasuredCharacteristics>
        <CharacteristicActuals>
            <DiameterCharacteristicActual id="30030">
                <Status>
                    <CharacteristicStatusEnum>PASS</CharacteristicStatusEnum>
                </Status>
                <CharacteristicItemId>2001</CharacteristicItemId>
                <ManufacturingProcessId>1</ManufacturingProcessId>
                <Value>2.000</Value>
            </DiameterCharacteristicActual>
        </CharacteristicActuals>
    </MeasuredCharacteristics>
    <InspectionStatus>
        <InspectionStatusEnum>PASS</InspectionStatusEnum>
    </InspectionStatus>
    <ActualComponentIds N="1">
        <Id>30</Id>
    </ActualComponentIds>
</MeasurementResults>
<ActualComponentSet N="1">
    <ActualComponent id="1">
        <SerialNumber>1ABC-DEFG</SerialNumber>
    </ActualComponent>

```

```

    <Status>
      <InspectionStatusEnum>PASS</InspectionStatusEnum>
    </Status>
  </ActualComponent>
</ActualComponentSet>
<ActualComponentSet N="1">
  <ActualComponent id="2">
    <SerialNumber>2ABC-DEFG</SerialNumber>
    <Status>
      <InspectionStatusEnum>PASS</InspectionStatusEnum>
    </Status>
  </ActualComponent>
</ActualComponentSet>
  * * *
<ActualComponentSet N="1">
  <ActualComponent id="30">
    <SerialNumber>30ABC-DEFG</SerialNumber>
    <Status>
      <InspectionStatusEnum>PASS</InspectionStatusEnum>
    </Status>
  </ActualComponent>
</ActualComponentSet>
</MeasurementsResults>
<Statistics>
  <StatisticalStudiesResults>
    <ProductionStudyResults id="1">
      <ThisStatisticalStudyResultsInstanceQPIId>
        4aa329b3-fbbb-11e3-a3ac-0800200c9a66
      </ThisStatisticalStudyResultsInstanceQPIId>
      <Status>
        <StatsEvalStatusEnum>INFORMATIONAL</StatsEvalStatusEnum>
      </Status>
      <CharacteristicsStats>
        <DiameterCharacteristicStats>
          <Subgroup id="1">
            <ActualIds>
              <Ids N="3">
                <Id>3001</Id>
                <Id>3002</Id>
                <Id>3003</Id>
              </Ids>
            </ActualIds>
          </Subgroup>
          * * *
          <Subgroup id="10">
            <ActualIds>
              <Ids N="3">
                <Id>30028</Id>
                <Id>30029</Id>
                <Id>30030</Id>
              </Ids>
            </ActualIds>
          </Subgroup>
          <Status>
            <StatsEvalStatusEnum>INFORMATIONAL</StatsEvalStatusEnum>
          </Status>
        </DiameterCharacteristicStats>
      </CharacteristicsStats>
    </ProductionStudyResults>
  </StatisticalStudiesResults>
</Statistics>

```

```

    <StudyIssue id="1">
      <AssignableCauselds N="1">
        <Id>1</Id>
      </AssignableCauselds>
      <CorrectiveActionIds N="2" >
        <Id>1</Id>
        <Id>2</Id>
      </CorrectiveActionIds>
      <SubgroupIds N="1">
        <Id>3</Id>
      </SubgroupIds>
    </StudyIssue>
    <ValueStats>
      <TotalNumber>30</TotalNumber>
      <NumberSubgroups>10</NumberSubgroups>
      <Average>1.984466667</Average>
      <Maximum>2.156</Maximum>
      <Minimum>1.764</Minimum>
      <StandardDeviation>0.07869</StandardDeviation>
      <NumberOutOfTolerance>1</NumberOutOfTolerance>
      <Cp>1.678</Cp>
      <Cpk>1.345</Cpk>
    </ValueStats>
    </DiameterCharacteristicStats>
  </CharacteristicsStats>
  <NumberOfSamples>10</NumberOfSamples>
</ProductionStudyResults>
</StatisticalStudiesResults>
<CorrectiveActionPlans>
  <CorrectiveActionPlan id="1">
    <AssignableCauses>
      <AssignableCause id="1">
        <AssignableCause>broken tool</AssignableCause>
        <CorrectiveActionIds N="2">
          <Id>1</Id>
          <Id>2</Id>
        </CorrectiveActionIds>
      </AssignableCause>
    </AssignableCauses>
    <CorrectiveActions>
      <CorrectiveAction id="1">
        <ActionToTake>Scrap Part</ActionToTake>
      </CorrectiveAction>
      <CorrectiveAction id="2">
        <ActionToTake>Call Maintenance</ActionToTake>
      </CorrectiveAction>
    </CorrectiveActions>
  </CorrectiveActionPlan>
</CorrectiveActionPlans>
</Statistics>
<ManufacturingProcessTraceabilities>
  <ManufacturingProcessTraceability id="1">
    <Description>CNC Machining</Description>
    <MachineManufacturerName>MC Hammer</MachineManufacturerName>
    <MachineIdentifier>214-West</MachineIdentifier>
    <Shift>1</Shift>
  </ManufacturingProcessTraceability>
</ManufacturingProcessTraceabilities>

```

```

<Department>Mill</Department>
<PlantSector>West Building</PlantSector>
<ProcessParameter>
  <ParameterType>Drill</ParameterType>
  <ParameterValue>Tool # 1</ParameterValue>
</ProcessParameter>
</ManufacturingProcessTraceability>
</ManufacturingProcessTraceabilities>
</QIFDocument>

```

The structure above can be logically described as follows:

1. The **Part** id is identified in the **Product** *element*.
2. The characteristic name (Diameter) and the tolerance are defined in the **CharacteristicDefinitions** *element*.
3. The characteristic target value is defined in the **CharacteristicNominals** *element* and the target value is indicated by a reference to the characteristic definition.
4. The characteristic name is further expressed in the **DiameterCharacteristicItem** *element* with a reference to the characteristic nominal.
5. The actual measurement values are identified in the **MeasurementsResults** *element* with reference to the characteristic items.
6. Each measurement result has an **ActualComponent** reference to provide a relationship to the serial numbers.
7. The **ProductionStudyResults** section defines the study type and references the actual ids from the **MeasurementsResults** *element* and further describes the detailed statistical values.
8. The **StudyIssue** section contains information that identifies the relationship to the **AssignableCauses** and **CorrectiveActions** which are defined in the **CorrectiveActionPlan** *element*.

8.2.4 Gage repeatability and reproducibility study example

Repeatability and Reproducibility (R&R) studies are a method of analyzing the variation of measurement in a gage (repeatability) and the variation of measurements by operators (reproducibility).

Repeatability is the variation in measurements obtained with one measurement instrument when used several times by one appraiser while measuring the identical characteristic on the same part.

Reproducibility is the variation in the average of the measurements made by different appraisers using the same measuring instrument when measuring identical characteristics on the same part.

The following QIF document structure is an example that describes a single characteristic from a Long Form (Average and Range) R&R study with 2 Appraisers, 2 trials and 5 parts that would result in a total of 20 QIF Results blocks (not shown):

```

<QIFDocument xmlns="http://qifstandards.org/xsd/qif2" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" versionQIF="2.0" xsi:schemaLocation="http://qifstandards.org/xsd/qif2
  ../Applications/QIFDocument.xsd">
  <FileUnits>

```

```

<PrimaryUnits>
  <AngularUnit>
    <UnitName>degree</UnitName>
  </AngularUnit>
  <LinearUnit>
    <UnitName>inch</UnitName>
  </LinearUnit>
  <TemperatureUnit>
    <UnitName>Fahrenheit</UnitName>
  </TemperatureUnit>
</PrimaryUnits>
<OtherUnits>
  <LinearUnit>
    <UnitName>mm</UnitName>
  </LinearUnit>
</OtherUnits>
</FileUnits>
<MeasurementResources>
  <MeasurementDevices>
    <Caliper id="1">
      <Name>500-196-30</Name>
      <Description>Digital Caliper</Description>
      <Manufacturer>Gage Manufacturing Company</Manufacturer>
      <SerialNumber>1234-5678</SerialNumber>
      <Resolution>.0005</Resolution>
      <Accuracy>
        <AccuracyValue>.001</AccuracyValue>
      </Accuracy>
    </Caliper>
  </MeasurementDevices>
</MeasurementResources>
<Product>
  <PartSet N="1">
    <Part id="2">
      <Name>QIF Widget</Name>
    </Part>
  </PartSet>
</Product>
<Characteristics>
  <FormalStandard>
    <FormalStandardEnum>COMPANY</FormalStandardEnum>
  </FormalStandard>
  <CharacteristicDefinitions>
    <UserDefinedLinearCharacteristicDefinition id="1">
      <Name>Diameter #1</Name>
      <Tolerance>
        <MaxValue>2.001</MaxValue>
        <MinValue linearUnit="inch">1.999</MinValue>
        <DefinedAsLimit>true</DefinedAsLimit>
      </Tolerance>
      <WhatToMeasure>measure the diameter</WhatToMeasure>
    </UserDefinedLinearCharacteristicDefinition>
  </CharacteristicDefinitions>
  <CharacteristicNominals>
    <UserDefinedLinearCharacteristicNominal id="3">
      <CharacteristicDefinitionId>1</CharacteristicDefinitionId>
    </UserDefinedLinearCharacteristicNominal>
  </CharacteristicNominals>
</Characteristic>

```

```

    <TargetValue linearUnit="inch">2.000</TargetValue>
  </UserDefinedLinearCharacteristicNominal>
</CharacteristicNominals>
<CharacteristicItems>
  <UserDefinedLinearCharacteristicItem id="4">
    <Name>Diameter #1</Name>
    <MeasurementDeviceIds N="1">
      <Id>1</Id>
    </MeasurementDeviceIds>
    <CharacteristicNominalId>3</CharacteristicNominalId>
  </UserDefinedLinearCharacteristicItem>
</CharacteristicItems>
</Characteristics>
<Statistics>
  <StatisticalStudyPlans>
    <GageRandRStudyPlan id="1">
      <RandRStudyType>AVGANDRANGE</RandRStudyType>
      <NumberOfAppraisers>2</NumberOfAppraisers>
      <NumberOfParts>5</NumberOfParts>
      <NumberOfTrials>2</NumberOfTrials>
    </GageRandRStudyPlan>
  </StatisticalStudyPlans>
  <StatisticalStudiesResults>
    <GageRandRStudyResults id="1">
      <Status>
        <StatsEvalStatusEnum>INFORMATIONAL</StatsEvalStatusEnum>
      </Status>
      <CharacteristicsStats>
        <UserDefinedLinearCharacteristicStats>
          <Status>
            <StatsEvalStatusEnum>INFORMATIONAL</StatsEvalStatusEnum>
          </Status>
          <ValueStats linearUnit="mm">
            <AppraiserVariation>0.02</AppraiserVariation>
            <EquipmentVariation>0.01</EquipmentVariation>
            <GageRandR>0.07</GageRandR>
            <TotalVariation>0.03</TotalVariation>
          </ValueStats>
        </UserDefinedLinearCharacteristicStats>
      </CharacteristicsStats>
      <MeasurementDeviceIds N="1">
        <Id>1</Id>
      </MeasurementDeviceIds>
      <NumberOfAppraisers>2</NumberOfAppraisers>
      <NumberOfParts>5</NumberOfParts>
      <NumberOfTrials>2</NumberOfTrials>
    </GageRandRStudyResults>
  </StatisticalStudiesResults>
</Statistics>
</QIFDocument>

```

The structure above can be logically described as follows:

1. The units used in the file are identified in the **FileUnits** section.
2. The measurement device (a caliper) is defined in the **MeasurementResources** *element*

3. The **Part** id is identified in the **Product** *element*.
4. The characteristic name (Diameter #1) and the tolerance are defined in the **CharacteristicDefinitions** *element*.
5. The characteristic target value is defined in the **CharacteristicNominals** *element* and the tolerance is indicated by a reference to the characteristic definition.
6. The characteristic name is further expressed in the **CharacteristicItems** *element* with a reference to the characteristic nominal.
7. The Gage R&R Study parameters for appraisers, parts and trial are defined in the **GageRandRStudyPlan** *element*.
8. The detailed statistical results of the R&R study are defined in the **GageRandRStudyResults** *element*, including reference to the measurement device.

8.2.5 Gage stability study example

Gage Stability studies are a method of analyzing the variation of measurement over time. Stability (or drift) is the total variation in the measurements obtained with a measurement system on the same master or parts when measuring a single characteristic over an extended time period.

The following QIF document structure is an example that contains two QIF Results block QIF Statistics XML file for a typical Gage Stability study:

```
<QIFDocument xmlns="http://qifstandards.org/xsd/qif2" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" versionQIF="2.0" xsi:schemaLocation="http://qifstandards.org/xsd/qif2
../Applications/QIFDocument.xsd">
  <MeasurementResources>
    <MeasurementDevices>
      <Caliper id="1">
        <Name>500-171-30</Name>
        <Description>6 inch Caliper</Description>
        <Manufacturer>Gage Manufacturer</Manufacturer>
        <SerialNumber>1234-5678</SerialNumber>
        <Resolution>0.0005</Resolution>
        <Accuracy>
          <AccuracyValue>0.001</AccuracyValue>
        </Accuracy>
      </Caliper>
    </MeasurementDevices>
  </MeasurementResources>
  <Characteristics>
    <FormalStandard>
      <FormalStandardEnum>COMPANY</FormalStandardEnum>
    </FormalStandard>
    <CharacteristicDefinitions>
      <DiameterCharacteristicDefinition id="1">
        <Name>Diameter_2.000</Name>
        <Tolerance>
          <MaxValue>2.200</MaxValue>
          <MinValue>1.800</MinValue>
          <DefinedAsLimit>true</DefinedAsLimit>
        </Tolerance>
      </DiameterCharacteristicDefinition>
    </CharacteristicDefinitions>
    <CharacteristicNominals>
```

```

    <DiameterCharacteristicNominal id="1001">
      <CharacteristicDefinitionId>1</CharacteristicDefinitionId>
      <TargetValue>2.000</TargetValue>
    </DiameterCharacteristicNominal>
  </CharacteristicNominals>
  <CharacteristicItems>
    <DiameterCharacteristicItem id="2001">
      <Name>Top_Diameter_2.000</Name>
      <MeasurementDeviceIds N="1">
        <Id>1</Id>
      </MeasurementDeviceIds>
      <CharacteristicNominalId>1001</CharacteristicNominalId>
    </DiameterCharacteristicItem>
  </CharacteristicItems>
</Characteristics>
<MeasurementsResults>
  <MeasurementResults id="1">
    <InspectionTraceability>
      <InspectionStart>2014-06-19T19:12:32Z</InspectionStart>
    </InspectionTraceability>
    <MeasuredCharacteristics>
      <CharacteristicActuals>
        <DiameterCharacteristicActual id="3001">
          <Status>
            <CharacteristicStatusEnum>PASS</CharacteristicStatusEnum>
          </Status>
          <CharacteristicItemId>2001</CharacteristicItemId>
          <Value>2.001</Value>
        </DiameterCharacteristicActual>
      </CharacteristicActuals>
    </MeasuredCharacteristics>
    <InspectionStatus>
      <InspectionStatusEnum>PASS</InspectionStatusEnum>
    </InspectionStatus>
  </MeasurementResults>
  <MeasurementResults id="2">
    <InspectionTraceability>
      <InspectionStart>2014-06-26T12:40:32Z</InspectionStart>
    </InspectionTraceability>
    <MeasuredCharacteristics>
      <CharacteristicActuals>
        <DiameterCharacteristicActual id="3002">
          <Status>
            <CharacteristicStatusEnum>PASS</CharacteristicStatusEnum>
          </Status>
          <CharacteristicItemId>2001</CharacteristicItemId>
          <Value>1.999</Value>
        </DiameterCharacteristicActual>
      </CharacteristicActuals>
    </MeasuredCharacteristics>
    <InspectionStatus>
      <InspectionStatusEnum>PASS</InspectionStatusEnum>
    </InspectionStatus>
  </MeasurementResults>
</MeasurementsResults>
<Statistics>

```

```

<StatisticalStudiesResults>
  <StabilityStudyResults id="1">
    <Status>
      <StatsEvalStatusEnum>INFORMATIONAL</StatsEvalStatusEnum>
    </Status>
    <CharacteristicsStats>
      <DiameterCharacteristicStats>
        <ActualIds>
          <Ids N="2">
            <Id>3001</Id>
            <Id>3002</Id>
          </Ids>
        </ActualIds>
        <Status>
          <StatsEvalStatusEnum>INFORMATIONAL</StatsEvalStatusEnum>
        </Status>
        <ValueStats>
          <Average>2.000</Average>
          <Maximum>2.001</Maximum>
          <Minimum>1.999</Minimum>
          <StandardDeviation>0.0014</StandardDeviation>
        </ValueStats>
      </DiameterCharacteristicStats>
    </CharacteristicsStats>
    <MeasurementDeviceIds>
      <Id>1</Id>
    </MeasurementDeviceIds>
  </StabilityStudyResults>
</StatisticalStudiesResults>
</Statistics>
</QIFDocument>

```

The structure above can be logically described as follows:

1. The measurement device (a caliper) is defined in the **MeasurementResources** *element*.
2. The **Part** id is identified in the **Product** *element*.
3. The characteristic name (Diameter) and the tolerance are defined in the **CharacteristicDefinitions** *element*.
4. The characteristic target value is defined in the **CharacteristicNominals** *element* and the tolerance is indicated by a reference to the characteristic definition.
5. The characteristic name is further expressed in the **DiameterCharacteristicItem** *element* with a reference to the characteristic nominal and also a reference to the measurement device.
6. The actual measurement values are identified in the **MeasurementsResults** *element* with reference to the characteristic Items. Each **MeasurementResult** block also makes use of the **InspectionTraceability** *element* to capture the time.
7. The detailed statistical results of the stability study are defined in the **StabilityStudyResults** *element*, including reference to the measurement device.

8.2.6 Gage linearity study example

Gage Linearity studies are a method of analyzing the amount of error change throughout a measurement system's measuring range. Linearity is also the amount of deviation from an instrument's ideal straight-line performance.

The following **QIFDocument** structure is an example that contains a **Statistics** *element* for a typical Gage Linearity study:

```
<QIFDocument xmlns="http://qifstandards.org/xsd/qif2" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance" versionQIF="2.0" xsi:schemaLocation= "http://qifstandards.org/xsd/qif2
../Applications/QIFDocument.xsd">
  <MeasurementResources>
    <MeasurementDevices>
      <Caliper id="1">
        <Name>500-196-30</Name>
        <Description>Digital Caliper</Description>
        <Manufacturer>Gage Manufacturer</Manufacturer>
        <SerialNumber>1234-5678</SerialNumber>
        <Resolution>.0005</Resolution>
        <Accuracy>
          <AccuracyValue>.001</AccuracyValue>
        </Accuracy>
      </Caliper>
    </MeasurementDevices>
  </MeasurementResources>
  <Characteristics>
    <FormalStandard>
      <FormalStandardEnum>ASME-Y14.5-2009</FormalStandardEnum>
    </FormalStandard>
    <CharacteristicDefinitions>
      <LengthCharacteristicDefinition id="1">
        <Name>1 inch Ceramic Gage Block</Name>
        <Tolerance>
          <MaxValue>1.00000012</MaxValue>
          <MinValue>0.99999988</MinValue>
          <DefinedAsLimit>true</DefinedAsLimit>
        </Tolerance>
      </LengthCharacteristicDefinition>
      <LengthCharacteristicDefinition id="2">
        <Name>3 inch Ceramic Gage Block</Name>
        <Tolerance>
          <MaxValue>3.00000012</MaxValue>
          <MinValue>2.99999988</MinValue>
          <DefinedAsLimit>true</DefinedAsLimit>
        </Tolerance>
      </LengthCharacteristicDefinition>
      <LengthCharacteristicDefinition id="3">
        <Name>5 inch Ceramic Gage Block</Name>
        <Tolerance>
          <MaxValue>5.00000012</MaxValue>
          <MinValue>4.99999988</MinValue>
          <DefinedAsLimit>true</DefinedAsLimit>
        </Tolerance>
      </LengthCharacteristicDefinition>
    </CharacteristicDefinitions>
    <CharacteristicNominals>
      <LengthCharacteristicNominal id="4">
        <CharacteristicDefinitionId>1</CharacteristicDefinitionId>
        <TargetValue>1.000000</TargetValue>
      </LengthCharacteristicNominal>
    </CharacteristicNominals>
  </Characteristics>
</QIFDocument>
```

```

<LengthCharacteristicNominal id="5">
  <CharacteristicDefinitionId>2</CharacteristicDefinitionId>
  <TargetValue>3.000000</TargetValue>
</LengthCharacteristicNominal>
<LengthCharacteristicNominal id="6">
  <CharacteristicDefinitionId>3</CharacteristicDefinitionId>
  <TargetValue>5.000000</TargetValue>
</LengthCharacteristicNominal>
</CharacteristicNominals>
<CharacteristicItems>
  <LengthCharacteristicItem id="7">
    <Name>1 inch Ceramic Gage Block</Name>
    <MeasurementDeviceIds N="1">
      <Id>1</Id>
    </MeasurementDeviceIds>
    <CharacteristicNominalId>4</CharacteristicNominalId>
  </LengthCharacteristicItem>
  <LengthCharacteristicItem id="8">
    <Name>3 inch Ceramic Gage Block</Name>
    <MeasurementDeviceIds N="1">
      <Id>1</Id>
    </MeasurementDeviceIds>
    <CharacteristicNominalId>5</CharacteristicNominalId>
  </LengthCharacteristicItem>
  <LengthCharacteristicItem id="9">
    <Name>5 inch Ceramic Gage Block</Name>
    <MeasurementDeviceIds N="1">
      <Id>1</Id>
    </MeasurementDeviceIds>
    <CharacteristicNominalId>6</CharacteristicNominalId>
  </LengthCharacteristicItem>
</CharacteristicItems>
</Characteristics>
<MeasurementsResults>
  <MeasurementResults id="1">
    <MeasuredCharacteristics>
      <CharacteristicActuals>
        <LengthCharacteristicActual id="1">
          <Status>
            <CharacteristicStatusEnum>PASS</CharacteristicStatusEnum>
          </Status>
          <CharacteristicItemId>7</CharacteristicItemId>
          <Value>1.0010</Value>
        </LengthCharacteristicActual>
        <LengthCharacteristicActual id="2">
          <Status>
            <CharacteristicStatusEnum>PASS</CharacteristicStatusEnum>
          </Status>
          <CharacteristicItemId>8</CharacteristicItemId>
          <Value>3.00000</Value>
        </LengthCharacteristicActual>
        <LengthCharacteristicActual id="3">
          <Status>
            <CharacteristicStatusEnum>PASS</CharacteristicStatusEnum>
          </Status>
          <CharacteristicItemId>9</CharacteristicItemId>

```

```

    <Value>4.9995</Value>
  </LengthCharacteristicActual>
</CharacteristicActuals>
</MeasuredCharacteristics>
<InspectionStatus>
  <InspectionStatusEnum>PASS</InspectionStatusEnum>
</InspectionStatus>
</MeasurementResults>
</MeasurementsResults>
<Statistics>
  <StatisticalStudiesResults>
    <LinearityStudyResults id="1">
      <Status>
        <StatsEvalStatusEnum>INFORMATIONAL</StatsEvalStatusEnum>
      </Status>
      <CharacteristicsStats>
        <LengthCharacteristicStats>
          <Status>
            <StatsEvalStatusEnum>INFORMATIONAL</StatsEvalStatusEnum>
          </Status>
          <ValueStats>
            <RelativeEquipmentVariation>0.000002</RelativeEquipmentVariation>
          </ValueStats>
        </LengthCharacteristicStats>
      </CharacteristicsStats>
      <SampleSize>3</SampleSize>
    </LinearityStudyResults>
  </StatisticalStudiesResults>
</Statistics>
</QIFDocument>

```

The structure above can be logically described as follows:

1. The measurement device (a caliper) is defined in the **MeasurementResources** *element*.
2. The characteristic names (1 inch, 3 inch, 5 inch Gage Blocks as length characteristics) and tolerance values are defined in the **CharacteristicDefinitions** *element*.
3. The characteristic target value is defined in the **CharacteristicNominals** *element* and the tolerance is indicated by a reference to the characteristic definition.
4. The characteristic names are further expressed in the **LengthCharacteristicItems** *elements* with references to the characteristic nominals and also references to the measurement device.
5. The actual measurement values are identified in the **MeasurementsResults** *element* with reference to the characteristic Items.
6. The detailed statistical results of the linearity study are defined in the **LinearityStudyResults** *element*.

8.2.7 Gage bias study example

Gage Bias studies are a method of analyzing the difference between the observed average of measurements and the reference value. The reference value, also known as the accepted reference value or master value, is a value that serves as an agreed-upon reference for measured values. A reference value can be determined by averaging several measurements with a higher level of measuring equipment.

The following **QIFDocument** structure is an example that contains **MeasurementResults** for a typical Gage Bias study:

```
<QIFDocument xmlns="http://qifstandards.org/xsd/qif2" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance" versionQIF="2.0" xsi:schemaLocation="http://qifstandards.org/xsd/qif2
../Applications/QIFDocument.xsd">
  <MeasurementResources>
    <MeasurementDevices>
      <Caliper id="1">
        <Name>500-196-30</Name>
        <Description>Digital Caliper</Description>
        <Manufacturer>Gage Manufacturer</Manufacturer>
        <SerialNumber>1234-5678</SerialNumber>
        <Resolution>.0005</Resolution>
        <Accuracy>
          <AccuracyValue>.001</AccuracyValue>
        </Accuracy>
      </Caliper>
    </MeasurementDevices>
  </MeasurementResources>
  <Characteristics>
    <FormalStandard>
      <FormalStandardEnum>ASME-Y14.5-2009</FormalStandardEnum>
    </FormalStandard>
    <CharacteristicDefinitions>
      <LengthCharacteristicDefinition id="1">
        <Name>1 inch Ceramic Gage Block</Name>
        <Tolerance>
          <MaxValue>1.00000012</MaxValue>
          <MinValue>0.99999988</MinValue>
          <DefinedAsLimit>true</DefinedAsLimit>
        </Tolerance>
      </LengthCharacteristicDefinition>
      <LengthCharacteristicDefinition id="2">
        <Name>3 inch Ceramic Gage Block</Name>
        <Tolerance>
          <MaxValue>3.00000012</MaxValue>
          <MinValue>2.99999988</MinValue>
          <DefinedAsLimit>true</DefinedAsLimit>
        </Tolerance>
      </LengthCharacteristicDefinition>
      <LengthCharacteristicDefinition id="3">
        <Name>5 inch Ceramic Gage Block</Name>
        <Tolerance>
          <MaxValue>5.00000012</MaxValue>
          <MinValue>4.99999988</MinValue>
          <DefinedAsLimit>true</DefinedAsLimit>
        </Tolerance>
      </LengthCharacteristicDefinition>
    </CharacteristicDefinitions>
    <CharacteristicNominals>
      <LengthCharacteristicNominal id="4">
        <CharacteristicDefinitionId>1</CharacteristicDefinitionId>
        <TargetValue>1.000000</TargetValue>
      </LengthCharacteristicNominal>
    </CharacteristicNominals>
  </Characteristics>
</QIFDocument>
```



```

<LengthCharacteristicNominal id="5">
  <CharacteristicDefinitionId>2</CharacteristicDefinitionId>
  <TargetValue>3.000000</TargetValue>
</LengthCharacteristicNominal>
<LengthCharacteristicNominal id="6">
  <CharacteristicDefinitionId>3</CharacteristicDefinitionId>
  <TargetValue>5.000000</TargetValue>
</LengthCharacteristicNominal>
</CharacteristicNominals>
<CharacteristicItems>
  <LengthCharacteristicItem id="7">
    <Name>1 inch Ceramic Gage Block</Name>
    <MeasurementDeviceIds N="1">
      <Id>1</Id>
    </MeasurementDeviceIds>
    <CharacteristicNominalId>4</CharacteristicNominalId>
  </LengthCharacteristicItem>
  <LengthCharacteristicItem id="8">
    <Name>3 inch Ceramic Gage Block</Name>
    <MeasurementDeviceIds N="1">
      <Id>1</Id>
    </MeasurementDeviceIds>
    <CharacteristicNominalId>5</CharacteristicNominalId>
  </LengthCharacteristicItem>
  <LengthCharacteristicItem id="9">
    <Name>5 inch Ceramic Gage Block</Name>
    <MeasurementDeviceIds N="1">
      <Id>1</Id>
    </MeasurementDeviceIds>
    <CharacteristicNominalId>6</CharacteristicNominalId>
  </LengthCharacteristicItem>
</CharacteristicItems>
</Characteristics>
<MeasurementsResults>
  <MeasurementResults id="1">
    <MeasuredCharacteristics>
      <CharacteristicActuals>
        <LengthCharacteristicActual id="1">
          <Status>
            <CharacteristicStatusEnum>PASS</CharacteristicStatusEnum>
          </Status>
          <CharacteristicItemId>7</CharacteristicItemId>
          <Value>1.0000</Value>
        </LengthCharacteristicActual>
        <LengthCharacteristicActual id="2">
          <Status>
            <CharacteristicStatusEnum>PASS</CharacteristicStatusEnum>
          </Status>
          <CharacteristicItemId>8</CharacteristicItemId>
          <Value>3.0000</Value>
        </LengthCharacteristicActual>
        <LengthCharacteristicActual id="3">
          <Status>
            <CharacteristicStatusEnum>PASS</CharacteristicStatusEnum>
          </Status>
          <CharacteristicItemId>9</CharacteristicItemId>

```



```

    <Value>5.0000</Value>
  </LengthCharacteristicActual>
</CharacteristicActuals>
</MeasuredCharacteristics>
<InspectionStatus>
  <InspectionStatusEnum>PASS</InspectionStatusEnum>
</InspectionStatus>
</MeasurementResults>
</MeasurementsResults>
<Statistics>
  <StatisticalStudiesResults>
    <BiasStudyResults id="1">
      <Status>
        <StatsEvalStatusEnum>INFORMATIONAL</StatsEvalStatusEnum>
      </Status>
      <CharacteristicsStats>
        <LengthCharacteristicStats>
          <Status>
            <StatsEvalStatusEnum>INFORMATIONAL</StatsEvalStatusEnum>
          </Status>
          <ValueStats>
            <RelativeEquipmentVariation>0.000000</RelativeEquipmentVariation>
          </ValueStats>
        </LengthCharacteristicStats>
      </CharacteristicsStats>
      <SampleSize>3</SampleSize>
    </BiasStudyResults>
  </StatisticalStudiesResults>
</Statistics>
</QIFDocument>

```

The structure above can be logically described as follows:

1. The measurement device (a caliper) is defined in the **MeasurementResources** *element*.
2. The characteristic names (1 inch, 3 inch, 5 inch Gage Blocks as length characteristics) and tolerance values are defined in the **CharacteristicDefinitions** *element*.
3. The characteristic target value is defined in the **CharacteristicNominals** *element* and the tolerance is indicated by a reference to the characteristic definition.
4. The characteristic names are further expressed in the **LengthCharacteristicItem** *elements* with references to the characteristic nominals and also references to the measurement device.
5. The actual measurement values are identified in the **MeasurementResults** section with references to the characteristic Items.
6. The detailed statistical results of the bias study are defined in the **BiasStudyResults** *element*.

Annex A – Location of QIFStatistics.xsd schema file

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

Annex B - Graphical conventions of the data dictionary

(informative)

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

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

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

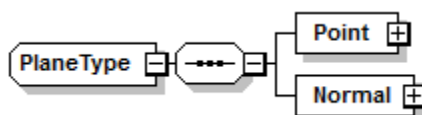


Figure B.1 – Notation for a type definition, *PlaneType*.

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

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

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

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

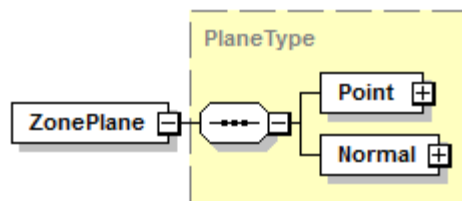


Figure B.2 – Reuse of the type definition *PlaneType* to generate element *ZonePlane*.

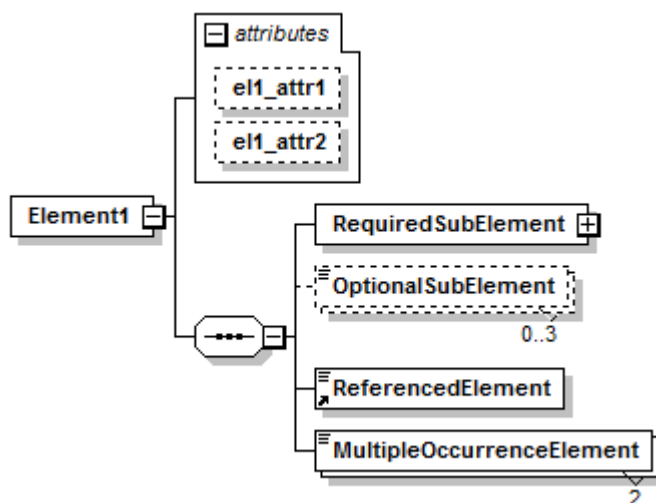


Figure B.3 – Notation for *elements*, *sub-elements*, and *attributes*.

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

Figure B.4 shows an example *element* definition where exactly one of the three sub-*element* choices must be given. The beveled box with three square dots and a "switch" line (⎓) indicate the XSDL *choice* structure. When **Element2** is instantiated in an XML instance file, it must have exactly one sub-*element* chosen among the three sub-*elements* shown.

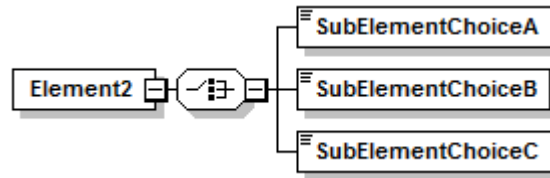


Figure B.4 – The *choice* of notation.

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

Annex C – QIFStatistics.xsd data dictionary

(normative)

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

Complex types

[BiasStudyPlanType](#)
[BiasStudyResultsType](#)
[CapabilityStudyPlanType](#)
[CapabilityStudyResultsType](#)
[ControlMethodType](#)
[CorrectiveActionPlansType](#)
[CorrectiveActionPlanType](#)
[FirstArticleStudyPlanType](#)
[FirstArticleStudyResultsType](#)
[GageRandRStudyPlanType](#)
[GageRandRStudyResultsType](#)
[LinearityStudyPlanType](#)
[LinearityStudyResultsType](#)
[MultipleProductInstanceStudyPlanBaseType](#)
[MultipleProductInstanceStudyResultsBaseType](#)
[ProcessDifferenceStudyPlanType](#)
[ProcessDifferenceStudyResultsType](#)
[ProductionStudyPlanType](#)
[ProductionStudyResultsType](#)
[SimpleStudyPlanType](#)
[SimpleStudyResultsType](#)
[StabilityStudyPlanType](#)
[StabilityStudyResultsType](#)
[StatisticalStudiesResultsType](#)
[StatisticalStudyPlanBaseType](#)
[StatisticalStudyPlansType](#)
[StatisticalStudyResultsBaseType](#)
[StatisticsType](#)

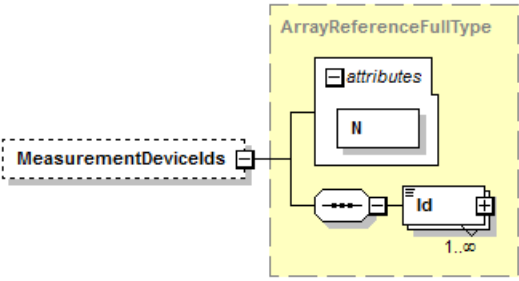
Simple types

[GageRandRStudyEnumType](#)

complexType **BiasStudyPlanType**

diagram						
type	extension of MultipleProductInstanceStudyPlanBaseType					
properties	base MultipleProductInstanceStudyPlanBaseType					
children	Attributes ThisStatisticalStudyPlanInstanceQPId FeatureItemIds CalculateAverageFeatures CharacteristicItemIds StatsValuesPerChar StatsValuesPerSubgroup StatsValuesSummary PreInspectionTraceability Name Description PlanId CorrectiveActionPlanId NumberOfSamples SubgroupSize MeasurementDeviceIds					
used by	element BiasStudyPlan					
attributes	Name id	Type QIFIdType	Use required	Default	Fixed	Annotation documentation The id attribute is the QIF id of the statistical study, used for referencing.
annotation	documentation The BiasStudyPlanType defines information that is related to a bias statistical study where the bias (measured value versus actual value) of a measurement system is determined.					

element **BiasStudyPlanType/MeasurementDevicelds**


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 MeasurementDevicelds element is a list of the ids of one or more measurement devices in the measurement system to be studied.					

complexType **BiasStudyResultsType**

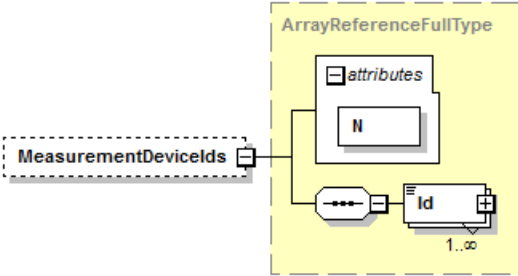
diagram						
type	extension of StatisticalStudyResultsBaseType					
properties	base StatisticalStudyResultsBaseType					
children	Attributes ThisStatisticalStudyResultsInstanceQPid Status StudyIssue InspectionTraceability Name Description StudyId ResultsId ResultsQPid ResultsFile AverageFeature CharacteristicsStats LinearStatsSummary AngularStatsSummary AreaStatsSummary ForceStatsSummary MassStatsSummary PressureStatsSummary SpeedStatsSummary TemperatureStatsSummary TimeStatsSummary UserDefinedUnitStatsSummary StatsSummary SampleSize MeasurementDevicelds					
used by	element BiasStudyResults					
attributes	Name id	Type QIFIdType	Use required	Default	Fixed	Annotation documentation

		The id attribute is the QIF id of the statistical study results, used for referencing.
annotation	documentation The BiasStudyResultsType defines the results from a bias statistical study where the bias (measured value versus actual value) of a measurement device was determined.	

element **BiasStudyResultsType/SampleSize**

diagram		
type	xs:positiveInteger	
properties	content	simple
annotation	documentation The SampleSize element specifies the number of samples n used in the statistical study.	

element **BiasStudyResultsType/MeasurementDevicelds**

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 MeasurementDevicelds element is a list of the ids of one or more measurement devices in the measurement system to be studied.					

complexType **CapabilityStudyPlanType**

diagram						
type	extension of MultipleProductInstanceStudyPlanBaseType					
properties	base MultipleProductInstanceStudyPlanBaseType					
children	Attributes ThisStatisticalStudyPlanInstancQPIId FeatureItemIds CalculateAverageFeatures CharacteristicItemIds StatsValuesPerChar StatsValuesPerSubgroup StatsValuesSummary PreInspectionTraceability Name Description PlanId CorrectiveActionPlanId NumberOfSamples SubgroupSize CpkThreshold PpkThreshold					
used by	element CapabilityStudyPlan					
attributes	Name id	Type QIFIdType	Use required	Default	Fixed	Annotation documentation The id attribute is the QIF id of the statistical study, used for referencing.

annotation	documentation The CapabilityStudyPlanType defines information that is related to a capability statistical study where a number of part samples are measured to establish the capability of a manufacturing process.
------------	--

element **CapabilityStudyPlanType/CpkThreshold**

diagram	
type	CriterionDecimalType
properties	content complex
children	Limit NumberAllowedExceptions ExtremeLimit
annotation	documentation The CpkThreshold element defines the minimum Cpk value that must be achieved for a process to be considered capable.

element **CapabilityStudyPlanType/PpkThreshold**

diagram	
type	CriterionDecimalType
properties	content complex
children	Limit NumberAllowedExceptions ExtremeLimit
annotation	documentation The PpkThreshold element defines the minimum Ppk value that must be achieved for a process to be considered capable.

complexType **CapabilityStudyResultsType**

diagram	<p>MultipleProductInstanceStudyResultsBaseType (extension)</p> <p>Attributes</p> <p>id</p> <p>Status</p> <p>StudyIssue</p> <p>InspectionTraceability</p> <p>Name</p> <p>Description</p> <p>StudyId</p> <p>ResultsId</p> <p>ResultsQPid</p> <p>ResultsFile</p> <p>AverageFeature</p> <p>CharacteristicsStats</p> <p>LinearStatsSummary</p> <p>AngularStatsSummary</p> <p>AreaStatsSummary</p> <p>ForceStatsSummary</p> <p>MassStatsSummary</p> <p>PressureStatsSummary</p> <p>SpeedStatsSummary</p> <p>TemperatureStatsSummary</p> <p>TimeStatsSummary</p> <p>UserDefinedUnitStatsSummary</p> <p>StatsSummary</p> <p>NumberOfSamples</p> <p>SubgroupSize</p> <p>CapabilityStudyResultsType</p>					
type	extension of MultipleProductInstanceStudyResultsBaseType					
properties	base MultipleProductInstanceStudyResultsBaseType					
children	Attributes ThisStatisticalStudyResultsInstanceQPid Status StudyIssue InspectionTraceability Name Description StudyId ResultsId ResultsQPid ResultsFile AverageFeature CharacteristicsStats LinearStatsSummary AngularStatsSummary AreaStatsSummary ForceStatsSummary MassStatsSummary PressureStatsSummary SpeedStatsSummary TemperatureStatsSummary TimeStatsSummary UserDefinedUnitStatsSummary StatsSummary NumberOfSamples SubgroupSize					
used by	element CapabilityStudyResults					
attributes	Name	Type	Use	Default	Fixed	Annotation
	id	QIFIdType	required			documentation

		The id attribute is the QIF id of the statistical study results, used for referencing.
annotation	documentation The CapabilityStudyResultsType defines information that is related to the results of a capability statistical study where a number of part samples were measured to establish the capability of a manufacturing process.	

complexType ControlMethodType

diagram						
children	AssignableCauseId NumOutOfTolerance CpThreshold CpkThreshold PpThreshold PpkThreshold NumOutOfControl TrendGrouping SkewGrouping OneThirdGrouping TwoThirdsGrouping Oscillation Stratification NumOutOfControlRng					
used by	element	ProductionStudyPlanType/ControlMethod				
attributes	Name	Type	Use	Default	Fixed	Annotation
	id	QIFIdType	required			documentation The id attribute is the QIF id of the control method, used for referencing.
annotation	documentation The ControlMethodType defines the control method for detecting statistical process control issues.					

attribute **ControlMethodType/@id**

type	QIFIdType
properties	use required
annotation	documentation The id attribute is the QIF id of the control method, used for referencing.

element **ControlMethodType/AssignableCauseId**

diagram						
type	QIFReferenceFullType					
properties	minOcc	0	maxOcc	unbounded	content	complex
attributes	Name asmPath	Type QIFIdType	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 Each optional AssignableCauseId element is the QIF id of a possible assignable cause for this control issue.					

element **ControlMethodType/NumOutOfTolerance**

diagram	<pre>graph LR NumOutOfTolerance[NumOutOfTolerance] --- C1(()) C1 --- Limit[Limit] C1 --- C2(()) C2 --- NumberAllowedExceptions[NumberAllowedExceptions] NumberAllowedExceptions --- ExtremeLimit[ExtremeLimit]</pre>
type	CriterionIntegerType
properties	content complex
children	Limit NumberAllowedExceptions ExtremeLimit
annotation	documentation The NumOutOfTolerance element defines the number of characteristic values that must exceed upper or lower specification limit for a control issue to exist.

element **ControlMethodType/CpThreshold**

diagram	
type	CriterionDecimalType
properties	content complex
children	Limit NumberAllowedExceptions ExtremeLimit
annotation	documentation The CpThreshold element defines the Cp threshold below which a control issue might exist.

element **ControlMethodType/CpkThreshold**

diagram	
type	CriterionDecimalType
properties	content complex
children	Limit NumberAllowedExceptions ExtremeLimit
annotation	documentation The CpkThreshold element defines the Cpk threshold below which a control issue might exist.

element **ControlMethodType/PpThreshold**

diagram	
type	CriterionDecimalType
properties	content complex
children	Limit NumberAllowedExceptions ExtremeLimit
annotation	documentation The PpThreshold element defines the Pp threshold below which a control issue might exist.

element **ControlMethodType/PpkThreshold**

diagram	
type	CriterionDecimalType
properties	content complex
children	Limit NumberAllowedExceptions ExtremeLimit
annotation	documentation The PpkThreshold element defines the Ppk threshold below which a control issue might exist.

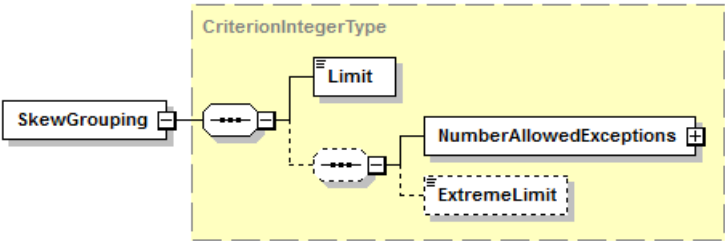
element **ControlMethodType/NumOutOfControl**

diagram	
type	CriterionIntegerType
properties	content complex
children	Limit NumberAllowedExceptions ExtremeLimit
annotation	documentation The NumOutOfControl element defines the number of characteristic values that must exceed upper or lower control limits for a control issue to exist.

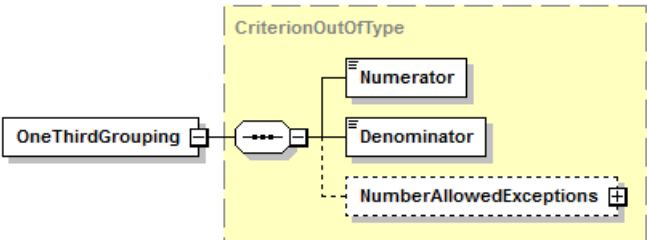
element **ControlMethodType/TrendGrouping**

diagram	
type	CriterionIntegerType
properties	content complex
children	Limit NumberAllowedExceptions ExtremeLimit
annotation	documentation The TrendGrouping element defines the number of adjacent characteristic measurements that must be trending either up or down as a group for a control issue to exist. Common practice is to flag a control issue when 6 or more measurements are trending.

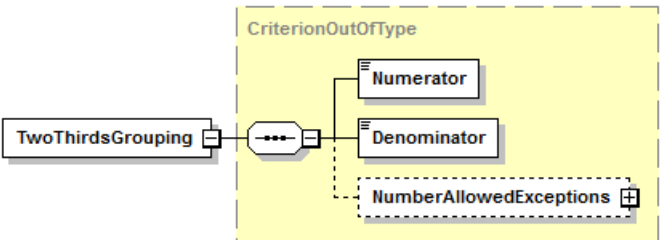
element **ControlMethodType/SkewGrouping**

diagram	 <p>The diagram shows the SkewGrouping element connected to a dashed box labeled CriterionIntegerType. Inside this box, SkewGrouping is linked to a Limit element, which is then linked to a NumberAllowedExceptions element. An ExtremeLimit element is also shown within the box, connected to the NumberAllowedExceptions element.</p>
type	CriterionIntegerType
properties	content complex
children	Limit NumberAllowedExceptions ExtremeLimit
annotation	<p>documentation</p> <p>The SkewGrouping element defines the number of adjacent characteristic measurements that must be grouped on one side of the mean for a control issue to exist. Common practice is to flag a control issue when 8 or more measurements are skewed to one side of the mean.</p>

element **ControlMethodType/OneThirdGrouping**

diagram	 <p>The diagram shows the OneThirdGrouping element connected to a dashed box labeled CriterionOutOfType. Inside this box, OneThirdGrouping is linked to a Numerator element, which is then linked to a Denominator element. A NumberAllowedExceptions element is also shown within the box, connected to the Denominator element.</p>
type	CriterionOutOfType
properties	content complex
children	Numerator Denominator NumberAllowedExceptions
annotation	<p>documentation</p> <p>The OneThirdGrouping element defines the fraction of adjacent characteristic measurements that must deviate from the mean by one third or more of the difference between a control limit and the mean and all on the same side of the mean for a control issue to exist. Common practice is to flag a control issue when 4 or more out of 5 measurements are one third or more of the way from the mean to the control limit and on one side of the mean.</p>

element **ControlMethodType/TwoThirdsGrouping**

diagram	 <p>The diagram shows the TwoThirdsGrouping element connected to a dashed box labeled CriterionOutOfType. Inside this box, TwoThirdsGrouping is linked to a Numerator element, which is then linked to a Denominator element. A NumberAllowedExceptions element is also shown within the box, connected to the Denominator element.</p>
type	CriterionOutOfType
properties	content complex

children	Numerator Denominator NumberAllowedExceptions
annotation	<p>documentation</p> <p>The TwoThirdsGrouping element defines the fraction of adjacent characteristic measurements that must deviate from the mean by two thirds or more of the difference between a control limit and the mean and all on the same side of the mean for a control issue to exist. Common practice is to flag a control issue when 2 or more out of 3 measurements are two thirds or more of the way from the mean to the control limit and on one side of the mean.</p>

element **ControlMethodType/Oscillation**

diagram	
type	CriterionOutOfType
properties	content complex
children	Numerator Denominator NumberAllowedExceptions
annotation	<p>documentation</p> <p>The Oscillation element defines the fraction of adjacent characteristic measurements that must deviate alternately from the one side of the mean to the other side of the mean for an oscillation control issue to exist.</p>

element **ControlMethodType/Stratification**

diagram	
type	CriterionOutOfType
properties	content complex
children	Numerator Denominator NumberAllowedExceptions
annotation	<p>documentation</p> <p>The Stratification element defines the fraction of adjacent characteristic measurements that must deviate from the mean by one third or more of the difference between a control limit and the mean and on either side of the mean for a control issue to exist.</p>

element **ControlMethodType/NumOutOfControlRng**

diagram	
type	CriterionIntegerType
properties	content complex
children	Limit NumberAllowedExceptions ExtremeLimit
annotation	<p>documentation</p> <p>The NumOutOfControlRng element defines the number of characteristic subgroup ranges that must exceed upper or lower control range limits for a control issue to exist.</p>

complexType **CorrectiveActionPlansType**

diagram	
children	CorrectiveActionPlan
used by	element StatisticsType/CorrectiveActionPlans
annotation	<p>documentation</p> <p>The CorrectiveActionPlansType defines a list of corrective action plans.</p>

element **CorrectiveActionPlansType/CorrectiveActionPlan**

diagram													
type	CorrectiveActionPlanType												
properties	<table><tr><td>minOcc</td><td>1</td></tr><tr><td>maxOcc</td><td>unbounded</td></tr><tr><td>content</td><td>complex</td></tr></table>	minOcc	1	maxOcc	unbounded	content	complex						
minOcc	1												
maxOcc	unbounded												
content	complex												
children	AssignableCauses CorrectiveActions												
attributes	<table><tr><th>Name</th><th>Type</th><th>Use</th><th>Default</th><th>Fixed</th><th>Annotation</th></tr><tr><td>id</td><td>QIFIdType</td><td>required</td><td></td><td></td><td>documentation The id attribute is the QIF id of the corrective action plan, used for referencing.</td></tr></table>	Name	Type	Use	Default	Fixed	Annotation	id	QIFIdType	required			documentation The id attribute is the QIF id of the corrective action plan, used for referencing.
Name	Type	Use	Default	Fixed	Annotation								
id	QIFIdType	required			documentation The id attribute is the QIF id of the corrective action plan, used for referencing.								

annotation	documentation Each CorrectiveActionPlan element defines a corrective action plan.
------------	--

complexType **CorrectiveActionPlanType**

diagram						
children	AssignableCauses CorrectiveActions					
used by	element	CorrectiveActionPlansType/CorrectiveActionPlan				
attributes	Name	Type	Use	Default	Fixed	Annotation
	id	QIFIdType	required			documentation The id attribute is the QIF id of the corrective action plan, used for referencing.
annotation	documentation The CorrectiveActionPlanType defines a corrective action plan as lists of assignable causes and corrective actions.					

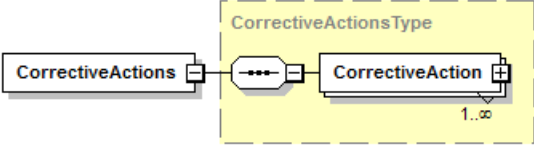
attribute **CorrectiveActionPlanType/@id**

type	QIFIdType
properties	use required
annotation	documentation The id attribute is the QIF id of the corrective action plan, used for referencing.

element **CorrectiveActionPlanType/AssignableCauses**

diagram	<pre>classDiagram class AssignableCausesType class AssignableCause AssignableCausesType "1" *-- "1..∞" AssignableCause</pre>
type	AssignableCausesType
properties	content complex
children	AssignableCause
annotation	documentation The AssignableCauses element defines one or more assignable causes.

element **CorrectiveActionPlanType/CorrectiveActions**


diagram	
type	CorrectiveActionsType
properties	content complex
children	CorrectiveAction
annotation	documentation The CorrectiveActions element defines one or more corrective actions.

complexType **FirstArticleStudyPlanType**

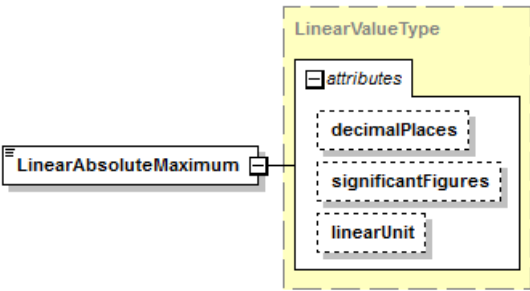
diagram	
type	extension of StatisticalStudyPlanBaseType
properties	base StatisticalStudyPlanBaseType
children	Attributes ThisStatisticalStudyPlanInstanceQPID FeatureItemIds CalculateAverageFeatures CharacteristicItemIds StatsValuesPerChar StatsValuesPerSubgroup StatsValuesSummary PreInspectionTraceability Name Description PlanId CorrectiveActionPlanId InSpecRatio LinearAbsoluteMaximum AngularAbsoluteMaximum AreaAbsoluteMaximum ForceAbsoluteMaximum MassAbsoluteMaximum PressureAbsoluteMaximum SpeedAbsoluteMaximum TemperatureAbsoluteMaximum TimeAbsoluteMaximum UserDefinedUnitAbsoluteMaximum RelativeMaximum
used by	element FirstArticleStudyPlan

attributes	Name id	Type QIFIdType	Use required	Default	Fixed	Annotation documentation The id attribute is the QIF id of the statistical study, used for referencing.
annotation	documentation The FirstArticleStudyPlanType defines information that is related to a first article statistical study where the number and severity of non- conforming characteristics determines product acceptance.					

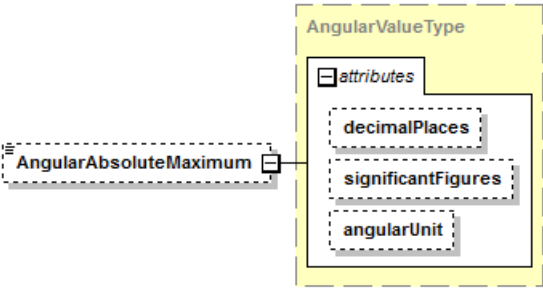
element **FirstArticleStudyPlanType/InSpecRatio**

diagram						
type	xs:decimal					
properties	content simple					
annotation	documentation The InSpecRatio element specifies the fraction of inspected characteristics which must be within specification limits for the product to pass expressed as a number between 0 and 1.					

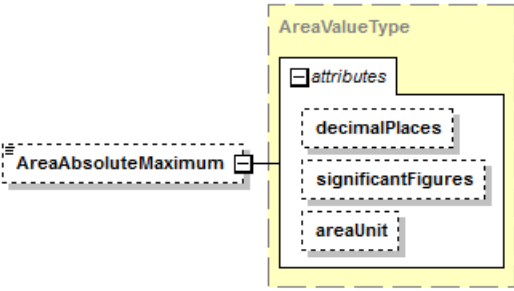
element **FirstArticleStudyPlanType/LinearAbsoluteMaximum**

diagram						
type	LinearValueType					
properties	content complex					
attributes	Name decimalPlaces	Type xs:nonNegativeInteger	Use	Default	Fixed	Annotation documentation See documentation of SpecifiedDecimalType. documentation See documentation of SpecifiedDecimalType. documentation The optional linearUnit attribute defines the UnitName for the LinearValueType.
	significantFigures	xs:nonNegativeInteger				
	linearUnit	xs:token				
annotation	documentation The LinearAbsoluteMaximum element defines the maximum allowable absolute deviation from nominal for out-of-specification linear characteristics.					

element **FirstArticleStudyPlanType/AngularAbsoluteMaximum**

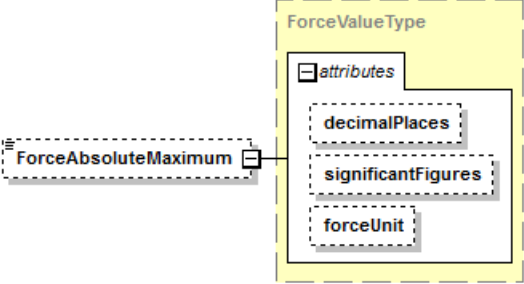
diagram						
type	AngularValueType					
properties	minOcc	0	maxOcc	1	content	complex
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	angularUnit	xs:token				documentation The optional angularUnit attribute defines the UnitName for the AngularValueType.
annotation	documentation The optional AngularAbsoluteMaximum element defines the maximum allowable absolute deviation from nominal for out-of-specification angular characteristics.					

element **FirstArticleStudyPlanType/AreaAbsoluteMaximum**

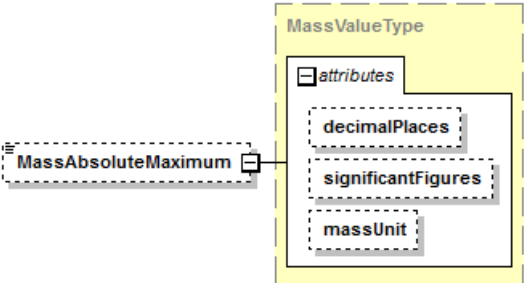
diagram						
type	AreaValueType					
properties	minOcc	0	maxOcc	1	content	complex
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	areaUnit	xs:token				documentation The optional areaUnit attribute defines the UnitName for the

	AreaValueType.
annotation	documentation The optional AreaAbsoluteMaximum element defines the maximum allowable absolute deviation from nominal for out-of-specification area characteristics.

element **FirstArticleStudyPlanType/ForceAbsoluteMaximum**

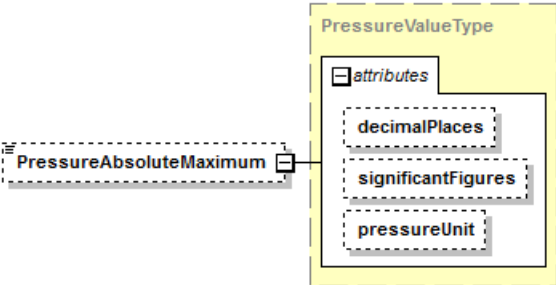
diagram						
type	ForceValueType					
properties	minOcc	0				
	maxOcc	1				
	content	complex				
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	forceUnit	xs:token				documentation The optional forceUnit attribute defines the UnitName for the ForceValueType.
annotation	documentation The optional ForceAbsoluteMaximum element defines the maximum allowable absolute deviation from nominal for out-of-specification force characteristics.					

element **FirstArticleStudyPlanType/MassAbsoluteMaximum**

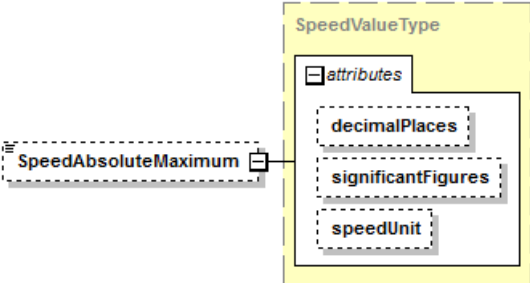
diagram						
type	MassValueType					
properties	minOcc	0				
	maxOcc	1				
	content	complex				
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.

	<p>significantFigures xs:nonNegativeInteger</p> <p>massUnit xs:token</p>	<p>documentation See documentation of SpecifiedDecimalType. documentation The optional massUnit attribute defines the UnitName for the MassValueType.</p>
annotation	<p>documentation The optional MassAbsoluteMaximum element defines the maximum allowable absolute deviation from nominal for out-of-specification mass characteristics.</p>	

element **FirstArticleStudyPlanType/PressureAbsoluteMaximum**

diagram						
type	PressureValueType					
properties	minOcc	0				
	maxOcc	1				
	content	complex				
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType. documentation
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType. documentation
	pressureUnit	xs:token				documentation The optional pressureUnit attribute defines the UnitName for the PressureValueType.
annotation	<p>documentation The optional PressureAbsoluteMaximum element defines the maximum allowable absolute deviation from nominal for out-of-specification pressure characteristics.</p>					

element **FirstArticleStudyPlanType/SpeedAbsoluteMaximum**

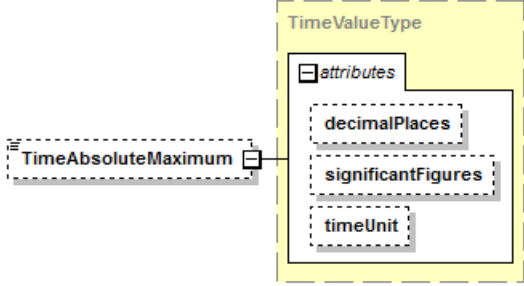
diagram						
type	SpeedValueType					

properties	minOcc 0 maxOcc 1 content complex					
attributes	<div> <div>Name</div> <div>decimalPlaces</div> </div> <div> <div>Type</div> <div>xs:nonNegativeInteger</div> </div> <div>Use</div> <div>Default</div> <div>Fixed</div> <div>Annotation</div> <div>documentation</div> <div>See documentation of SpecifiedDecimalType.</div> <div>documentation</div> <div>See documentation of SpecifiedDecimalType.</div> <div>documentation</div> <div>The optional speedUnit attribute defines the UnitName for the SpeedValueType.</div>					
annotation	documentation The optional SpeedAbsoluteMaximum element defines the maximum allowable absolute deviation from nominal for out-of-specification speed characteristics.					

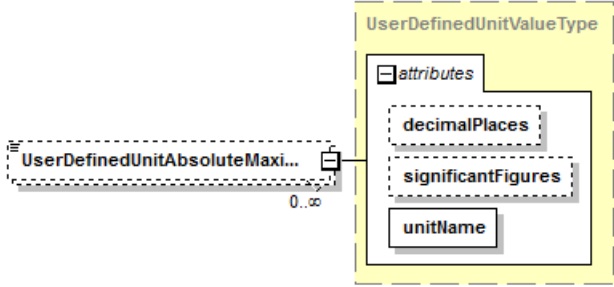
element FirstArticleStudyPlanType/TemperatureAbsoluteMaximum

diagram	<pre> classDiagram class TemperatureAbsoluteMaximum { decimalPlaces xs:nonNegativeInteger significantFigures xs:nonNegativeInteger temperatureUnit xs:token } class TemperatureValueType { decimalPlaces xs:nonNegativeInteger significantFigures xs:nonNegativeInteger temperatureUnit xs:token } TemperatureAbsoluteMaximum -- > TemperatureValueType </pre>					
type	TemperatureValueType					
properties	minOcc 0 maxOcc 1 content complex					
attributes	<div> <div>Name</div> <div>decimalPlaces</div> </div> <div> <div>Type</div> <div>xs:nonNegativeInteger</div> </div> <div>Use</div> <div>Default</div> <div>Fixed</div> <div>Annotation</div> <div>documentation</div> <div>See documentation of SpecifiedDecimalType.</div> <div>documentation</div> <div>See documentation of SpecifiedDecimalType.</div> <div>documentation</div> <div>The optional temperatureUnit attribute defines the UnitName for the TemperatureValueType.</div>					
annotation	documentation The optional TemperatureAbsoluteMaximum element defines the maximum allowable absolute deviation from nominal for out-of-specification temperature characteristics.					

element **FirstArticleStudyPlanType/TimeAbsoluteMaximum**

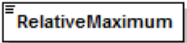
diagram						
type	TimeValueType					
properties	minOcc	0	maxOcc	1	content	complex
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	timeUnit	xs:token				documentation The optional timeUnit attribute defines the UnitName for the TimeValueType.
annotation	documentation The optional TimeAbsoluteMaximum element defines the maximum allowable absolute deviation from nominal for out-of-specification time characteristics.					

element **FirstArticleStudyPlanType/UserDefinedUnitAbsoluteMaximum**

diagram						
type	UserDefinedUnitValueType					
properties	minOcc	0	maxOcc	unbounded	content	complex
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	unitName	xs:token	required			documentation The (required) UnitName attribute is the unit name for the UserDefinedUnitValueType.

annotation	<p>documentation</p> <p>Each optional UserDefinedUnitAbsoluteMaximum element defines the maximum allowable absolute deviation from nominal for out-of-specification user defined unit characteristics. This element is not to be used to define a maximum with units available in another element. In particular this element is not to be used to define a maximum with linear units, angular units, or units of temperature, area, force, mass, pressure, speed, or time.</p>
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element **FirstArticleStudyPlanType/RelativeMaximum**

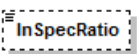
diagram	
type	xs:decimal
properties	content simple
annotation	<p>documentation</p> <p>The RelativeMaximum element defines the maximum allowable deviation for out of specification characteristics as a multiple of the tolerance zone.</p>

complexType **FirstArticleStudyResultsType**

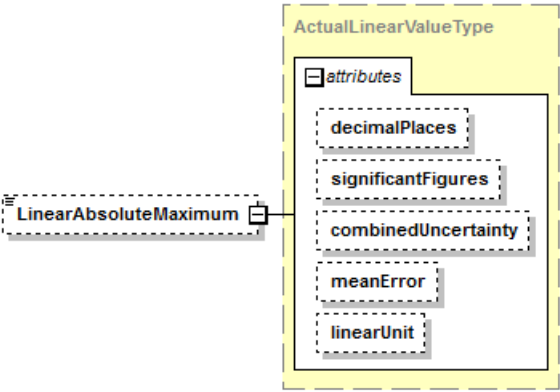
diagram	
type	extension of StatisticalStudyResultsBaseType
properties	base <code>StatisticalStudyResultsBaseType</code>
children	Attributes ThisStatisticalStudyResultsInstanceQPId Status StudyIssue InspectionTraceability Name Description StudyId ResultId ResultsQPid ResultsFile AverageFeature CharacteristicsStats LinearStatsSummary AngularStatsSummary AreaStatsSummary ForceStatsSummary MassStatsSummary PressureStatsSummary SpeedStatsSummary TemperatureStatsSummary TimeStatsSummary UserDefinedUnitStatsSummary StatsSummary InSpecRatio LinearAbsoluteMaximum AngularAbsoluteMaximum AreaAbsoluteMaximum ForceAbsoluteMaximum MassAbsoluteMaximum PressureAbsoluteMaximum SpeedAbsoluteMaximum TemperatureAbsoluteMaximum TimeAbsoluteMaximum UserDefinedUnitAbsoluteMaximum RelativeMaximum

used by	element FirstArticleStudyResults					
attributes	Name id	Type QIFIdType	Use required	Default	Fixed	Annotation documentation The id attribute is the QIF id of the statistical study results, used for referencing.
annotation	documentation The FirstArticleStudyResultsType defines information that is related the to the results of a first article statistical study where the number and severity of non-conforming characteristics determined product acceptance.					

element **FirstArticleStudyResultsType/InSpecRatio**

diagram						
type	xs:decimal					
properties	minOcc	0	maxOcc	1	content	simple
annotation	documentation The optional InSpecRatio element is the fraction of inspected characteristics which were within specification limits expressed as a number between 0 and 1.					

element **FirstArticleStudyResultsType/LinearAbsoluteMaximum**

diagram						
type	ActualLinearValueType					
properties	minOcc	0	maxOcc	1	content	complex
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty

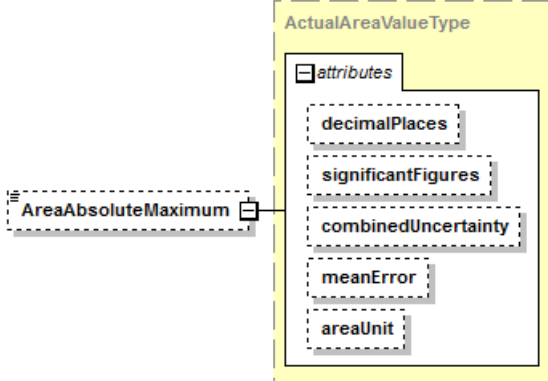
	<p>meanError NonNegativeDecimalType</p> <p>linearUnit xs:token</p>	<p>assigned to the SpecifiedDecimalType. documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType. documentation The optional linearUnit attribute defines the unit used by LinearValueType.</p>
annotation	documentation The optional LinearAbsoluteMaximum element defines the worst absolute linear deviation from nominal over all characteristics.	

element **FirstArticleStudyResultsType/AngularAbsoluteMaximum**

diagram						
type	ActualAngularValueType					
properties	minOcc	0	maxOcc	1	content	complex
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the
	meanError	NonNegativeDecimalType				SpecifiedDecimalType. documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.
	angularUnit	xs:token				documentation The optional angularUnit attribute defines the unit used by ActualAngularValueType.

annotation	documentation The optional AngularAbsoluteMaximum element defines the worst absolute angular deviation from nominal over all characteristics.
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element **FirstArticleStudyResultsType/AreaAbsoluteMaximum**

diagram						
type	ActualAreaValueType					
properties	minOcc	0				
	maxOcc	1				
	content	complex				
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.
	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.
	areaUnit	xs:token				documentation The optional areaUnit attribute defines the unit used by ActualAreaValueType.
annotation	documentation The optional AreaAbsoluteMaximum element defines the worst absolute area deviation from nominal over all characteristics.					

element **FirstArticleStudyResultsType/ForceAbsoluteMaximum**

diagram						
type	ActualForceValueType					
properties	minOcc	0				
	maxOcc	1				
	content	complex				
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.
	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.
	forceUnit	xs:token				documentation The optional forceUnit attribute defines the unit used by ActualForceValueType.
annotation	documentation The optional ForceAbsoluteMaximum element defines the worst absolute force deviation from nominal over all characteristics.					

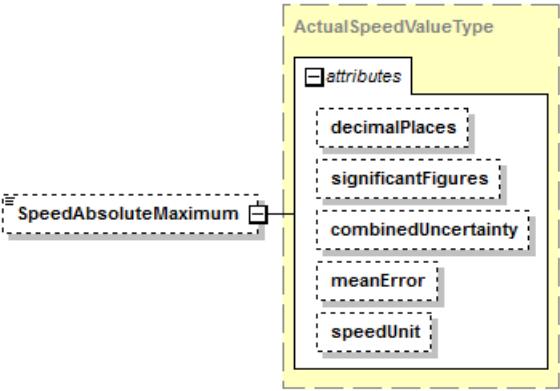
element **FirstArticleStudyResultsType/MassAbsoluteMaximum**

diagram						
type	ActualMassValueType					
properties	minOcc	0				
	maxOcc	1				
	content	complex				
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.
	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.
	massUnit	xs:token				documentation The optional massUnit attribute defines the unit used by ActualMassValueType.
annotation	documentation The optional MassAbsoluteMaximum element defines the worst absolute mass deviation from nominal over all characteristics.					

element **FirstArticleStudyResultsType/PressureAbsoluteMaximum**

diagram						
type	ActualPressureValueType					
properties	minOcc	0				
	maxOcc	1				
	content	complex				
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.
	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.
	pressureUnit	xs:token				documentation The optional pressureUnit attribute defines the UnitName for the ActualPressureValueType.
annotation	documentation The optional PressureAbsoluteMaximum element defines the worst absolute pressure deviation from nominal over all characteristics.					

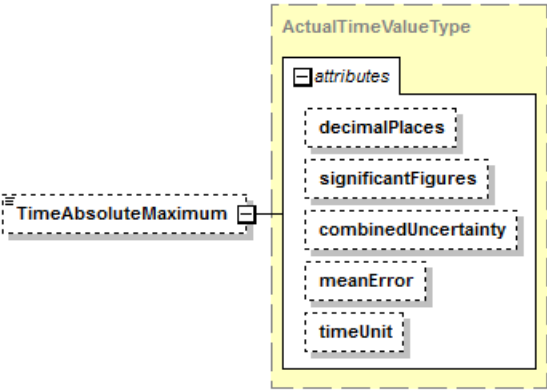
element **FirstArticleStudyResultsType/SpeedAbsoluteMaximum**

diagram						
type	ActualSpeedValueType					
properties	minOcc	0				
	maxOcc	1				
	content	complex				
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.
	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.
	speedUnit	xs:token				documentation The optional speedUnit attribute defines the UnitName for the ActualSpeedValueType.
annotation	documentation The optional SpeedAbsoluteMaximum element defines the worst absolute speed deviation from nominal over all characteristics.					

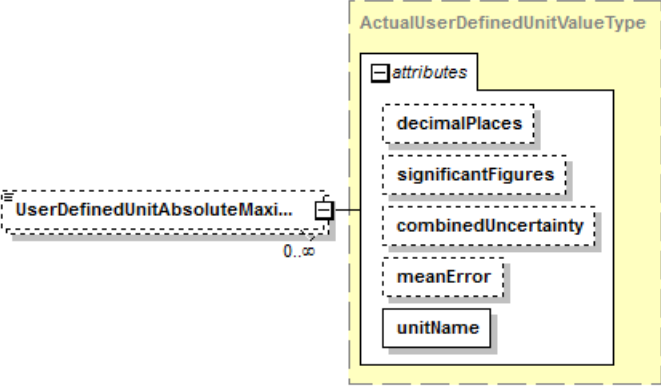
element **FirstArticleStudyResultsType/TemperatureAbsoluteMaximum**

diagram						
type	ActualTemperatureValueType					
properties	minOcc	0				
	maxOcc	1				
	content	complex				
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.
	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.
	temperatureUnit	xs:token				documentation The optional temperatureUnit attribute defines the UnitName for the TemperatureValueType.
annotation	documentation The optional TemperatureAbsoluteMaximum element defines the worst absolute temperature deviation from nominal over all characteristics.					

element **FirstArticleStudyResultsType/TimeAbsoluteMaximum**

diagram						
type	ActualTimeValueType					
properties	minOcc	0				
	maxOcc	1				
	content	complex				
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.
	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.
	timeUnit	xs:token				documentation The optional timeUnit attribute defines the UnitName for the TimeValueType.
annotation	documentation The optional TimeAbsoluteMaximum element defines the worst absolute time deviation from nominal over all characteristics.					

element **FirstArticleStudyResultsType/UserDefinedUnitAbsoluteMaximum**

diagram						
type	ActualUserDefinedUnitValueType					
properties	minOcc	0	maxOcc	unbounded	content	complex
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.
	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.
	unitName	xs:token	required			documentation The (required) UnitName attribute is the unit name for the UserDefinedUnitValueType.
annotation	documentation Each optional UserDefinedUnitAbsoluteMaximum element is the worst1 absolute deviation from nominal over all user-defined unit characteristics with a particular set of units. This element is not to be used to define an actual with units available in another element. In particular this element is not to be used to define an actual with linear units, angular units, or units of temperature, area, force, mass, pressure, speed, or time.					

element **FirstArticleStudyResultsType/RelativeMaximum**

diagram						
type	ActualDecimalType					
properties	minOcc	0				
	maxOcc	1				
	content	complex				
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.
	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.
annotation	documentation The optional RelativeMaximum element is the worst relative deviation from nominal over all characteristics					

complexType **GageRandRStudyPlanType**

diagram	
type	extension of StatisticalStudyPlanBaseType
properties	base StatisticalStudyPlanBaseType
children	Attributes ThisStatisticalStudyPlanInstanceQID FeatureItemIds CalculateAverageFeatures CharacteristicItemIds StatsValuesPerChar StatsValuesPerSubgroup StatsValuesSummary PreInspectionTraceability Name Description PlanId CorrectiveActionPlanId MeasurementDeviceIds RandRStudyType NumberOfAppraisers NumberOfParts NumberOfTrials MaximumRelativeAppraiserVariation MaximumAbsoluteLinearAppraiserVariation MaximumAbsoluteAngularAppraiserVariation MaximumAbsoluteAreaAppraiserVariation MaximumAbsoluteForceAppraiserVariation MaximumAbsoluteMassAppraiserVariation MaximumAbsolutePressureAppraiserVariation MaximumAbsoluteSpeedAppraiserVariation MaximumAbsoluteTemperatureAppraiserVariation MaximumAbsoluteTimeAppraiserVariation MaximumAbsoluteUserDefinedUnitAppraiserVariation

	MaximumRelativeEquipmentVariation MaximumAbsoluteLinearEquipmentVariation MaximumAbsoluteAngularEquipmentVariation MaximumAbsoluteAreaEquipmentVariation MaximumAbsoluteForceEquipmentVariation MaximumAbsoluteMassEquipmentVariation MaximumAbsolutePressureEquipmentVariation MaximumAbsoluteSpeedEquipmentVariation MaximumAbsoluteTemperatureEquipmentVariation MaximumAbsoluteTimeEquipmentVariation MaximumAbsoluteUserDefinedUnitEquipmentVariation MaximumRelativeTotalRandR MaximumAbsoluteLinearTotalRandR MaximumAbsoluteAngularTotalRandR MaximumAbsoluteAreaTotalRandR MaximumAbsoluteForceTotalRandR MaximumAbsoluteMassTotalRandR MaximumAbsolutePressureTotalRandR MaximumAbsoluteSpeedTotalRandR MaximumAbsoluteTemperatureTotalRandR MaximumAbsoluteTimeTotalRandR MaximumAbsoluteUserDefinedUnitTotalRandR					
used by	element GageRandRStudyPlan					
attributes	Name id	Type QIFIdType	Use required	Default	Fixed	Annotation documentation The id attribute is the QIF id of the statistical study, used for referencing.
annotation	documentation The GageRandRStudyPlanType defines information that is related to a gage repeatability and reproducibility statistical study where a number of part samples are repeatedly measured by two or more appraisers to establish the repeatability and reproducibility of a measurement process.					

element **GageRandRStudyPlanType/MeasurementDevicelds**


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 MeasurementDevicelds element is a list of the ids of one or more measurement devices in the measurement system to be studied.					

element **GageRandRStudyPlanType/RandRStudyType**

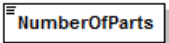
diagram						
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type	GageRandRStudyEnumType		
properties	content	simple	
facets	Kind	Value	Annotation
	enumeration	RANGE	
	enumeration	AVGANDRANGE	
	enumeration	ANOVA	
annotation	documentation The RandRStudyType element defines the type of the gage RandR study type.		


element **GageRandRStudyPlanType/NumberOfAppraisers**

diagram	
type	xs:positiveInteger
properties	content simple
annotation	<p>documentation</p> <p>The NumberOfAppraisers element defines the number of appraisers taking part in the study.</p>

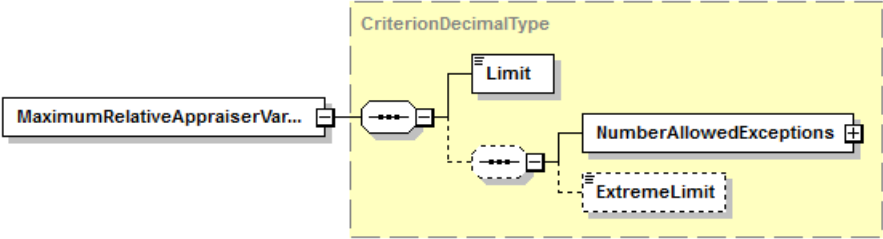
element **GageRandRStudyPlanType/NumberOfParts**

diagram	
type	xs:positiveInteger
properties	content simple
annotation	<div>documentation</div> <div>The NumberOfParts element defines the number of parts to be used in the study.</div>

element **GageRandRStudyPlanType/NumberOfTrials**

diagram	
type	xs:positiveInteger
properties	content simple
annotation	documentation The NumberOfTrials element defines the number of times each part is to be measured by each appraiser.

element **GageRandRStudyPlanType/MaximumRelativeAppraiserVariation**

diagram			
type	CriterionDecimalType		

properties	content complex
children	Limit NumberAllowedExceptions ExtremeLimit
annotation	documentation The MinimumRelativeAppraiserVariation element defines the maximum appraiser variation allowed for the gage RandR study to pass.

element **GageRandRStudyPlanType/MaximumAbsoluteLinearAppraiserVariation**

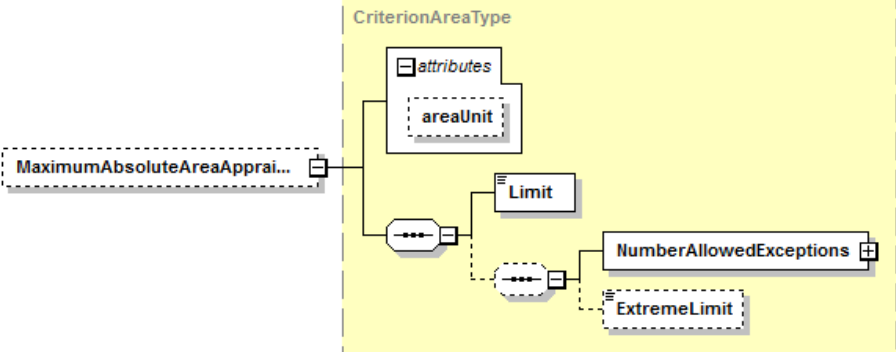
diagram						
type	CriterionLinearType					
properties	minOcc	0	maxOcc	1	content	complex
children	Limit NumberAllowedExceptions ExtremeLimit					
attributes	Name	Type	Use	Default	Fixed	Annotation
	linearUnit	xs:token				documentation The optional linearUnit attribute defines the UnitName for the CriterionLinearType.
annotation	documentation The optional MaximumAbsoluteLinearAppraiserVariation element defines the maximum appraiser variation allowed for linear characteristics for the gage RandR study to pass.					

element **GageRandRStudyPlanType/MaximumAbsoluteAngularAppraiserVariation**

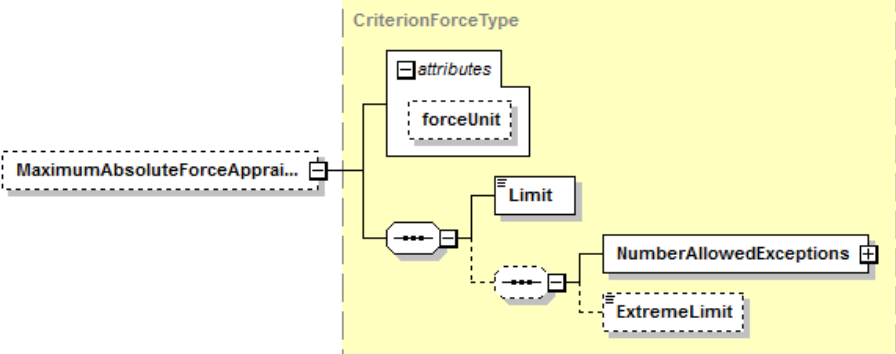
diagram						
type	CriterionAngularType					
properties	minOcc	0	maxOcc	1	content	complex

children	Limit NumberAllowedExceptions ExtremeLimit					
attributes	Name angularUnit	Type xs:token	Use	Default	Fixed	Annotation documentation The optional angularUnit attribute defines the UnitName for the CriterionAngularType.
annotation	documentation The optional MaximumAbsoluteAngularAppraiserVariation element defines the maximum appraiser variation allowed for angular characteristics for the gage RandR study to pass.					

element **GageRandRStudyPlanType/MaximumAbsoluteAreaAppraiserVariation**

diagram						
type	CriterionAreaType					
properties	minOcc	0	maxOcc	1	content	complex
children	Limit NumberAllowedExceptions ExtremeLimit					
attributes	Name areaUnit	Type xs:token	Use	Default	Fixed	Annotation documentation The optional areaUnit attribute defines the UnitName for the CriterionAreaType.
annotation	documentation The optional MaximumAbsoluteAreaAppraiserVariation element defines the maximum appraiser variation allowed for area characteristics for the gage RandR study to pass.					

element **GageRandRStudyPlanType/MaximumAbsoluteForceAppraiserVariation**

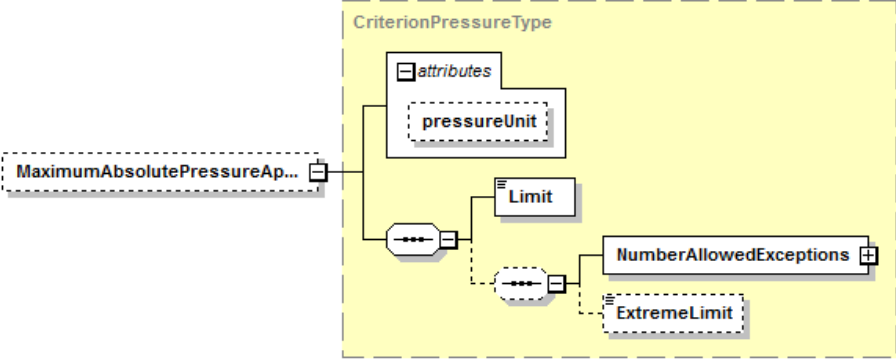
diagram						
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type	CriterionForceType					
properties	minOcc	0	maxOcc	1	content	complex
children	Limit NumberAllowedExceptions ExtremeLimit					
attributes	Name forceUnit	Type xs:token	Use	Default	Fixed	Annotation documentation The optional forceUnit attribute defines the UnitName for the CriterionForceType.
annotation	documentation The optional MaximumAbsoluteForceAppraiserVariation element defines the maximum appraiser variation allowed for force characteristics for the gage RandR study to pass.					

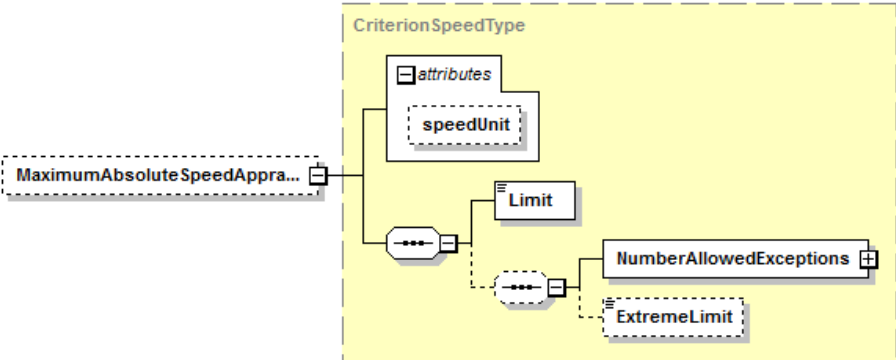
element **GageRandRStudyPlanType/MaximumAbsoluteMassAppraiserVariation**

diagram						
type	CriterionMassType					
properties	minOcc	0	maxOcc	1	content	complex
children	Limit NumberAllowedExceptions ExtremeLimit					
attributes	Name massUnit	Type xs:token	Use	Default	Fixed	Annotation documentation The optional massUnit attribute defines the UnitName for the CriterionMassType.
annotation	documentation The optional MaximumAbsoluteMassAppraiserVariation element defines the maximum appraiser variation allowed for mass characteristics for the gage RandR study to pass.					

element **GageRandRStudyPlanType/MaximumAbsolutePressureAppraiserVariation**

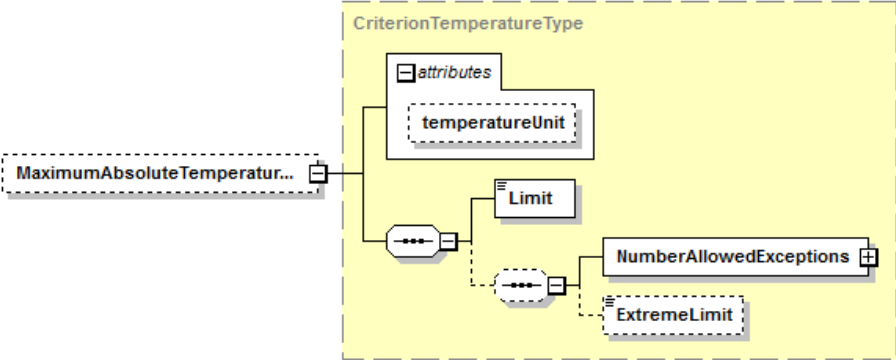
diagram						
type	CriterionPressureType					
properties	minOcc	0	maxOcc	1	content	complex
children	Limit NumberAllowedExceptions ExtremeLimit					
attributes	Name	Type	Use	Default	Fixed	Annotation
	pressureUnit	xs:token				documentation The optional pressureUnit attribute defines the UnitName for the CriterionPressureType.
annotation	documentation The optional MaximumAbsolutePressureAppraiserVariation element defines the maximum appraiser variation allowed for pressure characteristics for the gage RandR study to pass.					

element **GageRandRStudyPlanType/MaximumAbsoluteSpeedAppraiserVariation**

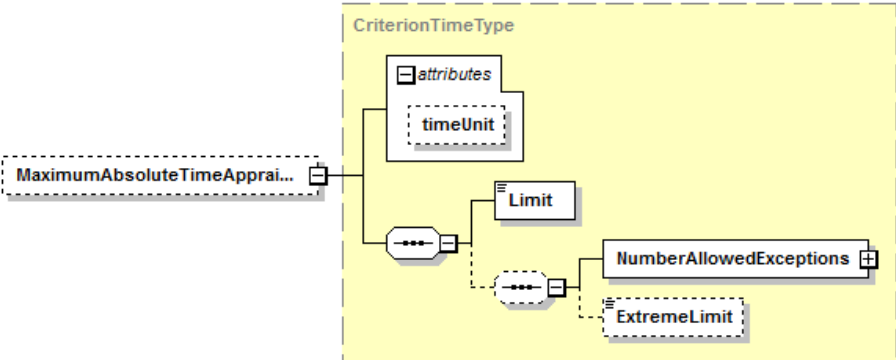
diagram						
type	CriterionSpeedType					
properties	minOcc	0	maxOcc	1	content	complex
children	Limit NumberAllowedExceptions ExtremeLimit					
attributes	Name	Type	Use	Default	Fixed	Annotation
	speedUnit	xs:token				documentation The optional speedUnit attribute defines the UnitName for the CriterionSpeedType.

annotation	documentation The optional MaximumAbsoluteSpeedAppraiserVariation element defines the maximum appraiser variation allowed for speed characteristics for the gage RandR study to pass.
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element **GageRandRStudyPlanType/MaximumAbsoluteTemperatureAppraiserVariation**

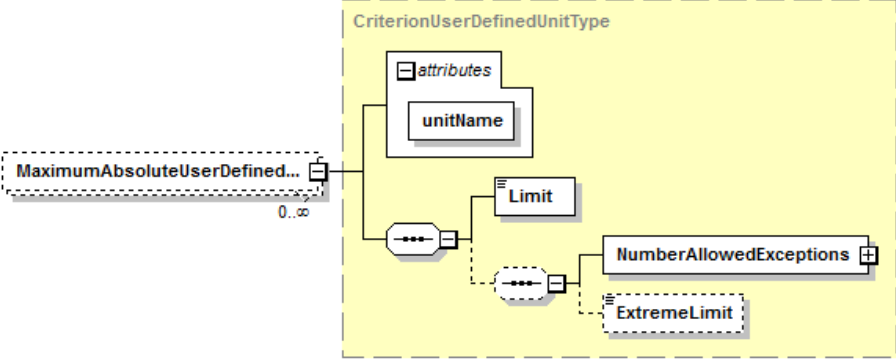
diagram	 <p>The diagram shows the structure of the MaximumAbsoluteTemperatureAppraiserVariation element. It is a dashed box containing a solid box labeled MaximumAbsoluteTemperatureAppraiserVariation. This solid box is connected to a dashed box labeled CriterionTemperatureType. Inside CriterionTemperatureType, there is an attributes box containing a temperatureUnit box. Below attributes is a Limit box. Below Limit is a dashed box containing a NumberAllowedExceptions box and an ExtremeLimit box. The MaximumAbsoluteTemperatureAppraiserVariation box is connected to the Limit box and the NumberAllowedExceptions box.</p>					
type	CriterionTemperatureType					
properties	minOcc	0	maxOcc	1	content	complex
children	Limit NumberAllowedExceptions ExtremeLimit					
attributes	Name	Type	Use	Default	Fixed	Annotation
	temperatureUnit	xs:token				documentation The optional temperatureUnit attribute defines the UnitName for the CriterionTemperatureType.
annotation	documentation	The optional MaximumAbsoluteTemperatureAppraiserVariation element defines the maximum appraiser variation allowed for temperature characteristics for the gage RandR study to pass.				

element **GageRandRStudyPlanType/MaximumAbsoluteTimeAppraiserVariation**

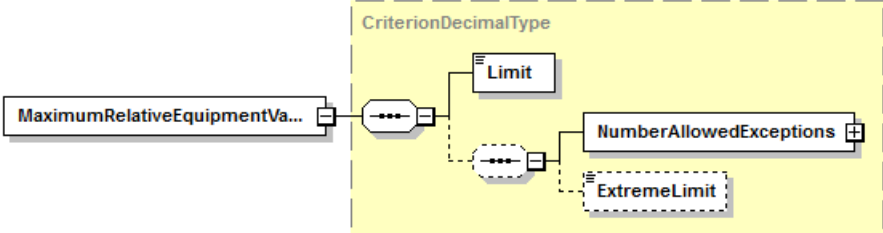
diagram	 <p>The diagram shows the structure of the MaximumAbsoluteTimeAppraiserVariation element. It is a dashed box containing a solid box labeled MaximumAbsoluteTimeAppraiserVariation. This solid box is connected to a dashed box labeled CriterionTimeType. Inside CriterionTimeType, there is an attributes box containing a timeUnit box. Below attributes is a Limit box. Below Limit is a dashed box containing a NumberAllowedExceptions box and an ExtremeLimit box. The MaximumAbsoluteTimeAppraiserVariation box is connected to the Limit box and the NumberAllowedExceptions box.</p>					
type	CriterionTimeType					
properties	minOcc	0	maxOcc	1	content	complex
children	Limit NumberAllowedExceptions ExtremeLimit					
attributes	Name	Type	Use	Default	Fixed	Annotation
	timeUnit	xs:token				documentation

		The optional timeUnit attribute defines the UnitName for the CriterionTimeType.
annotation	documentation The optional MaximumAbsoluteTimeAppraiserVariation element defines the maximum appraiser variation allowed for time characteristics for the gage RandR study to pass.	

element **GageRandRStudyPlanType/MaximumAbsoluteUserDefinedUnitAppraiserVariation**

diagram						
type	CriterionUserDefinedUnitType					
properties	minOcc	0	maxOcc	unbounded	content	complex
children	Limit NumberAllowedExceptions ExtremeLimit					
attributes	Name	Type	Use	Default	Fixed	Annotation
	unitName	xs:token	required			documentation The (required) unitName attribute is the unit name for the CriterionUserDefinedUnitType.
annotation	documentation	Each optional MaximumAbsoluteUserDefinedUnitAppraiserVariation element defines the maximum appraiser variation allowed for user defined unit characteristics for the gage RandR study to pass. This element is not to be used to define a maximum with units available in another element. In particular this element is not to be used to define a maximum with linear units, angular units, or units of temperature, area, force, mass, pressure, speed, or time.				

element **GageRandRStudyPlanType/MaximumRelativeEquipmentVariation**

diagram	
type	CriterionDecimalType
properties	content complex
children	Limit NumberAllowedExceptions ExtremeLimit
annotation	documentation

	The MinimumRelativeEquipmentVariation element defines the maximum equipment variation allowed for the gage RandR study to pass.
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element **GageRandRStudyPlanType/MaximumAbsoluteLinearEquipmentVariation**

diagram						
type	CriterionLinearType					
properties	minOcc	0	maxOcc	1	content	complex
children	Limit NumberAllowedExceptions ExtremeLimit					
attributes	Name	Type	Use	Default	Fixed	Annotation
	linearUnit	xs:token				documentation The optional linearUnit attribute defines the UnitName for the CriterionLinearType.
annotation	documentation The optional MaximumAbsoluteLinearEquipmentVariation element defines the maximum equipment variation allowed for linear characteristics for the gage RandR study to pass.					

element **GageRandRStudyPlanType/MaximumAbsoluteAngularEquipmentVariation**

diagram						
type	CriterionAngularType					
properties	minOcc	0	maxOcc	1	content	complex
children	Limit NumberAllowedExceptions ExtremeLimit					
attributes	Name	Type	Use	Default	Fixed	Annotation
	angularUnit	xs:token				documentation The optional

		angularUnit attribute defines the UnitName for the CriterionAngularType.
annotation	documentation The optional MaximumAbsoluteAngularEquipmentVariation element defines the maximum equipment variation allowed for angular characteristics for the gage RandR study to pass.	

element **GageRandRStudyPlanType/MaximumAbsoluteAreaEquipmentVariation**

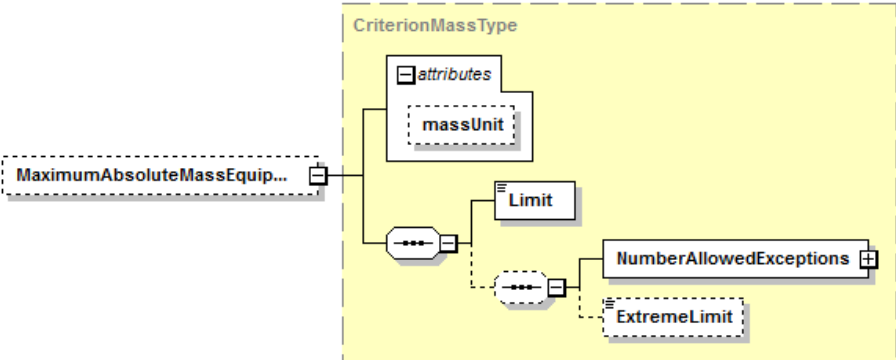
diagram						
type	CriterionAreaType					
properties	minOcc	0	maxOcc	1	content	complex
children	Limit NumberAllowedExceptions ExtremeLimit					
attributes	Name	Type	Use	Default	Fixed	Annotation
	areaUnit	xs:token				documentation The optional areaUnit attribute defines the UnitName for the CriterionAreaType.
annotation	documentation The optional MaximumAbsoluteAreaEquipmentVariation element defines the maximum equipment variation allowed for area characteristics for the gage RandR study to pass.					

element **GageRandRStudyPlanType/MaximumAbsoluteForceEquipmentVariation**

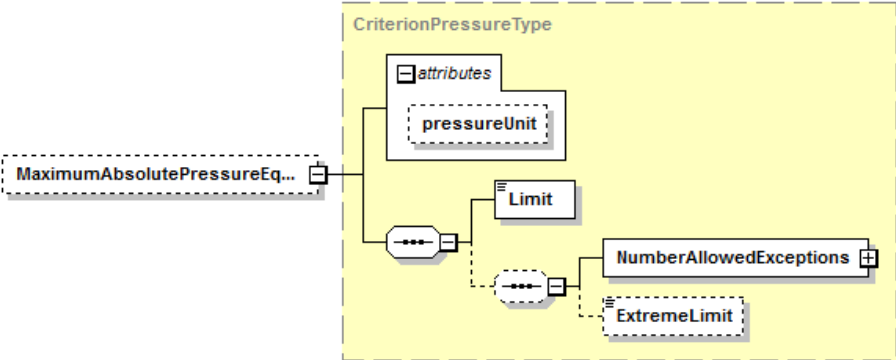
diagram						
type	CriterionForceType					
properties	minOcc	0	maxOcc	1	content	complex

children	Limit NumberAllowedExceptions ExtremeLimit					
attributes	Name forceUnit	Type xs:token	Use	Default	Fixed	Annotation documentation The optional forceUnit attribute defines the UnitName for the CriterionForceType.
annotation	documentation The optional MaximumAbsoluteForceEquipmentVariation element defines the maximum equipment variation allowed for force characteristics for the gage RandR study to pass.					

element **GageRandRStudyPlanType/MaximumAbsoluteMassEquipmentVariation**

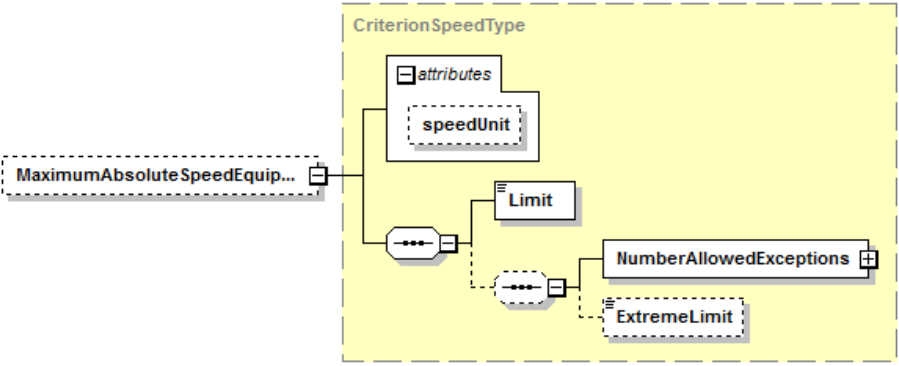
diagram	 <p>The diagram shows the structure of the MaximumAbsoluteMassEquipmentVariation element. It is a dashed box containing a solid box labeled 'MaximumAbsoluteMassEquip...'. This solid box has an 'attributes' section with 'massUnit'. It also has a 'Limit' section with a 'Limit' element. The 'Limit' element has a 'NumberAllowedExceptions' section with 'NumberAllowedExceptions' and 'ExtremeLimit' elements. The entire structure is enclosed in a yellow dashed box labeled 'CriterionMassType'.</p>					
type	CriterionMassType					
properties	minOcc	0	maxOcc	1	content	complex
children	Limit NumberAllowedExceptions ExtremeLimit					
attributes	Name massUnit	Type xs:token	Use	Default	Fixed	Annotation documentation The optional massUnit attribute defines the UnitName for the CriterionMassType.
annotation	documentation The optional MaximumAbsoluteMassEquipmentVariation element defines the maximum equipment variation allowed for mass characteristics for the gage RandR study to pass.					

element **GageRandRStudyPlanType/MaximumAbsolutePressureEquipmentVariation**

diagram	 <p>The diagram shows the structure of the MaximumAbsolutePressureEquipmentVariation element. It is a dashed box containing a solid box labeled 'MaximumAbsolutePressureEq...'. This solid box has an 'attributes' section with 'pressureUnit'. It also has a 'Limit' section with a 'Limit' element. The 'Limit' element has a 'NumberAllowedExceptions' section with 'NumberAllowedExceptions' and 'ExtremeLimit' elements. The entire structure is enclosed in a yellow dashed box labeled 'CriterionPressureType'.</p>					
type	CriterionPressureType					
properties	minOcc	0	maxOcc	1	content	complex
children	Limit NumberAllowedExceptions ExtremeLimit					
attributes	Name pressureUnit	Type xs:token	Use	Default	Fixed	Annotation documentation The optional pressureUnit attribute defines the UnitName for the CriterionPressureType.
annotation	documentation The optional MaximumAbsolutePressureEquipmentVariation element defines the maximum equipment variation allowed for pressure characteristics for the gage RandR study to pass.					

type	CriterionPressureType					
properties	minOcc	0	maxOcc	1	content	complex
children	Limit NumberAllowedExceptions ExtremeLimit					
attributes	Name pressureUnit	Type xs:token	Use	Default	Fixed	Annotation documentation The optional pressureUnit attribute defines the UnitName for the CriterionPressureType.
annotation	documentation The optional MaximumAbsolutePressureEquipmentVariation element defines the maximum equipment variation allowed for pressure characteristics for the gage RandR study to pass.					

element **GageRandRStudyPlanType/MaximumAbsoluteSpeedEquipmentVariation**

diagram						
type	CriterionSpeedType					
properties	minOcc	0	maxOcc	1	content	complex
children	Limit NumberAllowedExceptions ExtremeLimit					
attributes	Name speedUnit	Type xs:token	Use	Default	Fixed	Annotation documentation The optional speedUnit attribute defines the UnitName for the CriterionSpeedType.
annotation	documentation The optional MaximumAbsoluteSpeedEquipmentVariation element defines the maximum equipment variation allowed for speed characteristics for the gage RandR study to pass.					

element GageRandRStudyPlanType/MaximumAbsoluteTemperatureEquipmentVariation

diagram						
type	CriterionTemperatureType					
properties	minOcc	0	maxOcc	1	content	complex
children	Limit NumberAllowedExceptions ExtremeLimit					
attributes	Name	Type	Use	Default	Fixed	Annotation
	temperatureUnit	xs:token				documentation The optional temperatureUnit attribute defines the UnitName for the CriterionTemperatureType.
annotation	documentation The optional MaximumAbsoluteTemperatureEquipmentVariation element defines the maximum equipment variation allowed for temperature characteristics for the gage RandR study to pass.					

element GageRandRStudyPlanType/MaximumAbsoluteTimeEquipmentVariation

diagram						
type	CriterionTimeType					
properties	minOcc	0	maxOcc	1	content	complex
children	Limit NumberAllowedExceptions ExtremeLimit					
attributes	Name	Type	Use	Default	Fixed	Annotation
	timeUnit	xs:token				documentation The optional timeUnit attribute defines the UnitName for the CriterionTimeType.

annotation	documentation The optional MaximumAbsoluteTimeEquipmentVariation element defines the maximum equipment variation allowed for time characteristics for the gage RandR study to pass.
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element **GageRandRStudyPlanType/MaximumAbsoluteUserDefinedUnitEquipmentVariation**

diagram						
type	CriterionUserDefinedUnitType					
properties	minOcc	0	maxOcc	unbounded	content	complex
children	Limit NumberAllowedExceptions ExtremeLimit					
attributes	Name	Type	Use	Default	Fixed	Annotation
	unitName	xs:token	required			documentation The (required) unitName attribute is the unit name for the CriterionUserDefinedUnitType.
annotation	documentation Each optional MaximumAbsoluteUserDefinedUnitEquipmentVariation element defines the maximum equipment variation allowed for user defined unit characteristics for the gage RandR study to pass. This element is not to be used to define a maximum with linear units, angular units, or units of temperature, area, force, mass, pressure, speed, or time.					

element **GageRandRStudyPlanType/MaximumRelativeTotalRandR**

diagram	
type	CriterionDecimalType
properties	content complex
children	Limit NumberAllowedExceptions ExtremeLimit
annotation	documentation The MinimumRelativeTotalRandR element defines the maximum total RandR allowed for the gage RandR study to pass.

element **GageRandRStudyPlanType/MaximumAbsoluteLinearTotalRandR**

diagram	<pre>graph LR subgraph CriterionLinearType direction TB attributes[attributes] --- linearUnit[linearUnit] Limit[Limit] NumberAllowedExceptions[NumberAllowedExceptions] ExtremeLimit[ExtremeLimit] Limit --- NumberAllowedExceptions Limit --- ExtremeLimit end MaximumAbsoluteLinearTotalR[MaximumAbsoluteLinearTotalR...] --- Limit</pre>						
type	CriterionLinearType						
properties	minOcc	0	maxOcc	1	content	complex	
children	Limit NumberAllowedExceptions ExtremeLimit						
attributes	Name	Type	Use	Default	Fixed	Annotation	
	linearUnit	xs:token				documentation The optional linearUnit attribute defines the UnitName for the CriterionLinearType.	
annotation	documentation The optional MaximumAbsoluteLinearTotalRandR element defines the maximum total RandR allowed for linear characteristics for the gage RandR study to pass.						

element **GageRandRStudyPlanType/MaximumAbsoluteAngularTotalRandR**

diagram	<pre>graph LR subgraph CriterionAngularType attributes[attributes] angularUnit[angularUnit] Limit[Limit] NumberAllowedExceptions[NumberAllowedExceptions] ExtremeLimit[ExtremeLimit] end MaximumAbsoluteAngularTota...[MaximumAbsoluteAngularTota...] --- Limit Limit --- ExtremeLimit ExtremeLimit --- NumberAllowedExceptions</pre>					
type	CriterionAngularType					
properties	minOcc	0	maxOcc	1	content	complex
children	Limit NumberAllowedExceptions ExtremeLimit					
attributes	Name	Type	Use	Default	Fixed	Annotation
	angularUnit	xs:token				documentation The optional angularUnit attribute defines the UnitName for the CriterionAngularType.

annotation	documentation The optional MaximumAbsoluteAngularTotalRandR element defines the maximum total RandR allowed for angular characteristics for the gage RandR study to pass.
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element **GageRandRStudyPlanType/MaximumAbsoluteAreaTotalRandR**

diagram						
type	CriterionAreaType					
properties	minOcc	0	maxOcc	1	content	complex
children	Limit NumberAllowedExceptions ExtremeLimit					
attributes	Name	Type	Use	Default	Fixed	Annotation
	areaUnit	xs:token				documentation The optional areaUnit attribute defines the UnitName for the CriterionAreaType.
annotation	documentation The optional MaximumAbsoluteAreaTotalRandR element defines the maximum total RandR allowed for area characteristics for the gage RandR study to pass.					

element **GageRandRStudyPlanType/MaximumAbsoluteForceTotalRandR**

diagram						
type	CriterionForceType					
properties	minOcc	0	maxOcc	1	content	complex
children	Limit NumberAllowedExceptions ExtremeLimit					
attributes	Name	Type	Use	Default	Fixed	Annotation
	forceUnit	xs:token				documentation

		The optional forceUnit attribute defines the UnitName for the CriterionForceType.
annotation	documentation The optional MaximumAbsoluteForceTotalRandR element defines the maximum total RandR allowed for force characteristics for the gage RandR study to pass.	

element **GageRandRStudyPlanType/MaximumAbsoluteMassTotalRandR**

diagram						
type	CriterionMassType					
properties	minOcc	0	maxOcc	1	content	complex
children	Limit NumberAllowedExceptions ExtremeLimit					
attributes	Name	Type	Use	Default	Fixed	Annotation
	massUnit	xs:token				documentation The optional massUnit attribute defines the UnitName for the CriterionMassType.
annotation	documentation The optional MaximumAbsoluteMassTotalRandR element defines the maximum total RandR allowed for mass characteristics for the gage RandR study to pass.					

element **GageRandRStudyPlanType/MaximumAbsolutePressureTotalRandR**

diagram						
type	CriterionPressureType					
properties	minOcc	0	maxOcc	1		

	content complex					
children	Limit NumberAllowedExceptions ExtremeLimit					
attributes	Name pressureUnit	Type xs:token	Use	Default	Fixed	Annotation documentation The optional pressureUnit attribute defines the UnitName for the CriterionPressureType.
annotation	documentation The optional MaximumAbsolutePressureTotalRandR element defines the maximum total RandR allowed for pressure characteristics for the gage RandR study to pass.					

element **GageRandRStudyPlanType/MaximumAbsoluteSpeedTotalRandR**

diagram						
type	CriterionSpeedType					
properties	minOcc	0	maxOcc	1	content	complex
children	Limit NumberAllowedExceptions ExtremeLimit					
attributes	Name speedUnit	Type xs:token	Use	Default	Fixed	Annotation documentation The optional speedUnit attribute defines the UnitName for the CriterionSpeedType.
annotation	documentation The optional MaximumAbsoluteSpeedTotalRandR element defines the maximum total RandR allowed for speed characteristics for the gage RandR study to pass.					

element **GageRandRStudyPlanType/MaximumAbsoluteTemperatureTotalRandR**

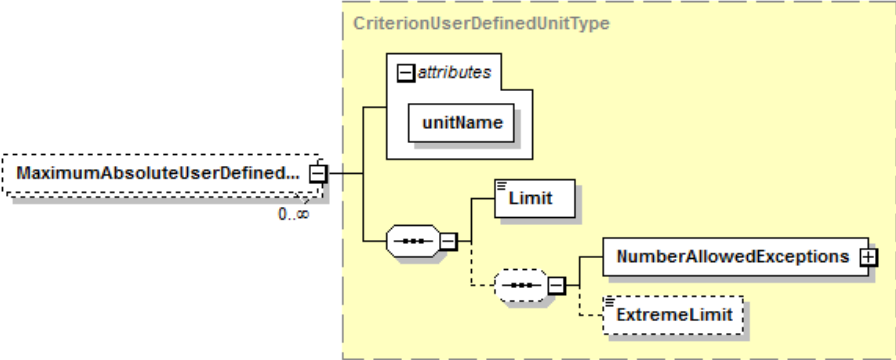
diagram						
type	CriterionTemperatureType					
properties	minOcc	0	maxOcc	1	content	complex
children	Limit NumberAllowedExceptions ExtremeLimit					
attributes	Name	Type	Use	Default	Fixed	Annotation
	temperatureUnit	xs:token				documentation The optional temperatureUnit attribute defines the UnitName for the CriterionTemperatureType.
annotation	documentation The optional MaximumAbsoluteTemperatureTotalRandR element defines the maximum total RandR allowed for temperature characteristics for the gage RandR study to pass.					

element **GageRandRStudyPlanType/MaximumAbsoluteTimeTotalRandR**

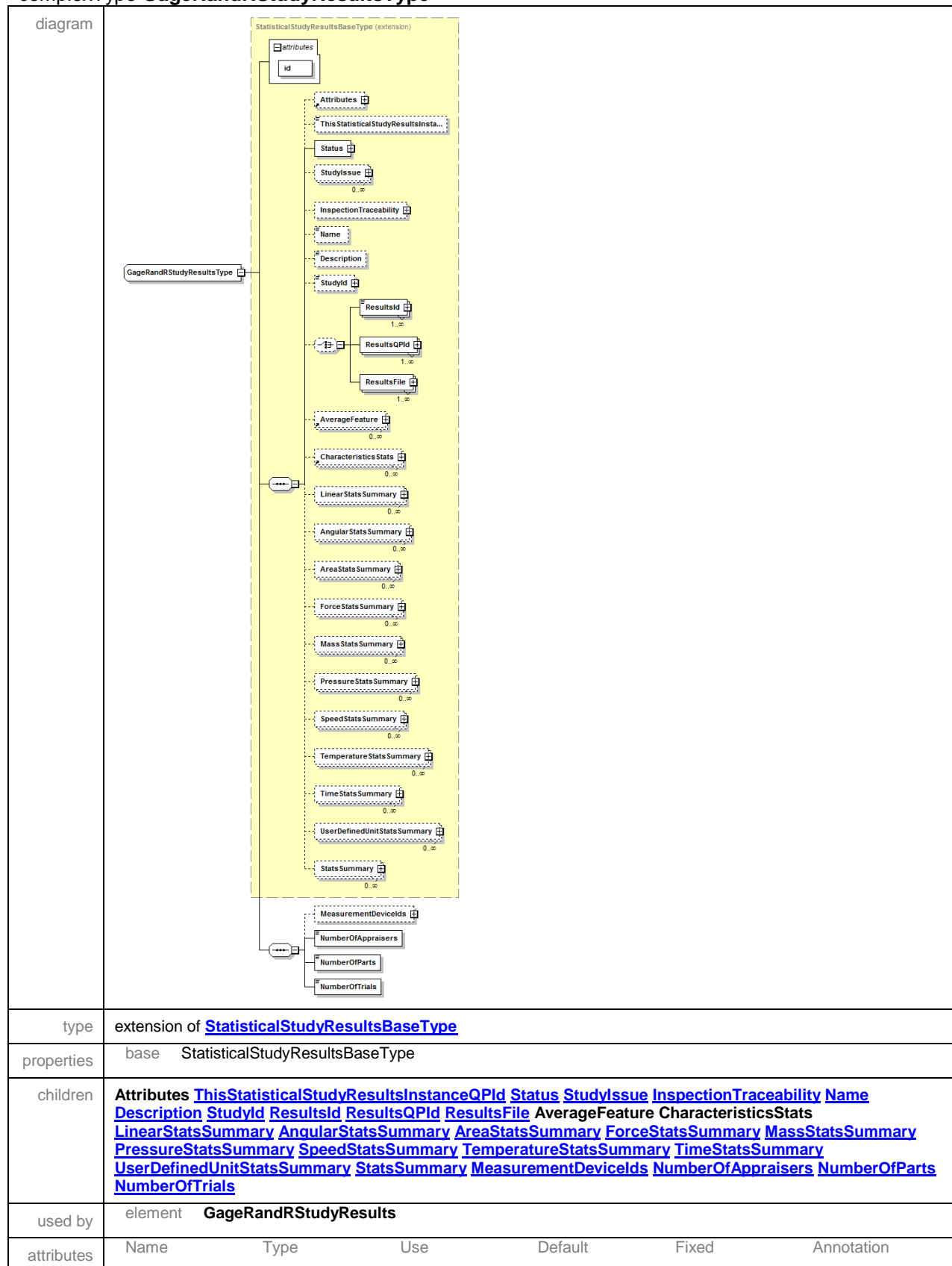
diagram						
type	CriterionTimeType					
properties	minOcc	0	maxOcc	1	content	complex
children	Limit NumberAllowedExceptions ExtremeLimit					
attributes	Name	Type	Use	Default	Fixed	Annotation
	timeUnit	xs:token				documentation The optional timeUnit attribute defines the UnitName for the CriterionTimeType.

annotation	documentation The optional MaximumAbsoluteTimeTotalRandR element defines the maximum total RandR allowed for time characteristics for the gage RandR study to pass.
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element **GageRandRStudyPlanType/MaximumAbsoluteUserDefinedUnitTotalRandR**

diagram						
type	CriterionUserDefinedUnitType					
properties	minOcc	0	maxOcc	unbounded	content	complex
children	Limit NumberAllowedExceptions ExtremeLimit					
attributes	Name unitName	Type xs:token	Use required	Default	Fixed	Annotation documentation The (required) unitName attribute is the unit name for the CriterionUserDefinedUnitType.
annotation	documentation Each optional MaximumAbsoluteUserDefinedUnitTotalRandR element defines the maximum total RandR allowed for user defined unit characteristics for the gage RandR study to pass. This element is not to be used to define a maximum with units available in another element. In particular this element is not to be used to define a maximum with linear units, angular units, or units of temperature, area, force, mass, pressure, speed, or time.					

complexType **GageRandRStudyResultsType**




	id QIFIdType required	documentation The id attribute is the QIF id of the statistical study results, used for referencing.
annotation	documentation The GageRandRStudyPlanType defines information that is related to the results of a gage repeatability and reproducibility statistical study where a number of part samples were repeatedly measured by two or more appraisers to establish the repeatability and reproducibility of a measurement process.	

element **GageRandRStudyResultsType/MeasurementDevicelds**

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 MeasurementDevicelds element is a list of the ids of one or more measurement devices in the measurement system to be studied.					

element **GageRandRStudyResultsType/NumberOfAppraisers**

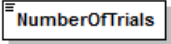
diagram	
type	xs:positiveInteger
properties	content simple
annotation	<p>documentation</p> <p>The NumberOfAppraisers element defines the number of appraisers that took part in the study.</p>

element **GageRandRStudyResultsType/NumberOfParts**

diagram						
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type	xs:positiveInteger
properties	content simple
annotation	documentation The NumberOfParts element defines the number of parts used in the study.

element **GageRandRStudyResultsType/NumberOfTrials**

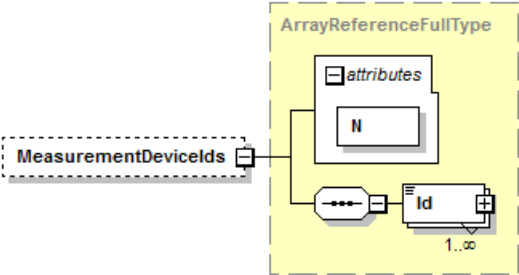
diagram	
type	xs:positiveInteger
properties	content simple
annotation	documentation The NumberOfTrials element defines the number of times each part was measured by each appraiser.

complexType **LinearityStudyPlanType**


diagram	
type	extension of StatisticalStudyPlanBaseType
properties	base <code>StatisticalStudyPlanBaseType</code>
children	Attributes ThisStatisticalStudyPlanInstanceQPIId FeatureItemIds CalculateAverageFeatures CharacteristicItemIds StatsValuesPerChar StatsValuesPerSubgroup StatsValuesSummary PreInspectionTraceability Name Description PlanId CorrectiveActionPlanId MeasurementDeviceIds GoodnessOfFitThreshold LinearAbsoluteLinearityMinimum AngularAbsoluteLinearityMinimum AreaAbsoluteLinearityMinimum ForceAbsoluteLinearityMinimum MassAbsoluteLinearityMinimum PressureAbsoluteLinearityMinimum SpeedAbsoluteLinearityMinimum TemperatureAbsoluteLinearityMinimum TimeAbsoluteLinearityMinimum UserDefinedUnitAbsoluteLinearityMinimum RelativeLinearityMinimum
used by	element LinearityStudyPlan

attributes	Name id	Type QIFIdType	Use required	Default	Fixed	Annotation documentation The id attribute is the QIF id of the statistical study, used for referencing.
annotation	documentation The LinearityStudyPlanType defines information that is related to a linearity statistical study where an artifact or artifacts are measured to determine the linearity of a measurement system.					

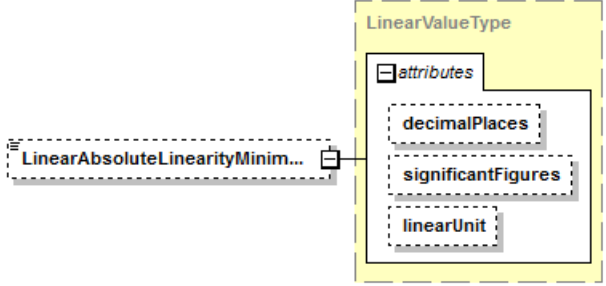
element **LinearityStudyPlanType/MeasurementDeviceIds**

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 MeasurementDeviceIds element is a list of the ids of one or more measurement devices in the measurement system to be studied.					

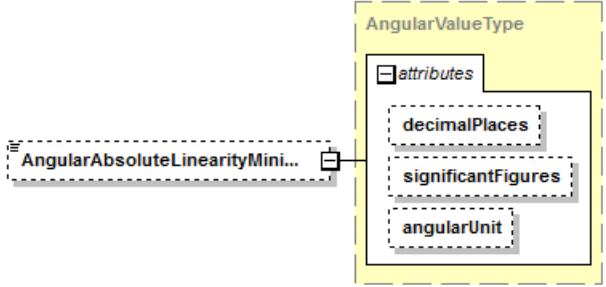
element **LinearityStudyPlanType/GoodnessOfFitThreshold**

diagram						
type	xs:decimal					
properties	minOcc	0	maxOcc	1	content	simple
annotation	documentation The optional GoodnessOfFitThreshold element is the minimum goodness of fit (R-squared) that must be achieved for the measurement device to pass.					

element **LinearityStudyPlanType/LinearAbsoluteLinearityMinimum**

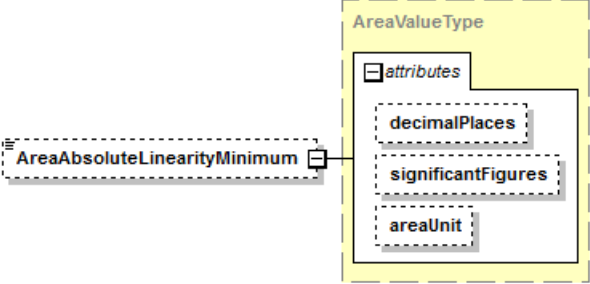
diagram						
type	LinearValueType					
properties	minOcc	0	maxOcc	1	content	complex
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	linearUnit	xs:token				documentation The optional linearUnit attribute defines the UnitName for the LinearValueType.
annotation	documentation The optional LinearAbsoluteLinearityMinimum element defines the minimum allowable linearity a device measuring a linear characteristic must achieve.					

element **LinearityStudyPlanType/AngularAbsoluteLinearityMinimum**

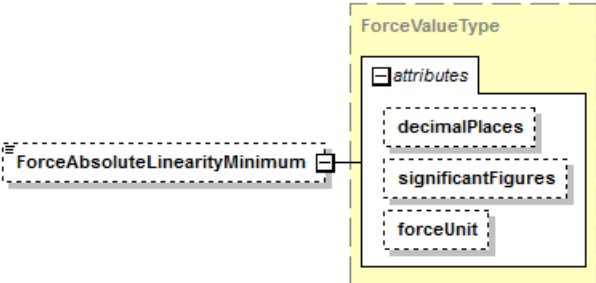
diagram						
type	AngularValueType					
properties	minOcc	0	maxOcc	1	content	complex
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	angularUnit	xs:token				documentation The optional angularUnit attribute defines the UnitName for the

	AngularValueType.
annotation	documentation The optional AngularAbsoluteLinearityMinimum element defines the minimum allowable linearity a device measuring an angular characteristic must achieve.

element **LinearityStudyPlanType/AreaAbsoluteLinearityMinimum**

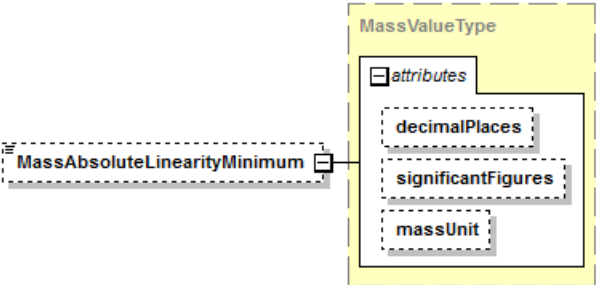
diagram						
type	AreaValueType					
properties	minOcc	0	maxOcc	1	content	complex
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	areaUnit	xs:token				documentation The optional areaUnit attribute defines the UnitName for the AreaValueType.
annotation	documentation The optional AreaAbsoluteLinearityMinimum element defines the minimum allowable linearity a device measuring an area characteristic must achieve.					

element **LinearityStudyPlanType/ForceAbsoluteLinearityMinimum**

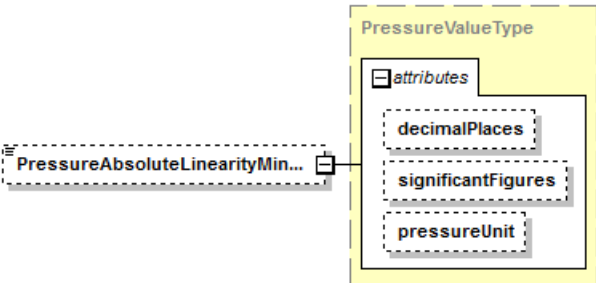
diagram						
type	ForceValueType					
properties	minOcc	0	maxOcc	1	content	complex
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.

	<p>significantFigures xs:nonNegativeInteger</p> <p>forceUnit xs:token</p>	<p>documentation See documentation of SpecifiedDecimalType. documentation The optional forceUnit attribute defines the UnitName for the ForceValueType.</p>
annotation	<p>documentation The optional ForceAbsoluteLinearityMinimum element defines the minimum allowable linearity a device measuring a force characteristic must achieve.</p>	

element **LinearityStudyPlanType/MassAbsoluteLinearityMinimum**

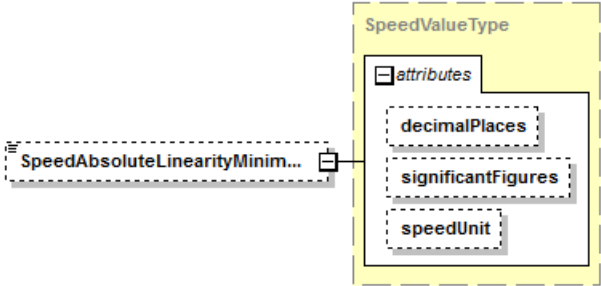
diagram						
type	MassValueType					
properties	minOcc	0				
	maxOcc	1				
	content	complex				
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType. documentation
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType. documentation
	massUnit	xs:token				documentation The optional massUnit attribute defines the UnitName for the MassValueType.
annotation	<p>documentation The optional MassAbsoluteLinearityMinimum element defines the minimum allowable linearity a device measuring a mass characteristic must achieve.</p>					

element **LinearityStudyPlanType/PressureAbsoluteLinearityMinimum**

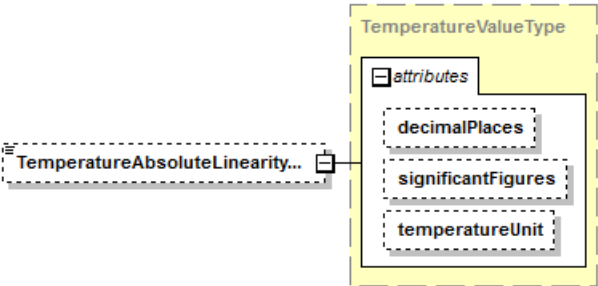
diagram						
type	PressureValueType					

properties	minOcc 0 maxOcc 1 content complex					
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	pressureUnit	xs:token				documentation The optional pressureUnit attribute defines the UnitName for the PressureValueType.
annotation	documentation The optional PressureAbsoluteLinearityMinimum element defines the minimum allowable linearity a device measuring a pressure characteristic must achieve.					

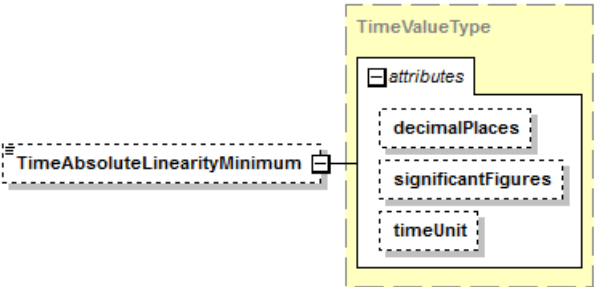
element LinearityStudyPlanType/SpeedAbsoluteLinearityMinimum

diagram						
type	SpeedValueType					
properties	minOcc 0 maxOcc 1 content complex					
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	speedUnit	xs:token				documentation The optional speedUnit attribute defines the UnitName for the SpeedValueType.
annotation	documentation The optional SpeedAbsoluteLinearityMinimum element defines the minimum allowable linearity a device measuring a speed characteristic must achieve.					

element **LinearityStudyPlanType/TemperatureAbsoluteLinearityMinimum**

diagram						
type	TemperatureValueType					
properties	minOcc	0	maxOcc	1	content	complex
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	temperatureUnit	xs:token				documentation The optional temperatureUnit attribute defines the UnitName for the TemperatureValueType.
annotation	documentation The optional TemperatureAbsoluteLinearityMinimum element defines the minimum allowable linearity a device measuring a temperature characteristic must achieve.					

element **LinearityStudyPlanType/TimeAbsoluteLinearityMinimum**


diagram						
type	TimeValueType					
properties	minOcc	0	maxOcc	1	content	complex
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	timeUnit	xs:token				documentation The optional timeUnit attribute defines the UnitName for the

	TimeValueType.
annotation	documentation The optional TimeAbsoluteLinearityMinimum element defines the minimum allowable linearity a device measuring a time characteristic must achieve.

element **LinearityStudyPlanType/UserDefinedUnitAbsoluteLinearityMinimum**

diagram						
type	UserDefinedUnitValueType					
properties	minOcc	0	maxOcc	unbounded	content	complex
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	unitName	xs:token	required			documentation The (required) UnitName attribute is the unit name for the UserDefinedUnitValueType.
annotation	documentation Each optional UserDefinedUnitAbsoluteLinearityMinimum element defines the minimum allowable linearity a device measuring a user-defined unit characteristic must achieve. This element is not to be used to define a minimum with units available in another element. In particular this element is not to be used to define a minimum with linear units, angular units, or units of temperature, area, force, mass, pressure, speed, or time.					

element **LinearityStudyPlanType/RelativeLinearityMinimum**


diagram	
type	xs:decimal
properties	content simple
annotation	documentation The RelativeLinearityMinimum element defines the minimum allowable relative linearity must achieve.

complexType **LinearityStudyResultsType**

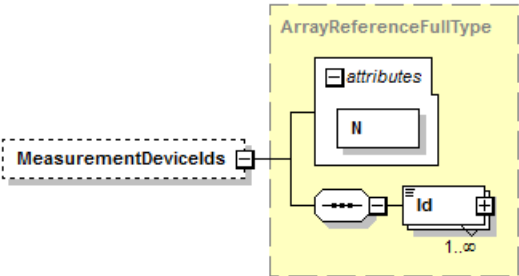
diagram	
type	extension of StatisticalStudyResultsBaseType
properties	base <code>StatisticalStudyResultsBaseType</code>
children	Attributes ThisStatisticalStudyResultsInstanceQPid Status StudyIssue InspectionTraceability Name Description StudyId ResultsId ResultsQPid ResultsFile AverageFeature CharacteristicsStats LinearStatsSummary AngularStatsSummary AreaStatsSummary ForceStatsSummary MassStatsSummary PressureStatsSummary SpeedStatsSummary TemperatureStatsSummary TimeStatsSummary UserDefinedUnitStatsSummary StatsSummary SampleSize MeasurementDevicelds GoodnessOfFit LinearAbsoluteLinearity AngularAbsoluteLinearity AreaAbsoluteLinearity ForceAbsoluteLinearity MassAbsoluteLinearity PressureAbsoluteLinearity SpeedAbsoluteLinearity TemperatureAbsoluteLinearity TimeAbsoluteLinearity UserDefinedUnitAbsoluteLinearity RelativeLinearity
used by	element LinearityStudyResults

attributes	Name id	Type QIFIdType	Use required	Default	Fixed	Annotation documentation The id attribute is the QIF id of the statistical study results, used for referencing.
annotation	documentation The LinearityStudyResultsType defines the results from a linearity statistical study where an artifact or artifacts were measured to determine the linearity of a measurement device.					

element **LinearityStudyResultsType/SampleSize**

diagram						
type	xs:positiveInteger					
properties	content simple					
annotation	documentation The SampleSize element specifies the number of samples n used in the statistical study.					

element **LinearityStudyResultsType/MeasurementDeviceIds**

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 MeasurementDeviceIds element is a list of the ids of one or more measurement devices in the measurement system to be studied.					

element **LinearityStudyResultsType/GoodnessOfFit**

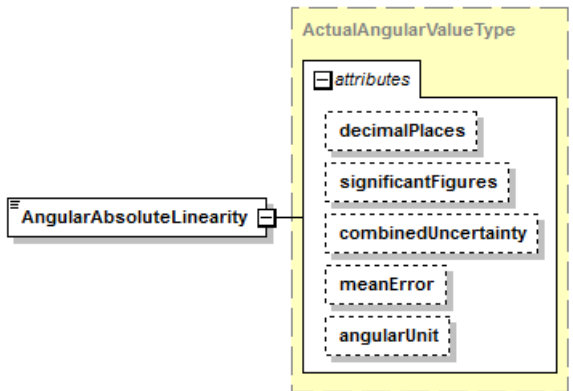
diagram						
type	ActualDecimalType					
properties	minOcc	0				
	maxOcc	1				
	content	complex				
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.
	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.
annotation	documentation The optional GoodnessOfFit element is the goodness of fit (R-squared) achieved by the measurement device.					

element **LinearityStudyResultsType/LinearAbsoluteLinearity**

diagram						
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type	ActualLinearValueType					
properties	content	complex				
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.
	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.
	linearUnit	xs:token				documentation The optional linearUnit attribute defines the unit used by LinearValueType.
annotation	documentation The optional LinearAbsoluteLinearity element is the linearity achieved by the measurement device measuring a linear characteristic.					

element LinearityStudyResultsType/AngularAbsoluteLinearity

diagram						
type	ActualAngularValueType					
properties	content	complex				
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty

	<p>meanError NonNegativeDecimalType</p> <p>angularUnit xs:token</p>	<p>attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType. documentation</p> <p>The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType. documentation</p> <p>The optional angularUnit attribute defines the unit used by ActualAngularValueType.</p>
annotation	documentation The optional AngularAbsoluteLinearity element is the linearity achieved by the measurement device measuring an angular characteristic.	

element **LinearityStudyResultsType/AreaAbsoluteLinearity**

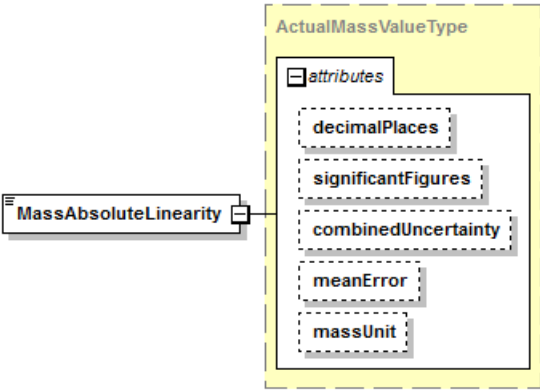
diagram						
type	ActualAreaValueType					
properties	content complex					
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.
	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.
	areaUnit	xs:token				documentation The optional areaUnit attribute defines the

	unit used by ActualAreaValueType.
annotation	documentation The optional AreaAbsoluteLinearity element is the linearity achieved by the measurement device measuring an area characteristic.

element **LinearityStudyResultsType/ForceAbsoluteLinearity**

diagram						
type	ActualForceValueType					
properties	content complex					
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.
	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.
	forceUnit	xs:token				documentation The optional forceUnit attribute defines the unit used by ActualForceValueType.
annotation	documentation The optional ForceAbsoluteLinearity element is the linearity achieved by the measurement device measuring a force characteristic.					

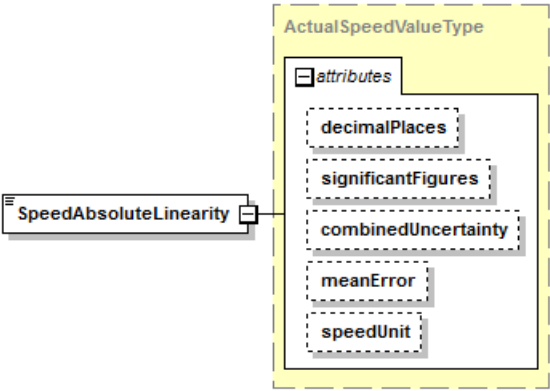
element **LinearityStudyResultsType/MassAbsoluteLinearity**

diagram						
type	ActualMassValueType					
properties	content complex					
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.
	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.
	massUnit	xs:token				documentation The optional massUnit attribute defines the unit used by ActualMassValueType.
annotation	documentation The optional MassAbsoluteLinearity element is the linearity achieved by the measurement device measuring a mass characteristic.					

element **LinearityStudyResultsType/PressureAbsoluteLinearity**

diagram						
type	ActualPressureValueType					
properties	content complex					
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.
	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.
	pressureUnit	xs:token				documentation The optional pressureUnit attribute defines the UnitName for the ActualPressureValueType.
annotation	documentation The optional PressureAbsoluteLinearity element is the linearity achieved by the measurement device measuring a pressure characteristic.					

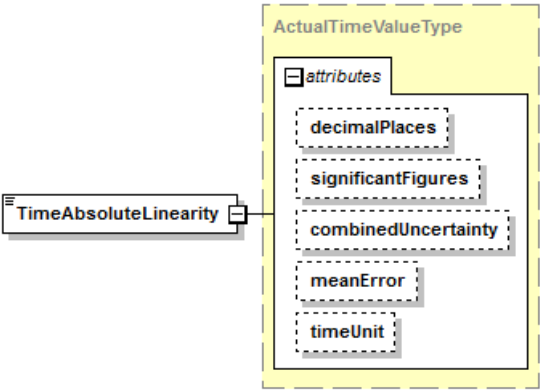
element **LinearityStudyResultsType/SpeedAbsoluteLinearity**

diagram						
type	ActualSpeedValueType					
properties	content complex					
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.
	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.
	speedUnit	xs:token				documentation The optional speedUnit attribute defines the UnitName for the ActualSpeedValueType.
annotation	documentation The optional SpeedAbsoluteLinearity element is the linearity achieved by the measurement device measuring a speed characteristic.					

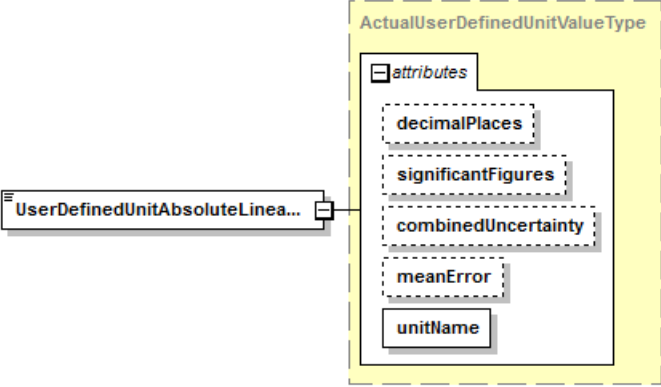
element **LinearityStudyResultsType/TemperatureAbsoluteLinearity**

diagram																																										
type	ActualTemperatureValueType																																									
properties	content complex																																									
attributes	<table><thead><tr><th>Name</th><th>Type</th><th>Use</th><th>Default</th><th>Fixed</th><th>Annotation</th></tr></thead><tbody><tr><td>decimalPlaces</td><td>xs:nonNegativeInteger</td><td></td><td></td><td></td><td>documentation See documentation of SpecifiedDecimalType.</td></tr><tr><td>significantFigures</td><td>xs:nonNegativeInteger</td><td></td><td></td><td></td><td>documentation See documentation of SpecifiedDecimalType.</td></tr><tr><td>combinedUncertainty</td><td>NonNegativeDecimalType</td><td></td><td></td><td></td><td>documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.</td></tr><tr><td>meanError</td><td>NonNegativeDecimalType</td><td></td><td></td><td></td><td>documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.</td></tr><tr><td>temperatureUnit</td><td>xs:token</td><td></td><td></td><td></td><td>documentation The optional temperatureUnit attribute defines the UnitName for the TemperatureValueType.</td></tr></tbody></table>	Name	Type	Use	Default	Fixed	Annotation	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.	temperatureUnit	xs:token				documentation The optional temperatureUnit attribute defines the UnitName for the TemperatureValueType.					
Name	Type	Use	Default	Fixed	Annotation																																					
decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.																																					
significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.																																					
combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.																																					
meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.																																					
temperatureUnit	xs:token				documentation The optional temperatureUnit attribute defines the UnitName for the TemperatureValueType.																																					
annotation	documentation The optional TemperatureAbsoluteLinearity element is the linearity achieved by the measurement device measuring a temperature characteristic.																																									

element **LinearityStudyResultsType/TimeAbsoluteLinearity**

diagram						
type	ActualTimeValueType					
properties	content complex					
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.
	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.
	timeUnit	xs:token				documentation The optional timeUnit attribute defines the UnitName for the TimeValueType.
annotation	documentation The optional TimeAbsoluteLinearity element is the linearity achieved by the measurement device measuring a time characteristic.					

element **LinearityStudyResultsType/UserDefinedUnitAbsoluteLinearity**

diagram						
type	ActualUserDefinedUnitValueType					
properties	content complex					
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.
	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.
	unitName	xs:token	required			documentation The (required) UnitName attribute is the unit name for the UserDefinedUnitValueType.
annotation	documentation The optional UserDefinedUnitAbsoluteLinearity element is the linearity achieved by the measurement device measuring an user-defined unit characteristic. This element is not to be used to define an actual with units available in another element. In particular this element is not to be used to define an actual with linear units, angular units, or units of temperature, area, force, mass, pressure, speed, or time.					

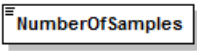
element **LinearityStudyResultsType/RelativeLinearity**

diagram						
type	ActualDecimalType					
properties	minOcc	0				
	maxOcc	1				
	content	complex				
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.
	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.
annotation	documentation The optional RelativeLinearity element is relative linearity achieved by the measurement device.					


complexType **MultipleProductInstanceStudyPlanBaseType**

diagram	<p>StatisticalStudyPlanBaseType (extension)</p> <p>attributes</p> <p>id</p> <p>Attributes</p> <p>This StatisticalStudyPlanInstanc...</p> <p>FeatureItemIds</p> <p>CalculateAverageFeatures</p> <p>CharacteristicItemIds</p> <p>StatsValuesPerChar</p> <p>StatsValuesPerSubgroup</p> <p>StatsValuesSummary</p> <p>0..∞</p> <p>PreInspectionTraceability</p> <p>Name</p> <p>Description</p> <p>PlanId</p> <p>CorrectiveActionPlanId</p> <p>NumberOfSamples</p> <p>SubgroupSize</p>						
type	extension of StatisticalStudyPlanBaseType						
properties	base abstract	StatisticalStudyPlanBaseType true					
children	Attributes ThisStatisticalStudyPlanInstanceQPIId FeatureItemIds CalculateAverageFeatures CharacteristicItemIds StatsValuesPerChar StatsValuesPerSubgroup StatsValuesSummary PreInspectionTraceability Name Description PlanId CorrectiveActionPlanId NumberOfSamples SubgroupSize						
used by	complexTypes	BiasStudyPlanType CapabilityStudyPlanType ProductionStudyPlanType SimpleStudyPlanType					
attributes	Name id	Type QIFIdType	Use required	Default	Fixed	Annotation documentation The id attribute is the QIF id of the statistical study, used for referencing.	
annotation	documentation The MultipleProductInstanceStudyPlanBaseType is the abstract base type that defines information common to all statistical studies involving multiple part measurements.						

element **MultipleProductInstanceStudyPlanBaseType/NumberOfSamples**

diagram	
type	xs:positiveInteger
properties	content simple
annotation	documentation The NumberOfSamples element specifies the number of samples to be used in the statistical study.

element **MultipleProductInstanceStudyPlanBaseType/SubgroupSize**

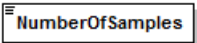
diagram	
type	xs:positiveInteger
properties	minOcc 0 maxOcc 1 content simple
annotation	documentation The optional SubgroupSize element defines the size of each subgroup. The number of subgroups is determined by dividing the number of samples by the subgroup size. The subgroup size must be specified if control limits, Cp, Cpk or the estimated standard deviation are to be calculated.

complexType **MultipleProductInstanceStudyResultsBaseType**

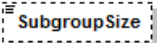
diagram						
type	extension of StatisticalStudyResultsBaseType					
properties	base abstract	StatisticalStudyResultsBaseType true				
children	Attributes ThisStatisticalStudyResultsInstanceQPId Status StudyIssue InspectionTraceability Name Description StudyId ResultsId ResultsQPId ResultsFile AverageFeature CharacteristicsStats LinearStatsSummary AngularStatsSummary AreaStatsSummary ForceStatsSummary MassStatsSummary PressureStatsSummary SpeedStatsSummary TemperatureStatsSummary TimeStatsSummary UserDefinedUnitStatsSummary StatsSummary NumberOfSamples SubgroupSize					
used by	complexTypes	CapabilityStudyResultsType ProductionStudyResultsType SimpleStudyResultsType				
attributes	Name	Type	Use	Default	Fixed	Annotation

	id QIFIdType required	documentation The id attribute is the QIF id of the statistical study results, used for referencing.
annotation	documentation The MultipleProductInstanceStudyResultsBaseType is the abstract base type that defines information common to the results of all statistical studies involving multiple part measurements.	

element **MultipleProductInstanceStudyResultsBaseType/NumberOfSamples**

diagram		
type	xs:positiveInteger	
properties	content simple	
annotation	documentation The NumberOfSamples element specifies the number of samples used in the statistical study.	

element **MultipleProductInstanceStudyResultsBaseType/SubgroupSize**

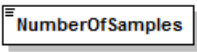
diagram		
type	xs:positiveInteger	
properties	minOcc 0 maxOcc 1 content simple	
annotation	documentation The optional SubgroupSize element is the size of each subgroup used in the statistical study.	

complexType **ProcessDifferenceStudyPlanType**


diagram	
type	extension of StatisticalStudyPlanBaseType
properties	base StatisticalStudyPlanBaseType
children	Attributes ThisStatisticalStudyPlanInstanceQPID FeatureItemIds CalculateAverageFeatures CharacteristicItemIds StatsValuesPerChar StatsValuesPerSubgroup StatsValuesSummary PreInspectionTraceability Name Description PlanId CorrectiveActionPlanId NumberOfSamples SubgroupSize ManufacturingProcessId LinearAbsoluteDifference AngularAbsoluteDifference AreaAbsoluteDifference ForceAbsoluteDifference MassAbsoluteDifference PressureAbsoluteDifference SpeedAbsoluteDifference TemperatureAbsoluteDifference TimeAbsoluteDifference UserDefinedUnitAbsoluteDifference RelativeDifference
used by	element ProcessDifferenceStudyPlan

attributes	Name id	Type QIFIdType	Use required	Default	Fixed	Annotation documentation The id attribute is the QIF id of the statistical study, used for referencing.
annotation	documentation The ProcessDifferenceStudyPlanType defines information that is related to a difference statistical study where the same part is measured before and after a manufacturing process to determine any part distortion caused by that process.					

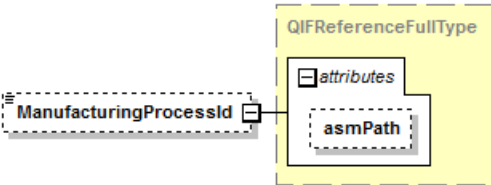
element **ProcessDifferenceStudyPlanType/NumberOfSamples**

diagram						
type	xs:positiveInteger					
properties	content simple					
annotation	documentation The NumberOfSamples element specifies the number of samples to be used in the statistical study.					

element **ProcessDifferenceStudyPlanType/SubgroupSize**

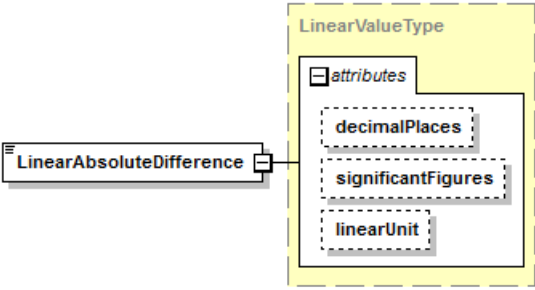
diagram						
type	xs:positiveInteger					
properties	content simple fixed 2					
annotation	documentation The SubgroupSize element fixes the size of each subgroup to 2. The first item in each subgroup is the result of measurement before the manufacturing process and the second item is the result of measurement after the process.					

element **ProcessDifferenceStudyPlanType/ManufacturingProcessId**

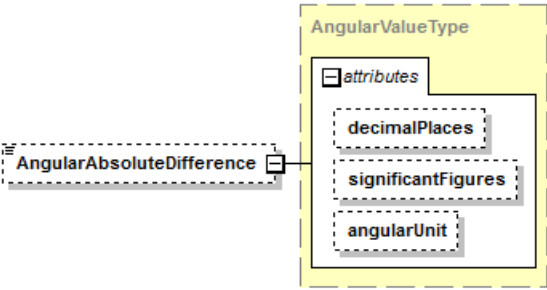
diagram						
type	QIFReferenceFullType					
properties	minOcc 0 maxOcc 1 content complex					
attributes	Name asmPath	Type QIFIdType	Use	Default	Fixed	Annotation documentation The optional asmPath attribute is an id which must be used for locating of the assembly path within the

		AsmPaths. The assembly path (instantiation chain) unambiguously identifies a model entity within an assembly.
annotation	documentation The optional ManufacturingProcessId element is a reference to the traceability information for the process on which the study is to be based.	

element **ProcessDifferenceStudyPlanType/LinearAbsoluteDifference**

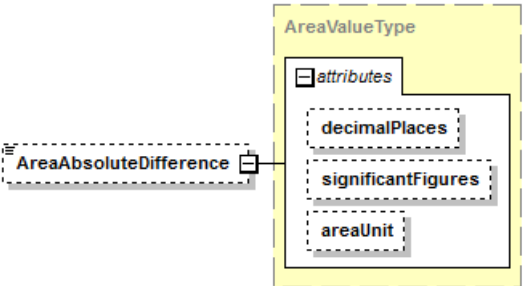
diagram						
type	LinearValueType					
properties	content complex					
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	linearUnit	xs:token				documentation The optional linearUnit attribute defines the UnitName for the LinearValueType.
annotation	documentation The LinearAbsoluteDifference element defines the maximum allowable absolute difference between before and after for linear characteristics.					

element **ProcessDifferenceStudyPlanType/AngularAbsoluteDifference**

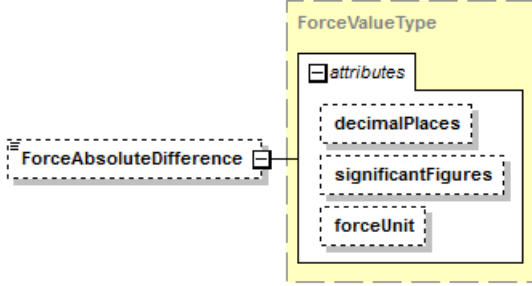
diagram						
type	AngularValueType					

properties	minOcc 0 maxOcc 1 content complex					
attributes	Name decimalPlaces	Type xs:nonNegativeInteger	Use	Default	Fixed	Annotation documentation See documentation of SpecifiedDecimalType. documentation See documentation of SpecifiedDecimalType. documentation The optional angularUnit attribute defines the UnitName for the AngularValueType.
	significantFigures	xs:nonNegativeInteger				
	angularUnit	xs:token				
annotation	documentation The optional AngularAbsoluteDifference element defines the maximum allowable absolute difference between before and after for angular characteristics.					

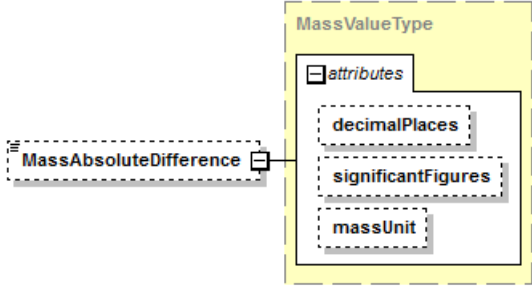
element **ProcessDifferenceStudyPlanType/AreaAbsoluteDifference**

diagram						
type	AreaValueType					
properties	minOcc 0 maxOcc 1 content complex					
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	areaUnit	xs:token				documentation The optional areaUnit attribute defines the UnitName for the AreaValueType.
annotation	documentation The optional AreaAbsoluteDifference element defines the maximum allowable absolute difference between before and after for area characteristics.					

element **ProcessDifferenceStudyPlanType/ForceAbsoluteDifference**

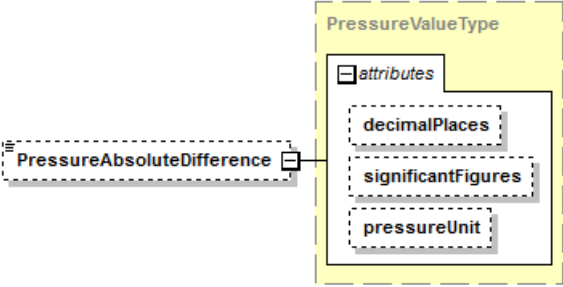
diagram						
type	ForceValueType					
properties	minOcc	0	maxOcc	1	content	complex
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	forceUnit	xs:token				documentation The optional forceUnit attribute defines the UnitName for the ForceValueType.
annotation	documentation The optional ForceAbsoluteDifference element defines the maximum allowable absolute difference between before and after for force characteristics.					

element **ProcessDifferenceStudyPlanType/MassAbsoluteDifference**

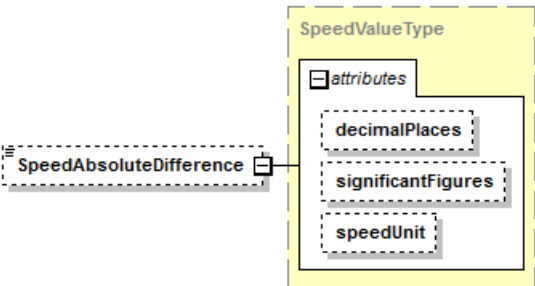
diagram						
type	MassValueType					
properties	minOcc	0	maxOcc	1	content	complex
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	massUnit	xs:token				documentation The optional massUnit attribute defines the UnitName for the MassValueType.

annotation	documentation The optional MassAbsoluteDifference element defines the maximum allowable absolute difference between before and after for mass characteristics.
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element **ProcessDifferenceStudyPlanType/PressureAbsoluteDifference**

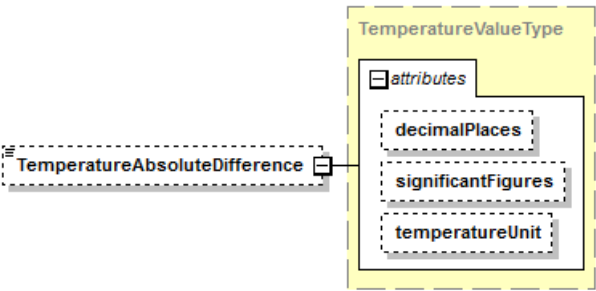
diagram						
type	PressureValueType					
properties	minOcc	0	maxOcc	1	content	complex
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	pressureUnit	xs:token				documentation The optional pressureUnit attribute defines the UnitName for the PressureValueType.
annotation	documentation The optional PressureAbsoluteDifference element defines the maximum allowable absolute difference between before and after for pressure characteristics.					

element **ProcessDifferenceStudyPlanType/SpeedAbsoluteDifference**

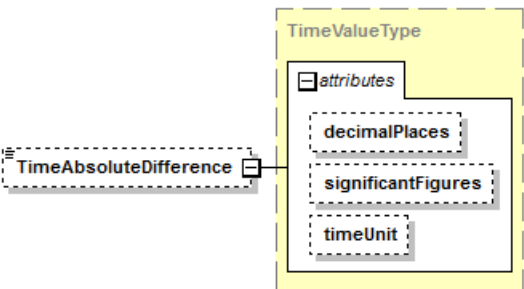
diagram						
type	SpeedValueType					
properties	minOcc	0	maxOcc	1	content	complex
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.

	<p>significantFigures xs:nonNegativeInteger</p> <p>speedUnit xs:token</p>	<p>documentation See documentation of SpecifiedDecimalType. documentation The optional speedUnit attribute defines the UnitName for the SpeedValueType.</p>
annotation	<p>documentation The optional SpeedAbsoluteDifference element defines the maximum allowable absolute difference between before and after for speed characteristics.</p>	

element **ProcessDifferenceStudyPlanType/TemperatureAbsoluteDifference**

diagram						
type	TemperatureValueType					
properties	minOcc	0	maxOcc	1	content	complex
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	temperatureUnit	xs:token				documentation The optional temperatureUnit attribute defines the UnitName for the TemperatureValueType.
annotation	<p>documentation The optional TemperatureAbsoluteDifference element defines the maximum allowable absolute difference between before and after for temperature characteristics.</p>					

element **ProcessDifferenceStudyPlanType/TimeAbsoluteDifference**

diagram						
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type	TimeValueType					
properties	minOcc	0				
	maxOcc	1				
	content	complex				
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	timeUnit	xs:token				documentation The optional timeUnit attribute defines the UnitName for the TimeValueType.
annotation	documentation The optional TimeAbsoluteDifference element defines the maximum allowable absolute difference between before and after for time characteristics.					

element **ProcessDifferenceStudyPlanType/UserDefinedUnitAbsoluteDifference**

diagram						
type	UserDefinedUnitValueType					
properties	minOcc	0				
	maxOcc	unbounded				
	content	complex				
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	unitName	xs:token	required			documentation The (required) UnitName attribute is the unit name for the UserDefinedUnitValueType.
annotation	documentation Each optional UserDefinedUnitAbsoluteDifference element defines the maximum allowable absolute difference between before and after for user defined unit characteristics. This element is not to be used to define a maximum with units available in another element. In particular this element is not to be used to define a maximum with linear units, angular units, or units of temperature, area, force, mass, pressure, speed, or time.					

element **ProcessDifferenceStudyPlanType/RelativeDifference**

diagram						
type	xs:decimal					

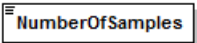
properties	content simple
annotation	documentation The RelativeMaximum element defines the maximum allowable difference between before and after for characteristics as a multiple of the tolerance zone.

complexType ProcessDifferenceStudyResultsType


diagram	<p>The diagram illustrates the structure of the ProcessDifferenceStudyResultsType complex type. It is an extension of the StatisticalStudyResultsBaseType. The base type includes the following elements: Attributes (with id), ThisStatisticalStudyResultsInstanceQPid, Status, StudyIssue, InspectionTraceability, Name, Description, StudyId, ResultsId, ResultsQPid, ResultsFile, AverageFeature, CharacteristicsState, LinearStateSummary, AngularStateSummary, AreaStateSummary, ForceStateSummary, MassStateSummary, PressureStateSummary, SpeedStateSummary, TemperatureStateSummary, TimeStateSummary, UserDefinedUnitStateSummary, and StateSummary. The ProcessDifferenceStudyResultsType extension adds the following elements: NumberOfSamples, SubgroupSize, ManufacturingProcessId, LinearAbsoluteDifference, AngularAbsoluteDifference, AreaAbsoluteDifference, ForceAbsoluteDifference, MassAbsoluteDifference, PressureAbsoluteDifference, SpeedAbsoluteDifference, TemperatureAbsoluteDifference, TimeAbsoluteDifference, UserDefinedUnitAbsoluteDifference, and RelativeDifference.</p>
type	extension of StatisticalStudyResultsBaseType
properties	base StatisticalStudyResultsBaseType
children	Attributes ThisStatisticalStudyResultsInstanceQPid Status StudyIssue InspectionTraceability Name

	Description StudyId ResultsId ResultsQPid ResultsFile AverageFeature CharacteristicsStats LinearStatsSummary AngularStatsSummary AreaStatsSummary ForceStatsSummary MassStatsSummary PressureStatsSummary SpeedStatsSummary TemperatureStatsSummary TimeStatsSummary UserDefinedUnitStatsSummary StatsSummary NumberOfSamples SubgroupSize ManufacturingProcessId LinearAbsoluteDifference AngularAbsoluteDifference AreaAbsoluteDifference ForceAbsoluteDifference MassAbsoluteDifference PressureAbsoluteDifference SpeedAbsoluteDifference TemperatureAbsoluteDifference TimeAbsoluteDifference UserDefinedUnitAbsoluteDifference RelativeDifference					
used by	element	ProcessDifferenceStudyResults				
attributes	Name id	Type QIFIdType	Use required	Default	Fixed	Annotation documentation The id attribute is the QIF id of the statistical study results, used for referencing.
annotation	documentation The ProcessDifferenceStudyResultsType defines information that is related the to the results of a difference statistical study where the same part was measured before and after a manufacturing process to determine any part distortion caused by that process.					

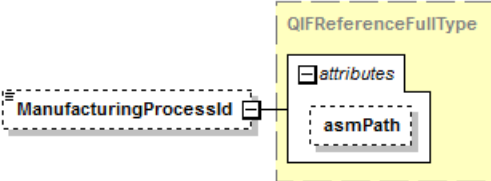
element **ProcessDifferenceStudyResultsType/NumberOfSamples**

diagram						
type	xs:positiveInteger					
properties	content simple					
annotation	documentation The NumberOfSamples element specifies the number of samples used in the statistical study.					

element **ProcessDifferenceStudyResultsType/SubgroupSize**

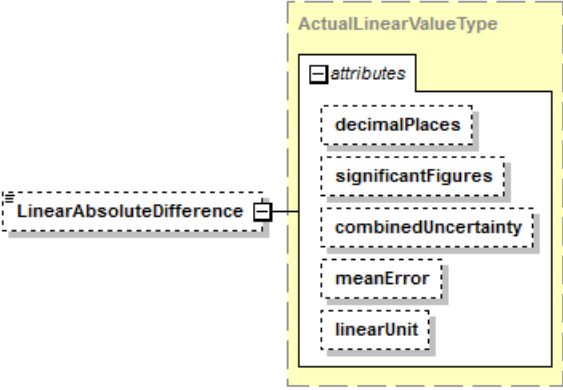
diagram						
type	xs:positiveInteger					
properties	content simple fixed 2					
annotation	documentation The SubgroupSize element fixed the size of each subgroup used in the difference statistical study.					

element **ProcessDifferenceStudyResultsType/ManufacturingProcessId**

diagram						
type	QIFReferenceFullType					
properties	minOcc	0	maxOcc	1	content	complex

attributes	Name asmPath	Type QIFIdType	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 optional ManufacturingProcessId element is a reference to the traceability information for the process on which the study was based.					

element **ProcessDifferenceStudyResultsType/LinearAbsoluteDifference**

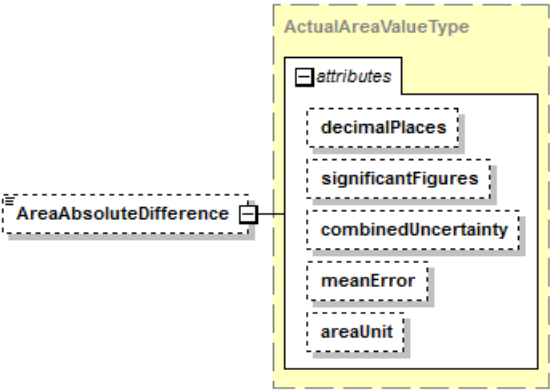
diagram						
type	ActualLinearValueType					
properties	minOcc	0				
	maxOcc	1				
	content	complex				
attributes	Name decimalPlaces	Type xs:nonNegativeInteger	Use	Default	Fixed	Annotation documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.
	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned

	linearUnit xs:token	to the SpecifiedDecimalType. documentation The optional linearUnit attribute defines the unit used by LinearValueType.
annotation	documentation The optional LinearAbsoluteDifference element defines the worst absolute linear difference between before and after over all characteristics.	

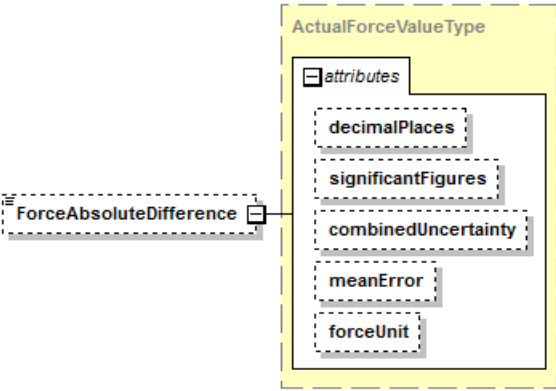
element **ProcessDifferenceStudyResultsType/AngularAbsoluteDifference**

diagram						
type	ActualAngularValueType					
properties	minOcc	0				
	maxOcc	1				
	content	complex				
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.
	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.
	angularUnit	xs:token				documentation The optional angularUnit attribute defines the unit used by ActualAngularValueType.
annotation	documentation The optional AngularAbsoluteDifference element defines the worst absolute angular difference between before and after over all characteristics.					

element **ProcessDifferenceStudyResultsType/AreaAbsoluteDifference**

diagram						
type	ActualAreaValueType					
properties	minOcc	0				
	maxOcc	1				
	content	complex				
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.
	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.
	areaUnit	xs:token				documentation The optional areaUnit attribute defines the unit used by ActualAreaValueType.
annotation	documentation The optional AreaAbsoluteDifference element defines the worst absolute area difference between before and after over all characteristics.					

element **ProcessDifferenceStudyResultsType/ForceAbsoluteDifference**

diagram						
type	ActualForceValueType					
properties	minOcc	0				
	maxOcc	1				
	content	complex				
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.
	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.
	forceUnit	xs:token				documentation The optional forceUnit attribute defines the unit used by ActualForceValueType.
annotation	documentation The optional ForceAbsoluteDifference element defines the worst absolute force difference between before and after over all characteristics.					

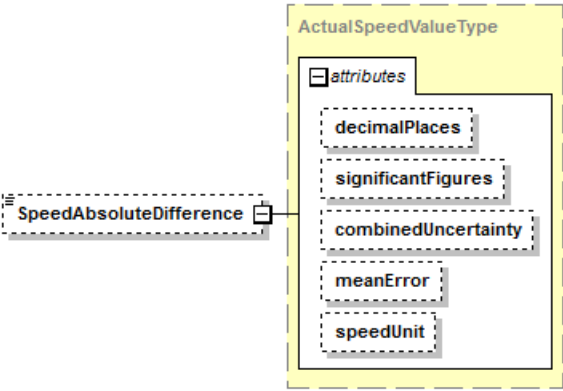
element **ProcessDifferenceStudyResultsType/MassAbsoluteDifference**

diagram						
type	ActualMassValueType					
properties	minOcc	0				
	maxOcc	1				
	content	complex				
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.
	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.
	massUnit	xs:token				documentation The optional massUnit attribute defines the unit used by ActualMassValueType.
annotation	documentation The optional MassAbsoluteDifference element defines the worst absolute mass difference between before and after over all characteristics.					

element **ProcessDifferenceStudyResultsType/PressureAbsoluteDifference**

diagram						
type	ActualPressureValueType					
properties	minOcc	0				
	maxOcc	1				
	content	complex				
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.
	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.
	pressureUnit	xs:token				documentation The optional pressureUnit attribute defines the UnitName for the ActualPressureValueType.
annotation	documentation The optional PressureAbsoluteDifference element defines the worst absolute pressure difference between before and after over all characteristics.					

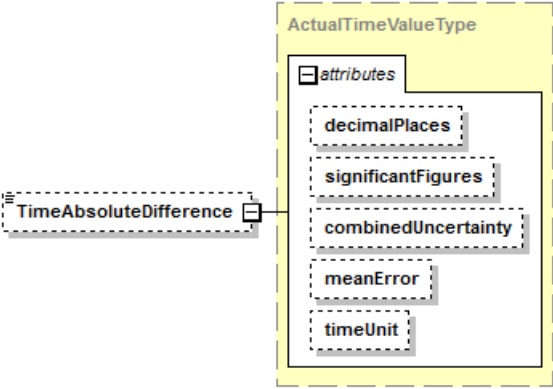
element **ProcessDifferenceStudyResultsType/SpeedAbsoluteDifference**

diagram						
type	ActualSpeedValueType					
properties	minOcc	0				
	maxOcc	1				
	content	complex				
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.
	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.
	speedUnit	xs:token				documentation The optional speedUnit attribute defines the UnitName for the ActualSpeedValueType.
annotation	documentation The optional SpeedAbsoluteDifference element defines the worst absolute speed difference between before and after over all characteristics.					

element **ProcessDifferenceStudyResultsType/TemperatureAbsoluteDifference**

diagram						
type	ActualTemperatureValueType					
properties	minOcc	0				
	maxOcc	1				
	content	complex				
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.
	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.
	temperatureUnit	xs:token				documentation The optional temperatureUnit attribute defines the UnitName for the TemperatureValueType.
annotation	documentation The optional TemperatureAbsoluteDifference element defines the worst absolute temperature difference between before and after over all characteristics.					

element **ProcessDifferenceStudyResultsType/TimeAbsoluteDifference**

diagram						
type	ActualTimeValueType					
properties	minOcc	0				
	maxOcc	1				
	content	complex				
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.
	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.
	timeUnit	xs:token				documentation The optional timeUnit attribute defines the UnitName for the TimeValueType.
annotation	documentation The optional TimeAbsoluteDifference element defines the worst absolute time difference between before and after over all characteristics.					

element **ProcessDifferenceStudyResultsType/UserDefinedUnitAbsoluteDifference**

diagram						
type	ActualUserDefinedUnitValueType					
properties	minOcc	0	maxOcc	unbounded	content	complex
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.
	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.
	unitName	xs:token	required			documentation The (required) UnitName attribute is the unit name for the UserDefinedUnitValueType.
annotation	documentation Each optional UserDefinedUnitAbsoluteDifference element is the worst absolute deviation between before and after over all user-defined unit characteristics with a particular set of units. This element is not to be used to define an actual with units available in another element. In particular this element is not to be used to define an actual with linear units, angular units, or units of temperature, area, force, mass, pressure, speed, or time.					

element **ProcessDifferenceStudyResultsType/RelativeDifference**

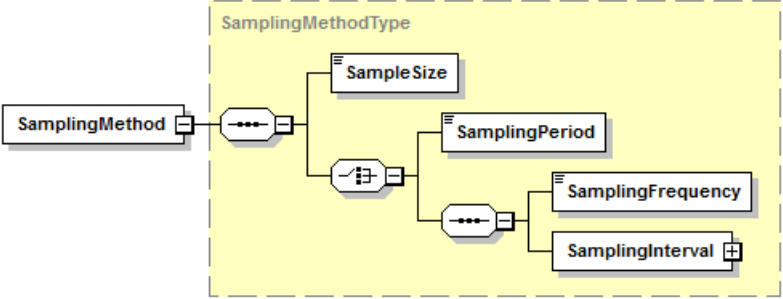
diagram						
type	ActualDecimalType					
properties	minOcc	0				
	maxOcc	1				
	content	complex				
attributes	Name	Type	Use	Default	Fixed	Annotation
	decimalPlaces	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	significantFigures	xs:nonNegativeInteger				documentation See documentation of SpecifiedDecimalType.
	combinedUncertainty	NonNegativeDecimalType				documentation The optional combinedUncertainty attribute is a value expressing the combined uncertainty assigned to the SpecifiedDecimalType.
	meanError	NonNegativeDecimalType				documentation The optional meanError attribute is a value expressing the mean error assigned to the SpecifiedDecimalType.
annotation	documentation The optional RelativeDifference element is the worst relative deviation between before and after over all characteristics					

complexType **ProductionStudyPlanType**

diagram						
type	extension of MultipleProductInstanceStudyPlanBaseType					
properties	base <code>MultipleProductInstanceStudyPlanBaseType</code>					
children	Attributes This Statistical Study Plan Instance QP Id Feature Item Ids Calculate Average Features Characteristic Item Ids Stats Values Per Char Stats Values Per Subgroup Stats Values Summary Preinspection Traceability Name Description Plan Id Corrective Action Plan Id Number of Samples Subgroup Size Sampling Method Control Method					
used by	element ProductionStudyPlan					
attributes	Name id	Type QIFIdType	Use required	Default	Fixed	Annotation documentation The id attribute is the QIF id of the

		statistical study, used for referencing.
annotation	documentation The ProductionStudyPlanType defines information that is related to an ongoing production statistical study where samples are measured for statistical process control to ensure the ongoing stability or capability of a manufacturing process.	

element **ProductionStudyPlanType/SamplingMethod**

diagram	 <p>The diagram illustrates the structure of the SamplingMethodType. It shows a SamplingMethod element connected to a container (dashed box) labeled SamplingMethodType. Inside this container, there are four elements: SampleSize, SamplingPeriod, SamplingFrequency, and SamplingInterval. The elements are connected by lines, indicating a hierarchical or sequential relationship. Specifically, SamplingMethod is connected to a container, which then branches into SampleSize and SamplingPeriod. SamplingPeriod is further connected to a container that branches into SamplingFrequency and SamplingInterval.</p>	
type	SamplingMethodType	
properties	content	complex
children	SampleSize SamplingPeriod SamplingFrequency SamplingInterval	
annotation	documentation	The SamplingMethod element defines a method of sample selection.

element **ProductionStudyPlanType/ControlMethod**

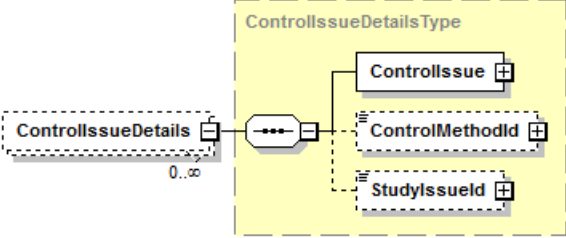
diagram						
type	ControlMethodType					
properties	minOcc	1	maxOcc	unbounded	content	complex
children	AssignableCauseId NumOutOfTolerance CpThreshold CpkThreshold PpThreshold PpkThreshold NumOutOfControl TrendGrouping SkewGrouping OneThirdGrouping TwoThirdsGrouping Oscillation Stratification NumOutOfControlRng					
attributes	Name id	Type QIFIdType	Use required	Default	Fixed	Annotation documentation The id attribute is the QIF id of the control method, used for referencing.
annotation	documentation Each ControlMethod element defines a method to detect process instability or lack of capability.					

complexType **ProductionStudyResultsType**

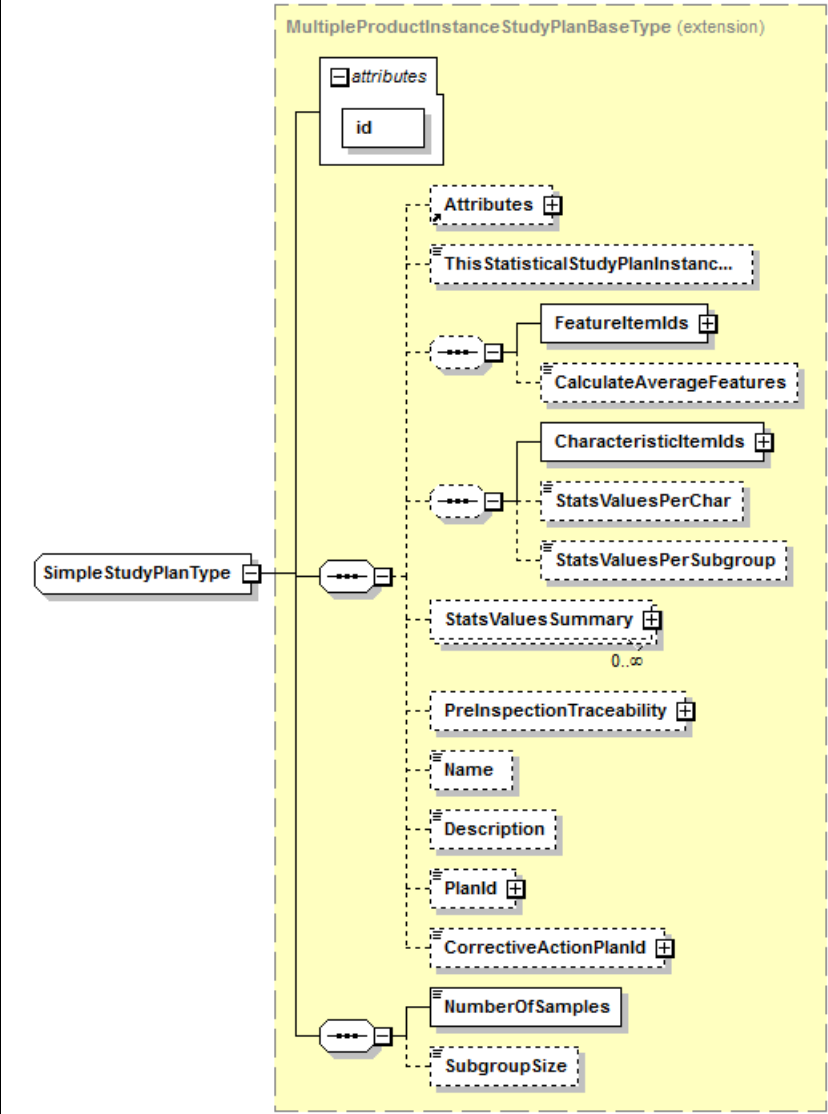
diagram						
type	extension of MultipleProductInstanceStudyResultsBaseType					
properties	base MultipleProductInstanceStudyResultsBaseType					
children	Attributes ThisStatisticalStudyResultsInstanceQPid Status StudyIssue InspectionTraceability Name Description StudyId ResultsId ResultsQPid ResultsFile AverageFeature CharacteristicsStats LinearStatsSummary AngularStatsSummary AreaStatsSummary ForceStatsSummary MassStatsSummary PressureStatsSummary SpeedStatsSummary TemperatureStatsSummary TimeStatsSummary UserDefinedUnitStatsSummary StatsSummary NumberOfSamples SubgroupSize ControlIssueDetails					
used by	element ProductionStudyResults					
attributes	Name	Type	Use	Default	Fixed	Annotation

	id QIFIdType required	documentation The id attribute is the QIF id of the statistical study results, used for referencing.
annotation	documentation The ProductionStudyResultsType defines information that is related to the results of an ongoing production statistical study where samples are measured for statistical process control to ensure the ongoing stability or capability of a manufacturing process.	

element **ProductionStudyResultsType/ControlIssueDetails**

diagram	 <p>The diagram illustrates the structure of the ControlIssueDetailsType. It shows a dashed box labeled ControlIssueDetails with a multiplicity of 0..∞. This box is connected to a central connector, which in turn connects to a larger dashed box labeled ControlIssueDetailsType. Inside this larger box, there are three child elements: ControlIssue, ControlMethodId, and StudyIssued, each with its own multiplicity and a plus sign indicating it is optional.</p>	
type	ControlIssueDetailsType	
properties	minOcc 0 maxOcc unbounded content complex	
children	ControlIssue ControlMethodId StudyIssued	
annotation	documentation Each optional ControlIssueDetails element defines the details of a control issue that was encountered.	

complexType **SimpleStudyPlanType**

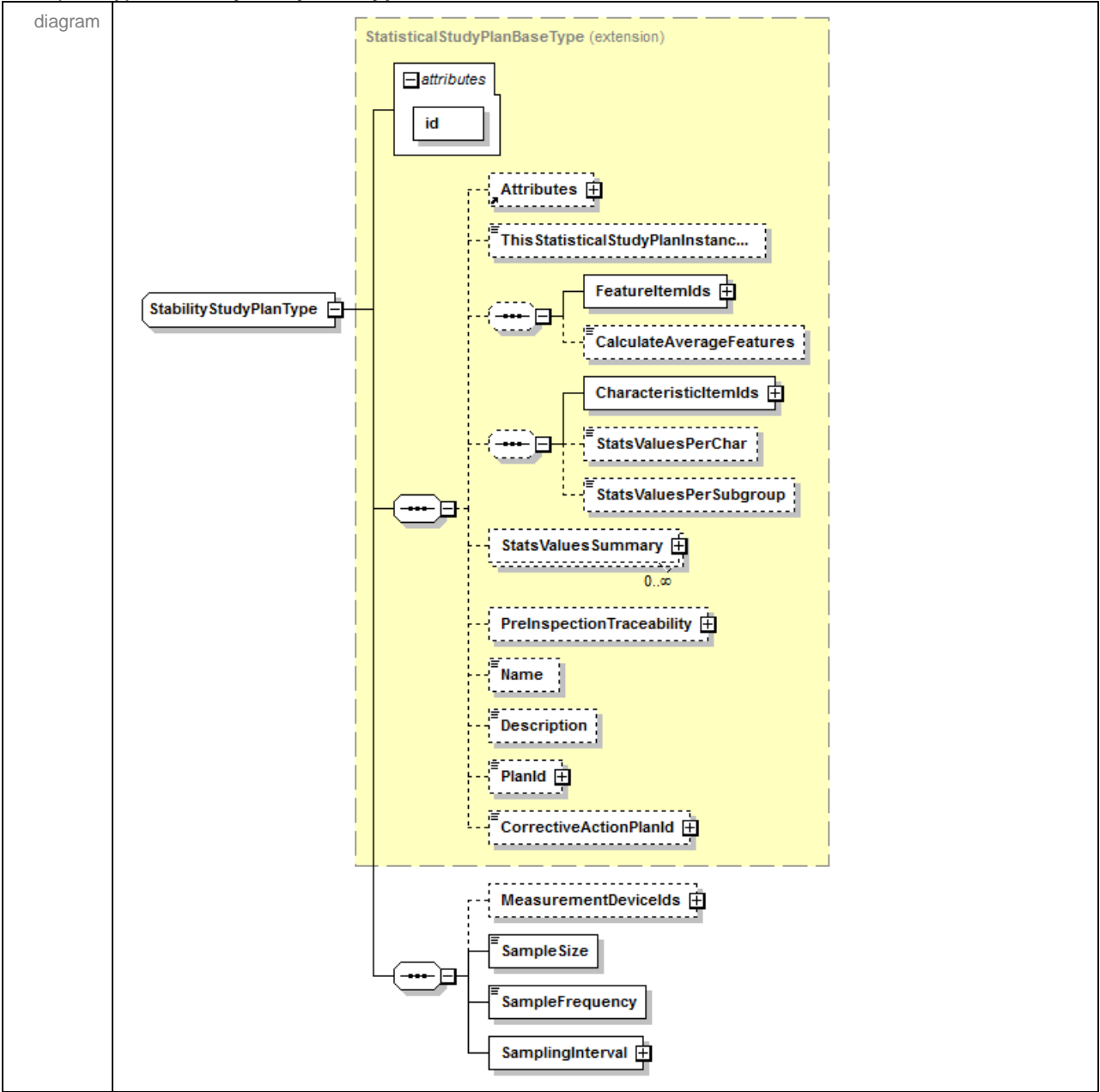
diagram						
type	extension of MultipleProductInstanceStudyPlanBaseType					
properties	base MultipleProductInstanceStudyPlanBaseType					
children	Attributes ThisStatisticalStudyPlanInstanceQPID FeatureItemIds CalculateAverageFeatures CharacteristicItemIds StatsValuesPerChar StatsValuesPerSubgroup StatsValuesSummary PreinspectionTraceability Name Description PlanId CorrectiveActionPlanId NumberOfSamples SubgroupSize					
used by	element SimpleStudyPlan					
attributes	Name id	Type QIFIdType	Use required	Default	Fixed	Annotation documentation The id attribute is the QIF id of the statistical study, used for referencing.
annotation	documentation The SimpleStudyPlanType defines information that is related to a simple statistical study where multiple samples are measured for the purpose of averaging features for process adjustment or reverse engineering.					

complexType **SimpleStudyResultsType**

diagram	
type	extension of MultipleProductInstanceStudyResultsBaseType
properties	base <code>MultipleProductInstanceStudyResultsBaseType</code>
children	Attributes ThisStatisticalStudyResultsInstanceQPid Status StudyIssue InspectionTraceability Name Description StudyId ResultsId ResultsQPId ResultsFile AverageFeature CharacteristicsStats LinearStatsSummary AngularStatsSummary AreaStatsSummary ForceStatsSummary MassStatsSummary PressureStatsSummary SpeedStatsSummary TemperatureStatsSummary TimeStatsSummary UserDefinedUnitStatsSummary StatsSummary NumberOfSamples SubgroupSize
used by	element SimpleStudyResults

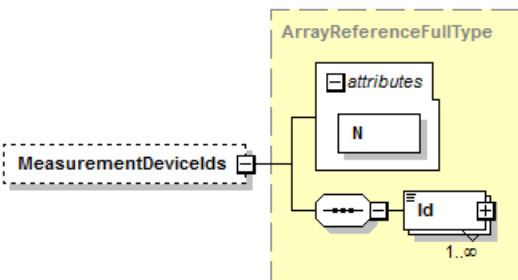
attributes	Name id	Type QIFIdType	Use required	Default	Fixed	Annotation documentation The id attribute is the QIF id of the statistical study results, used for referencing.
annotation	documentation The SimpleStudyResultsType defines information that is related to the results of a simple statistical study where multiple samples were measured for the purpose of averaging features for process adjustment or reverse engineering.					

complexType **StabilityStudyPlanType**




type	extension of StatisticalStudyPlanBaseType					
properties	base StatisticalStudyPlanBaseType					
children	Attributes ThisStatisticalStudyPlanInstanceQPId FeatureItemIds CalculateAverageFeatures CharacteristicItemIds StatsValuesPerChar StatsValuesPerSubgroup StatsValuesSummary PreInspectionTraceability Name Description PlanId CorrectiveActionPlanId MeasurementDeviceIds SampleSize SampleFrequency SamplingInterval					
used by	element StabilityStudyPlan					
attributes	Name id	Type QIFIdType	Use required	Default	Fixed	Annotation documentation The id attribute is the QIF id of the statistical study, used for referencing.
annotation	documentation The StabilityStudyPlanType defines information that is related to a stability statistical study where the same part or artifact is measured over time to assess the stability of a measurement system.					

element **StabilityStudyPlanType/MeasurementDeviceIds**


diagram						
type	ArrayReferenceFullType					
properties	minOcc	0				
	maxOcc	1				
	content	complex				
children	Id					
attributes	Name	Type	Use	Default	Fixed	Annotation
	N	NaturalType	required			documentation The required N attribute shows how many Id elements are present in this array.
annotation	documentation The optional MeasurementDeviceIds element is a list of the ids of one or more measurement devices in the measurement system to be studied.					

element **StabilityStudyPlanType/SampleSize**

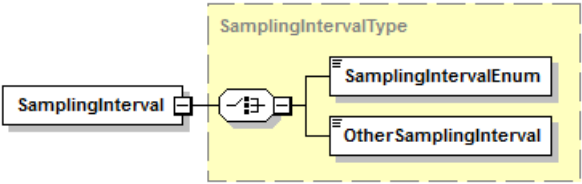
diagram						
type	xs:positiveInteger					
properties	content	simple				

annotation	documentation The SampleSize element specifies the number of samples n to be used in the statistical study.
------------	--

element **StabilityStudyPlanType/SampleFrequency**

diagram	 A diagram showing a rectangular box labeled "SampleFrequency" with a small square icon on its left side.
type	xs:positiveInteger
properties	content simple
annotation	documentation The SampleFrequency element specifies the sampling frequency n, n parts are measured in each sampling interval.

element **StabilityStudyPlanType/SamplingInterval**


diagram	 A diagram showing a rectangular box labeled "SamplingInterval" with a small square icon on its left side. This box is connected to a larger box labeled "SamplingIntervalType" which has a dashed border. Inside the "SamplingIntervalType" box, there is a small square icon with a plus sign, which is connected to two smaller boxes: "SamplingIntervalEnum" and "OtherSamplingInterval".
type	SamplingIntervalType
properties	content complex
children	SamplingIntervalEnum OtherSamplingInterval
annotation	documentation The SamplingInterval element specifies the sampling interval.

complexType **StabilityStudyResultsType**

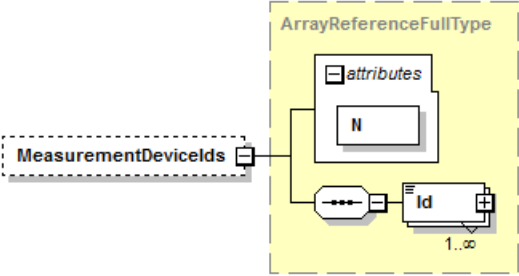
diagram						
type	extension of StatisticalStudyResultsBaseType					
properties	base StatisticalStudyResultsBaseType					
children	Attributes ThisStatisticalStudyResultsInstanceQPId Status StudyIssue InspectionTraceability Name Description StudyId ResultsId ResultsQPId ResultsFile AverageFeature CharacteristicsStats LinearStatsSummary AngularStatsSummary AreaStatsSummary ForceStatsSummary MassStatsSummary PressureStatsSummary SpeedStatsSummary TemperatureStatsSummary TimeStatsSummary UserDefinedUnitStatsSummary StatsSummary SampleSize MeasurementDeviceIds					
used by	element StabilityStudyResults					
attributes	Name id	Type QIFIdType	Use required	Default	Fixed	Annotation documentation

		The id attribute is the QIF id of the statistical study results, used for referencing.
annotation	documentation The StabilityStudyResultsType defines the results from a stability statistical study where the same part or artifact was measured over time to assess the stability of a measurement device.	

element **StabilityStudyResultsType/SampleSize**

diagram		
type	xs:positiveInteger	
properties	content	simple
annotation	documentation The SampleSize element specifies the number of samples n used in the statistical study.	

element **StabilityStudyResultsType/MeasurementDeviceIds**

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 MeasurementDeviceIds element is a list of the ids of one or more measurement devices in the measurement system to be studied.					

complexType **StatisticalStudiesResultsType**

diagram	<pre> <?xml version="1.0" encoding="UTF-8" standalone="no" ?> <StatisticalStudiesResultsType> <StatisticalStudyResults/> <Bias StudyResults/> <Capability StudyResults/> <FirstArticle StudyResults/> <GageRandR StudyResults/> <Linearity StudyResults/> <ProcessDifference StudyResults/> <Production StudyResults/> <Simple StudyResults/> <Stability StudyResults/> </StatisticalStudiesResultsType> </pre>
children	StatisticalStudyResults
used by	element StatisticsType/StatisticalStudiesResults
annotation	documentation The <code>StatisticalStudiesResultsType</code> defines a list of statistical study results.

complexType **StatisticalStudyPlanBaseType**

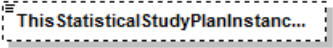
diagram						
properties	abstract true					
children	Attributes ThisStatisticalStudyPlanInstanceQPid FeatureItemIds CalculateAverageFeatures CharacteristicItemIds StatsValuesPerChar StatsValuesPerSubgroup StatsValuesSummary PreInspectionTraceability Name Description PlanId CorrectiveActionPlanId					
used by	element complexType	StatisticalStudyPlan FirstArticleStudyPlanType GageRandRStudyPlanType LinearityStudyPlanType MultipleProductInstanceStudyPlanBaseType ProcessDifferenceStudyPlanType StabilityStudyPlanType				
attributes	Name id	Type QIFIdType	Use required	Default	Fixed	Annotation documentation The id attribute is the QIF id of the statistical study, used for referencing.
annotation	documentation The StatisticalStudyPlanBaseType is the abstract base type that defines information common to all statistical study plans.					

attribute **StatisticalStudyPlanBaseType/@id**

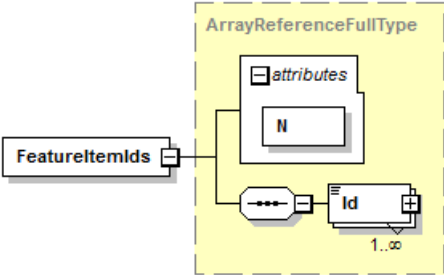
type	QIFIdType
properties	use required

annotation	documentation The id attribute is the QIF id of the statistical study, used for referencing.
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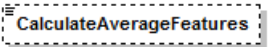
element **StatisticalStudyPlanBaseType/ThisStatisticalStudyPlanInstanceQPid**

diagram	 A dashed box containing the text "ThisStatisticalStudyPlanInstanc..."
type	QPidType
properties	minOcc 0 maxOcc 1 content simple
annotation	documentation The optional ThisStatisticalStudyPlanInstanceQPid element uniquely identifies the statistical study plan. Different versions of the plan must have different ThisStatisticalStudyPlanInstanceQPid elements.

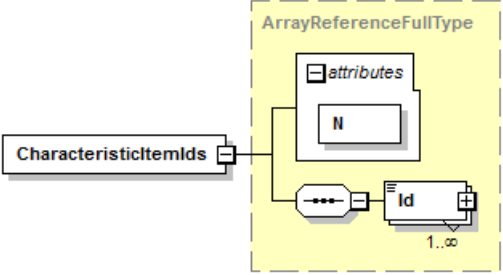
element **StatisticalStudyPlanBaseType/FeatureItemIds**

diagram	 A diagram showing a box labeled "FeatureItemIds" connected to a larger box labeled "ArrayReferenceFullType". Inside "ArrayReferenceFullType" is a box labeled "attributes" containing "N". Below "attributes" is a box labeled "Id" with a multiplicity of "1..∞".					
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 FeatureItemIds element is the list of feature items to be included in this statistical study.					


element **StatisticalStudyPlanBaseType/CalculateAverageFeatures**

diagram	 A dashed box containing the text "CalculateAverageFeatures"
type	xs:boolean
properties	minOcc 0 maxOcc 1 content simple
annotation	documentation The optional CalculateAverageFeatures element when present and set true signifies that average features are to be calculated in this statistical study.


element **StatisticalStudyPlanBaseType/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 the list of characteristic items to be included in this statistical study.					

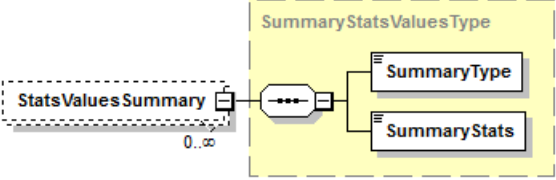
element **StatisticalStudyPlanBaseType/StatsValuesPerChar**

diagram	
type	ListAccumulatedStatsValuesType
properties	minOcc 0 maxOcc 1 content simple
annotation	documentation The optional StatsValuesPerChar element identifies the various statistical values to be accumulated on a per-characteristic basis in this statistical study plan. For example, the Cpk of each characteristic might be accumulated.

element **StatisticalStudyPlanBaseType/StatsValuesPerSubgroup**

diagram	
type	ListSubgroupStatsValuesType
properties	minOcc 0 maxOcc 1 content simple
annotation	documentation The optional StatsValuesPerSubgroup element identifies the various statistical values to be accumulated on a per-subgroup basis for this statistical study plan. For example, the average value of each characteristic might be accumulated for each subgroup.

element **StatisticalStudyPlanBaseType/StatsValuesSummary**

diagram	 <p>The diagram shows a dashed box labeled 'StatsValuesSummary' with a multiplicity of '0..∞'. This box is connected to a central connector, which is then connected to a yellow-shaded box labeled 'SummaryStatsValuesType'. Inside this yellow box, there are two sub-elements: 'SummaryType' and 'SummaryStats', each with a multiplicity of '1'.</p>
type	SummaryStatsValuesType
properties	<div>minOcc0</div> <div>maxOccunbounded</div> <div>contentcomplex</div>
children	SummaryType SummaryStats
annotation	<div>documentation</div> <div>Each StatsValuesSummary element identifies a statistical value to be summarized over all characteristics in this statistical study plan. For example, the Cpk value over all characteristics might be summarized.</div>

element **StatisticalStudyPlanBaseType/PreInspectionTraceability**

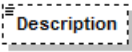
diagram	
type	PreInspectionTraceabilityType
properties	minOcc 0 maxOcc 1 content complex
children	InspectingOrganization CustomerOrganization SupplierCode PurchaseOrderNumber OrderNumber AsmPathIds ReportNumber InspectionScope InspectionMode PartialInspection NotableEvents InspectionSoftwareItems InspectionProgram SecurityClassification PlantLocation ReferencedQIFPlanInstance ReferencedQIFPlan FormalStandard
annotation	documentation The optional PreInspectionTraceability element gives traceability information that applies to the statistical study.

element **StatisticalStudyPlanBaseType/Name**

diagram	
type	xs:token

properties	minOcc 0 maxOcc 1 content simple
annotation	documentation The optional Name element is the name identifying the statistical study.

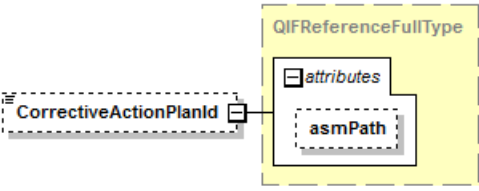
element StatisticalStudyPlanBaseType/Description

diagram	
type	xs:string
properties	minOcc 0 maxOcc 1 content simple
annotation	documentation The optional Description element is a description of the statistical study.

element StatisticalStudyPlanBaseType/PlanId


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 PlanId element is the QIF id of the associated measurement plan.					

element StatisticalStudyPlanBaseType/CorrectiveActionPlanId

diagram	
type	QIFReferenceFullType
properties	minOcc 0 maxOcc 1 content complex

attributes	Name asmPath	Type QIFIdType	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 optional CorrectiveActionPlanId element is the QIF id of a corrective action plan.					

complexType **StatisticalStudyPlansType**

diagram						
children	StatisticalStudyPlan					
used by	element	StatisticsType/StatisticalStudyPlans				
annotation	documentation	The StatisticalStudyPlansType defines a list of statistical study plans.				

complexType **StatisticalStudyResultsBaseType**

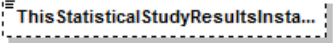
diagram							
properties	abstract	true					
children	Attributes ThisStatisticalStudyResultsInstanceQPId Status StudyIssue InspectionTraceability Name Description StudyId ResultsId ResultsQPid ResultsFile AverageFeature CharacteristicsStats LinearStatsSummary AngularStatsSummary AreaStatsSummary ForceStatsSummary MassStatsSummary PressureStatsSummary SpeedStatsSummary TemperatureStatsSummary TimeStatsSummary UserDefinedUnitStatsSummary StatsSummary						
used by	element complexType	StatisticalStudyResults BiasStudyResultsType FirstArticleStudyResultsType GageRandRStudyResultsType LinearityStudyResultsType MultipleProductInstanceStudyResultsBaseType ProcessDifferenceStudyResultsType StabilityStudyResultsType					
attributes	Name	Type	Use	Default	Fixed	Annotation	

	id QIFIdType required	documentation The id attribute is the QIF id of the statistical study results, used for referencing.
annotation	documentation The StatisticalStudyResultsBaseType is the abstract base type that defines information common to all statistical study results.	

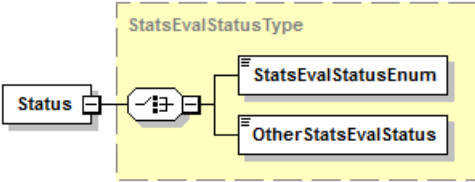
attribute StatisticalStudyResultsBaseType/@id

type	QIFIdType
properties	use required
annotation	documentation The id attribute is the QIF id of the statistical study results, used for referencing.

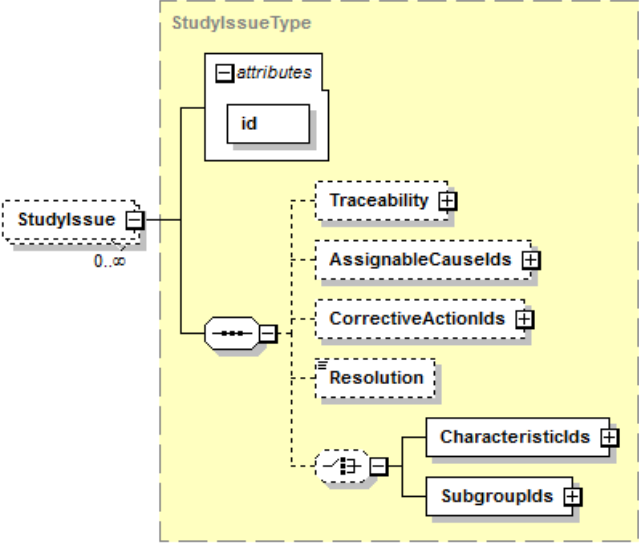
element StatisticalStudyResultsBaseType/ThisStatisticalStudyResultsInstanceQPId

diagram		
type	QPIdType	
properties	minOcc 0 maxOcc 1 content simple	
annotation	documentation The optional ThisStatisticalStudyResultsInstanceQPId element uniquely identifies the statistical study results. Different versions of the results must have different ThisStatisticalStudyResultsInstanceQPId elements.	

element StatisticalStudyResultsBaseType/Status

diagram		
type	StatsEvalStatusType	
properties	content complex	
children	StatsEvalStatusEnum OtherStatsEvalStatus	
annotation	documentation The Status element is the overall status of the statistical study.	


element **StatisticalStudyResultsBaseType/StudyIssue**

diagram						
type	StudyIssueType					
properties	minOcc	0	maxOcc	unbounded	content	complex
children	Traceability AssignableCauselds CorrectiveActionIds Resolution CharacteristicIds SubgroupIds					
attributes	Name id	Type QIFIdType	Use required	Default	Fixed	Annotation documentation The id attribute is the QIF id of the study issue, used for referencing.
annotation	documentation Each optional StudyIssue element provides details about any issues encountered in the study.					

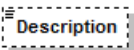
element **StatisticalStudyResultsBaseType/InspectionTraceability**

diagram	
type	InspectionTraceabilityType
properties	minOcc 0 maxOcc 1 content complex
children	InspectingOrganization CustomerOrganization SupplierCode PurchaseOrderNumber OrderNumber ReportNumber InspectionScope InspectionMode PartialInspection NotableEvents NotedEvents InspectionStart InspectionEnd InspectionSoftwareItems InspectionProgram InspectionOperator ReportPreparer ReportPreparationDate ReportType SecurityClassification PlantLocation ReferencedQIFPlanInstance ReferencedQIFPlan Errors
annotation	documentation The optional InspectionTraceability element gives traceability information that applies to the statistical study results.

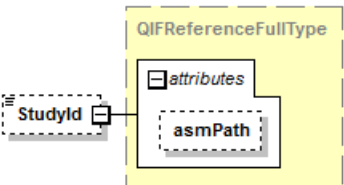
element **StatisticalStudyResultsBaseType/Name**

diagram	
type	xs:token
properties	minOcc 0 maxOcc 1 content simple
annotation	documentation The optional Name element is the name identifying the statistical study results.

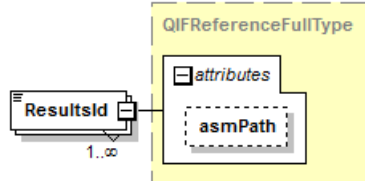
element **StatisticalStudyResultsBaseType/Description**

diagram	
type	xs:string
properties	minOcc 0 maxOcc 1 content simple
annotation	documentation The optional Description element is a description of the statistical study results.

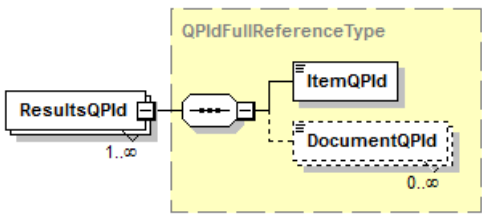
element **StatisticalStudyResultsBaseType/StudyId**

diagram						
type	QIFReferenceFullType					
properties	minOcc 0 maxOcc 1 content complex					
attributes	Name asmPath	Type QIFIdType	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 optional StudyId element is the QIF id of the associated statistical study plan.					

element **StatisticalStudyResultsBaseType/ResultsId**

diagram						
type	QIFReferenceFullType					
properties	minOcc	1	maxOcc	unbounded	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 Each ResultsId element is the QIF id of a measurement results internal to this QIF document.					

element **StatisticalStudyResultsBaseType/ResultsQPid**

diagram	
type	QPIdFullReferenceType
properties	minOcc 1 maxOcc unbounded content complex
children	ItemQPId DocumentQPId
annotation	documentation Each ResultsQPId element is the QPId of a measurement results in a QIF document external to this QIF document.

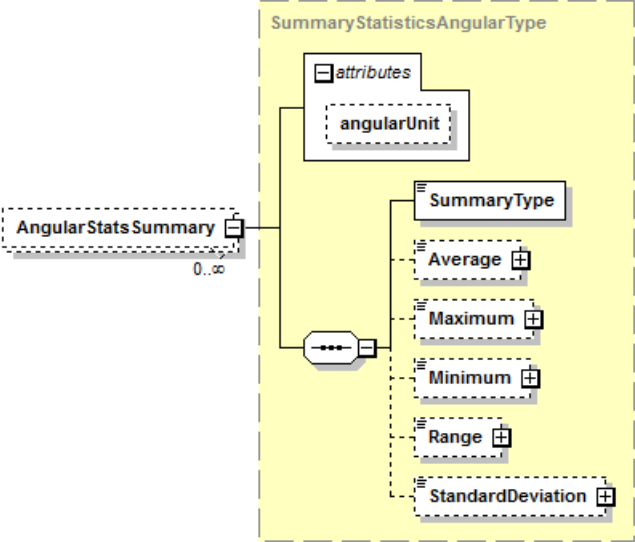
element **StatisticalStudyResultsBaseType/ResultsFile**

diagram	
type	ExternalFileReferenceType
properties	minOcc 1 maxOcc unbounded content complex
children	URI FileSpec Description
annotation	documentation Each ResultsFile element contains information about an external measurement results file.

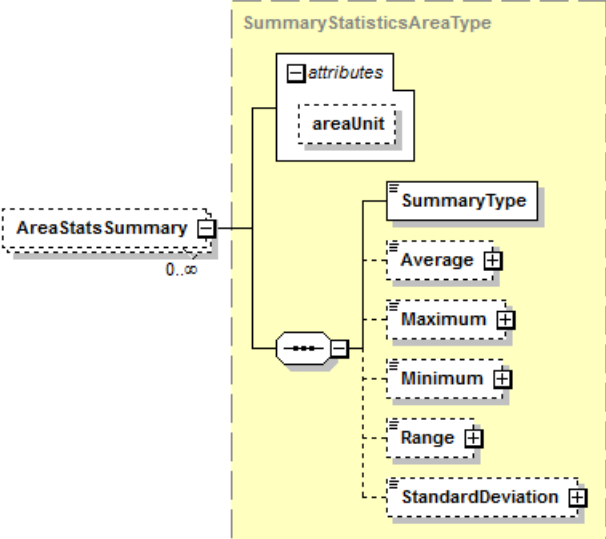
element **StatisticalStudyResultsBaseType/LinearStatsSummary**

diagram													
type	SummaryStatisticsLinearType												
properties	minOcc 0 maxOcc unbounded content complex												
children	SummaryType Average Maximum Minimum Range StandardDeviation												
attributes	<table><thead><tr><th>Name</th><th>Type</th><th>Use</th><th>Default</th><th>Fixed</th><th>Annotation</th></tr></thead><tbody><tr><td>linearUnit</td><td>xs:token</td><td></td><td></td><td></td><td>documentation The optional linearUnit attribute defines the UnitName for the SummaryStatisticsLinearType.</td></tr></tbody></table>	Name	Type	Use	Default	Fixed	Annotation	linearUnit	xs:token				documentation The optional linearUnit attribute defines the UnitName for the SummaryStatisticsLinearType.
Name	Type	Use	Default	Fixed	Annotation								
linearUnit	xs:token				documentation The optional linearUnit attribute defines the UnitName for the SummaryStatisticsLinearType.								
annotation	documentation Each optional LinearStatsSummary element contains the results of a statistical summary for a characteristic statistic with linear units.												

element **StatisticalStudyResultsBaseType/AngularStatsSummary**

diagram	 <p>The diagram illustrates the structure of the AngularStatsSummary element. It is shown as a dashed box containing a solid box labeled Angular Stats Summary with a multiplicity of 0..∞. This element is connected to a larger dashed box labeled SummaryStatisticsAngularType. Inside this box, there is an attributes section containing an optional angularUnit attribute. The main body of the type is a SummaryType section, which is a choice of five optional elements: Average, Maximum, Minimum, Range, and StandardDeviation, each represented by a dashed box with a plus icon.</p>					
type	SummaryStatisticsAngularType					
properties	minOcc	0	maxOcc	unbounded	content	complex
children	SummaryType Average Maximum Minimum Range StandardDeviation					
attributes	Name	Type	Use	Default	Fixed	Annotation
	angularUnit	xs:token				documentation The optional angularUnit attribute defines the UnitName for the SummaryStatisticsAngularType.
annotation	documentation Each optional AngularStatsSummary element contains the results of a statistical summary for a characteristic statistic with angular units.					

element **StatisticalStudyResultsBaseType/AreaStatsSummary**

diagram	 <p>The diagram illustrates the structure of the AreaStatsSummary element. It is shown as a dashed box containing a solid box labeled Area Stats Summary with a multiplicity of 0..∞. This element is connected to a larger dashed box labeled SummaryStatisticsAreaType. Inside this box, there is an attributes section containing an optional areaUnit attribute. The main body of the type is a SummaryType section, which is a choice of five optional elements: Average, Maximum, Minimum, Range, and StandardDeviation, each represented by a dashed box with a plus icon.</p>					
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type	SummaryStatisticsAreaType					
properties	minOcc	0	maxOcc	unbounded	content	complex
children	SummaryType Average Maximum Minimum Range StandardDeviation					
attributes	Name areaUnit	Type xs:token	Use	Default	Fixed	Annotation documentation The optional areaUnit attribute defines the UnitName for the SummaryStatisticsAreaType.
annotation	documentation Each optional AreaStatsSummary element contains the results of a statistical summary for a characteristic statistic with area units.					

element **StatisticalStudyResultsBaseType/ForceStatsSummary**

diagram						
type	SummaryStatisticsForceType					
properties	minOcc	0	maxOcc	unbounded	content	complex
children	SummaryType Average Maximum Minimum Range StandardDeviation					
attributes	Name forceUnit	Type xs:token	Use	Default	Fixed	Annotation documentation The optional forceUnit attribute defines the UnitName for the SummaryStatisticsForceType.
annotation	documentation Each optional ForceStatsSummary element contains the results of a statistical summary for a characteristic statistic with force units.					

element **StatisticalStudyResultsBaseType/MassStatsSummary**

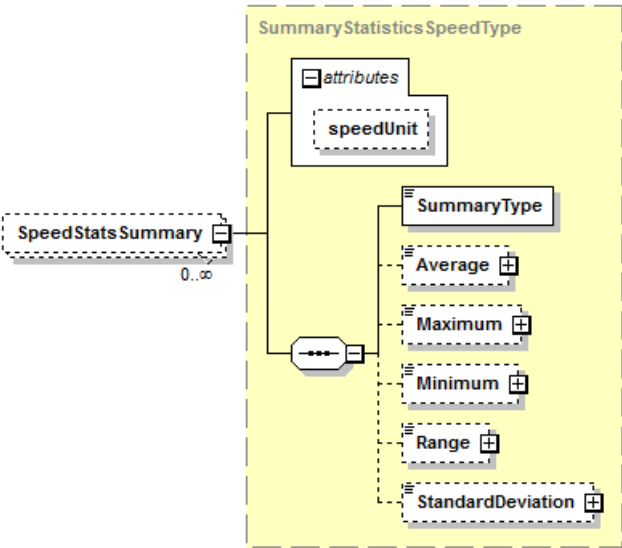
diagram						
type	SummaryStatisticsMassType					
properties	minOcc	0	maxOcc	unbounded	content	complex
children	SummaryType Average Maximum Minimum Range StandardDeviation					
attributes	Name	Type	Use	Default	Fixed	Annotation
	massUnit	xs:token				documentation The optional massUnit attribute defines the UnitName for the SummaryStatisticsMassType.
annotation	documentation Each optional MassStatsSummary element contains the results of a statistical summary for a characteristic statistic with mass units.					

element **StatisticalStudyResultsBaseType/PressureStatsSummary**

diagram						
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type	SummaryStatisticsPressureType					
properties	minOcc	0	maxOcc	unbounded	content	complex
children	SummaryType Average Maximum Minimum Range StandardDeviation					
attributes	Name	Type	Use	Default	Fixed	Annotation
	pressureUnit	xs:token				documentation The optional pressureUnit attribute defines the UnitName for the SummaryStatisticsPressureType.
annotation	documentation Each optional PressureStatsSummary element contains the results of a statistical summary for a characteristic statistic with pressure units.					

element **StatisticalStudyResultsBaseType/SpeedStatsSummary**

diagram						
type	SummaryStatisticsSpeedType					
properties	minOcc	0	maxOcc	unbounded	content	complex
children	SummaryType Average Maximum Minimum Range StandardDeviation					
attributes	Name	Type	Use	Default	Fixed	Annotation
	speedUnit	xs:token				documentation The optional speedUnit attribute defines the UnitName for the SummaryStatisticsSpeedType.
annotation	documentation Each optional SpeedStatsSummary element contains the results of a statistical summary for a characteristic statistic with speed units.					

element **StatisticalStudyResultsBaseType/TemperatureStatsSummary**

diagram						
type	SummaryStatisticsTemperatureType					
properties	minOcc	0	maxOcc	unbounded	content	complex
children	SummaryType Average Maximum Minimum Range StandardDeviation					
attributes	Name	Type	Use	Default	Fixed	Annotation
	temperatureUnit	xs:token				documentation The optional temperatureUnit attribute defines the UnitName for the SummaryStatisticsTemperatureType.
annotation	documentation Each optional TemperatureStatsSummary element contains the results of a statistical summary for a characteristic statistic with temperature units.					

element **StatisticalStudyResultsBaseType/TimeStatsSummary**

diagram						
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type	SummaryStatisticsTimeType					
properties	minOcc	0	maxOcc	unbounded	content	complex
children	SummaryType Average Maximum Minimum Range StandardDeviation					
attributes	Name timeUnit	Type xs:token	Use	Default	Fixed	Annotation documentation The optional timeUnit attribute defines the UnitName for the SummaryStatisticsTimeType.
annotation	documentation Each optional TimeStatsSummary element contains the results of a statistical summary for a characteristic statistic with time units.					

element **StatisticalStudyResultsBaseType/UserDefinedUnitStatsSummary**

diagram						
type	SummaryStatisticsUserDefinedUnitType					
properties	minOcc	0	maxOcc	unbounded	content	complex
children	SummaryType Average Maximum Minimum Range StandardDeviation					
attributes	Name unitName	Type xs:token	Use required	Default	Fixed	Annotation documentation The (required) unitName attribute defines the UnitName for the SummaryStatisticsUserDefinedUnitType.
annotation	documentation Each optional UserDefinedUnitStatsSummary element contains the results of a statistical summary for a characteristic statistic with user-defined units. This element is not to be used to define a summary with units available in another element. In particular this element is not to be used to define a summary with linear units, angular units, or units of temperature, area, force, mass, pressure, speed, or time.					

element **StatisticalStudyResultsBaseType/StatsSummary**

diagram	
type	SummaryStatisticsType
properties	minOcc 0 maxOcc unbounded content complex
children	SummaryType Average Maximum Minimum Range StandardDeviation
annotation	documentation Each optional StatsSummary element contains the results of a statistical summary for a characteristic statistic with dimensionless units.

complexType **StatisticsType**

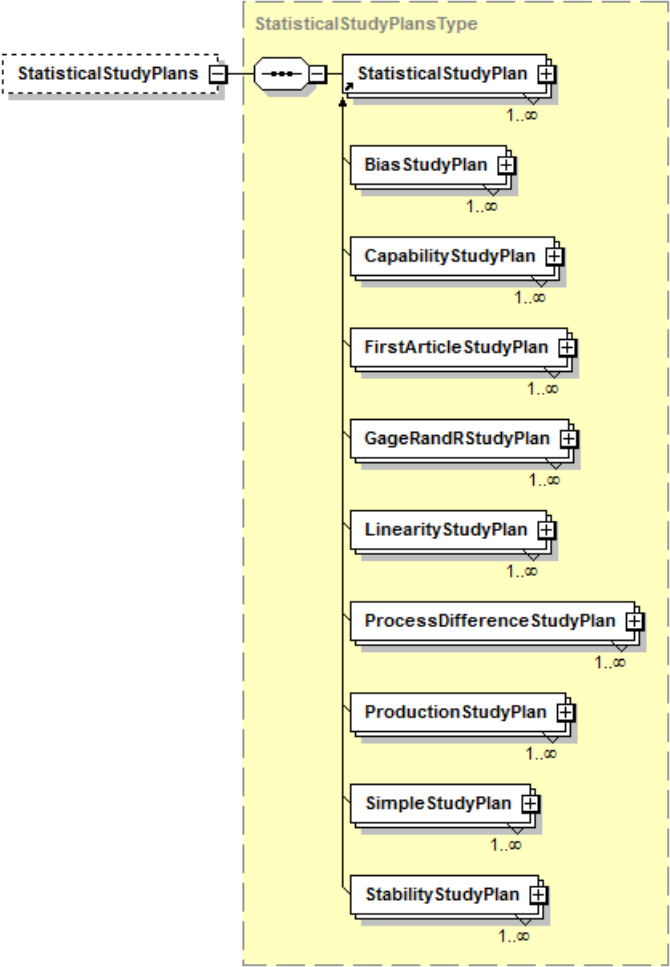
diagram	
children	Version StatisticalStudyPlans StatisticalStudiesResults CorrectiveActionPlans
used by	element Statistics
annotation	documentation The StatisticsType defines the container element that holds all statistical plan and/or results.

element **StatisticsType/Version**

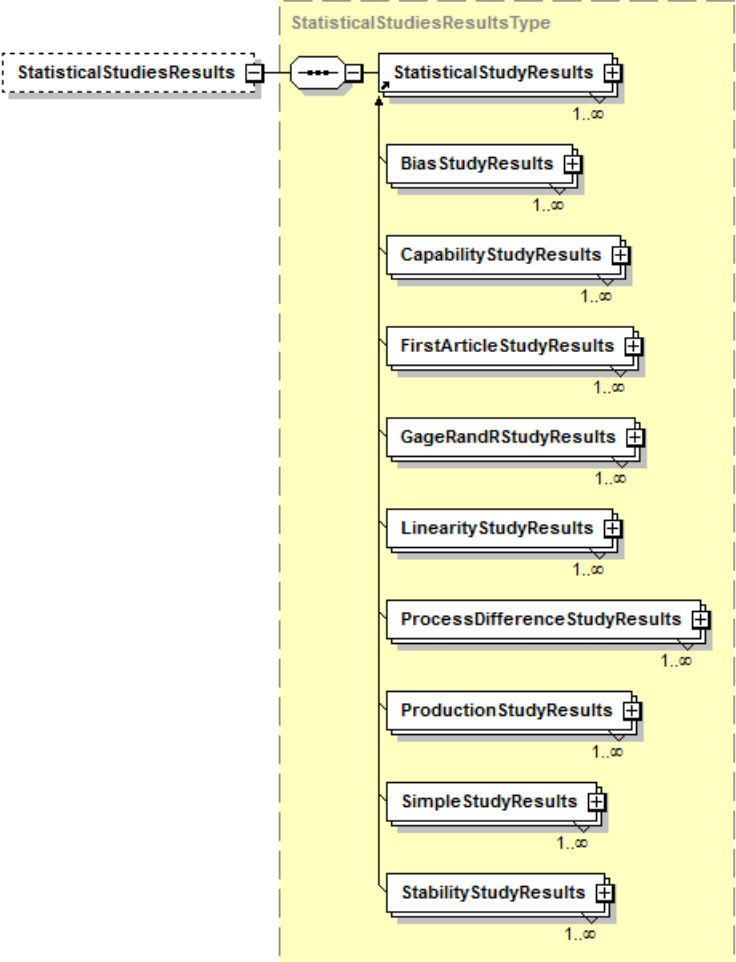
diagram	
type	VersionType
properties	minOcc 0 maxOcc 1

	content complex
children	TimeCreated SignOffs ThisInstanceQPId
annotation	documentation The optional Version element gives version information about the statistics.

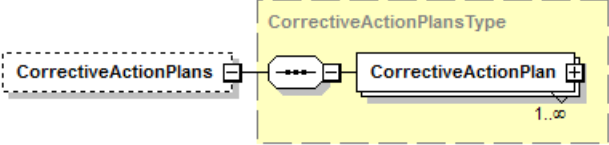
element **StatisticsType/StatisticalStudyPlans**

diagram	 <p>The diagram illustrates the structure of the StatisticalStudyPlansType element. It is represented by a dashed box labeled StatisticalStudyPlans containing a sequence of elements. The first element is StatisticalStudyPlan, which is followed by a vertical stack of specific study plan types: Bias StudyPlan, CapabilityStudyPlan, FirstArticle StudyPlan, GageRandRStudyPlan, LinearityStudyPlan, ProcessDifference StudyPlan, Production StudyPlan, Simple StudyPlan, and Stability StudyPlan. Each of these specific study plan types has a cardinality of 1..∞ indicated next to it. The entire structure is enclosed in a yellow dashed box labeled StatisticalStudyPlansType.</p>
type	<u>StatisticalStudyPlansType</u>
properties	minOcc 0 maxOcc 1 content complex
children	StatisticalStudyPlan
annotation	documentation The optional StatisticalStudyPlans element defines one or more statistical study plans.

element **StatisticsType/StatisticalStudiesResults**

diagram	 <p>The diagram illustrates the structure of the StatisticalStudiesResults element. On the left, a dashed box labeled StatisticalStudiesResults is connected via a line with a circle and a plus sign to a larger box on the right. This larger box is labeled StatisticalStudiesResultsType and has a yellow background. Inside this box, a vertical stack of study result elements is shown, each with a plus sign icon and a multiplicity of 1..∞ at the bottom right. The elements are: StatisticalStudyResults, Bias StudyResults, Capability StudyResults, FirstArticle StudyResults, GageRandR StudyResults, Linearity StudyResults, ProcessDifference StudyResults, Production StudyResults, Simple StudyResults, and Stability StudyResults.</p>
type	StatisticalStudiesResultsType
properties	minOcc 0 maxOcc 1 content complex
children	StatisticalStudyResults
annotation	documentation The optional StatisticalStudiesResults element defines one or more statistical study results.

element **StatisticsType/CorrectiveActionPlans**

diagram	 <p>The diagram illustrates the structure of the CorrectiveActionPlans element. On the left, a dashed box labeled CorrectiveActionPlans is connected via a line with a circle and a plus sign to a larger box on the right. This larger box is labeled CorrectiveActionPlansType and has a yellow background. Inside this box, a single CorrectiveActionPlan element is shown with a plus sign icon and a multiplicity of 1..∞ at the bottom right.</p>
type	CorrectiveActionPlansType
properties	minOcc 0 maxOcc 1 content complex
children	CorrectiveActionPlan

annotation	documentation The optional CorrectiveActionPlans element defines one or more corrective action plans.
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simpleType **GageRandRStudyEnumType**

type	restriction of xs:NMTOKEN		
properties	base	xs:NMTOKEN	
used by	element	GageRandRStudyPlanType/RandRStudyType	
facets	Kind	Value	Annotation
	enumeration	RANGE	
	enumeration	AVGANDRANGE	
	enumeration	ANOVA	
annotation	documentation	The GageRandRStudyEnumType enumerates the various gage RandR study types.	

~~ end of QIFStatistics.xsd data dictionary ~~

Bibliography

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