

DRAFT INTERNATIONAL STANDARD

ISO/DIS 23952

ISO/TC 184/SC 4

Secretariat: ANSI

Voting begins on:
2019-07-22

Voting terminates on:
2019-10-14

Quality information framework (QIF) — An integrated model of manufacturing quality information

ICS: 25.040.40

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Full standard:
<https://standards.iteh.ai/catalog/standards/sist/66a062b7-f0ca-42a6-b4a4-a1f417b37e5b/iso-prf-23952>

THIS DOCUMENT IS A DRAFT CIRCULATED FOR COMMENT AND APPROVAL. IT IS THEREFORE SUBJECT TO CHANGE AND MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

This document is circulated as received from the committee secretariat.

FAST TRACK PROCEDURE



Reference number
ISO/DIS 23952:2019(E)

© ISO 2019

iTeh STANDARD PREVIEW
(standards.iteh.ai)
Full standard:
<https://standards.iteh.ai/catalog/standards/sist/66a062b7-f0ca-42a6-b4a4-a1f417b37e5b/iso-prf-23952>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2019

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Foreword.....	xxiii
Introduction	xxv
1 Scope of the integrated model and fundamental principles	1
1.1 Contents of this document	1
1.2 Scope of the QIF Version 3.0 information model.....	1
1.3 Conformance	3
2 Normative references.....	4
3 Terms and definitions.....	6
3.1 Terms defined in ISO 22093:2011 and ANSI/DMIS 105.3-2016, Part 1	6
3.1.1 actual.....	6
3.1.2 dimensional measuring equipment (DME)	6
3.1.3 nominal.....	6
3.1.4 measurement.....	6
3.1.5 part coordinate system (PCS)	6
3.2 Terms defined in XML Schema Part 0: Primer Second Edition, W3C Recommendation 28 October 2004.....	6
3.2.1 attribute.....	6
3.2.2 complexType	6
3.2.3 element.....	7
3.2.4 instance file.....	7
3.3 Terms defined in XML Schema Part 1: Structures Second Edition, W3C Recommendation 28 October 2004	7
3.3.1 attribute information item	7
3.3.2 element information item.....	7
3.3.3 enumeration.....	7
3.3.4 extension	7
3.3.5 key.....	8
3.3.6 keyref.....	8
3.3.7 schema (or XML schema).....	8

3.3.8	schema document (or schema file)	8
3.3.9	simple type	8
3.3.10	string.....	8
3.3.11	token.....	8
3.4	Terms defined in the QIF standard.....	8
3.4.1	accuracy test.....	8
3.4.2	action.....	8
3.4.3	action group.....	9
3.4.4	action method	9
3.4.5	actual component	9
3.4.6	actual component set.....	9
3.4.7	application area	9
3.4.8	articulating arm CMM.....	9
3.4.9	aspect.....	9
3.4.10	definition aspect.....	9
3.4.11	nominal aspect.....	9
3.4.12	item aspect	9
3.4.13	measured aspect.....	10
3.4.14	assembly	10
3.4.15	assembly path.....	10
3.4.16	assignable cause	10
3.4.17	attribute characteristic.....	10
3.4.18	attribute data.....	10
3.4.19	autocollimator	10
3.4.20	bias.....	10
3.4.21	bill of characteristics (BoC)	10
3.4.22	boolean condition.....	10
3.4.23	calibration	11
3.4.24	caliper	11
3.4.25	capability.....	11
3.4.26	capacitive sensor	11
3.4.27	carriage.....	11
3.4.28	Cartesian CMM.....	11

3.4.29	characteristic.....	11
3.4.30	characteristic item.....	11
3.4.31	charge coupled device camera sensor.....	11
3.4.32	checked	11
3.4.33	clipping plane.....	11
3.4.34	complex tactile probe sensor	11
3.4.35	component.....	12
3.4.36	composite feature	12
3.4.37	computed tomography	12
3.4.38	confocal chromatic sensor	12
3.4.39	constructed feature	12
3.4.40	control limits.....	12
3.4.41	control points	12
3.4.42	coordinate measuring machine	12
3.4.43	control polygon	12
3.4.44	corrective action.....	12
3.4.45	corrective action plan.....	12
3.4.46	data/information quality.....	13
3.4.47	datum definition	13
3.4.48	datum reference frame.....	13
3.4.49	dial caliper	13
3.4.50	digital caliper.....	13
3.4.51	digital micrometer	13
3.4.52	draw wire sensor.....	13
3.4.53	DVRT sensor	13
3.4.54	eddy current sensor	13
3.4.55	entity.....	13
3.4.56	evaluation	14
3.4.57	event.....	14
3.4.58	external product definition	14
3.4.59	feature	14
3.4.60	file unit	14
3.4.61	fixture.....	14

3.4.62	gage	14
3.4.63	gage repeatability and reproduceability (gage R&R)	14
3.4.64	generatrix.....	15
3.4.65	generic feature.....	15
3.4.66	geometric.....	15
3.4.67	geometric characteristic	15
3.4.68	inspection	15
3.4.69	inspection traceability.....	15
3.4.70	internal product definition	15
3.4.71	item.....	15
3.4.72	key characteristic	16
3.4.73	knot vector	16
3.4.74	laser radar	16
3.4.75	laser tracker.....	16
3.4.76	laser triangulation sensor.....	16
3.4.77	light pen CMM.....	16
3.4.78	linearity	16
3.4.79	Long Term Archiving and Retrieval.....	16
3.4.80	LVDT sensor.....	16
3.4.81	magneto-inductive sensor.....	17
3.4.82	manufacturing traceability	17
3.4.83	measurand.....	17
3.4.84	measure feature method.....	17
3.4.85	measurement.....	17
3.4.86	measurement device.....	17
3.4.87	measurement plan	17
3.4.88	measurement resource	17
3.4.89	measurement result	17
3.4.90	measurement room.....	18
3.4.91	mesh.....	18
3.4.92	micrometer.....	18
3.4.93	microscope	18
3.4.94	multiple carriage CMM	18

3.4.95	non-dimensional quality data	18
3.4.96	normal.....	18
3.4.97	normal vector	18
3.4.98	notable event	18
3.4.99	note	18
3.4.100	noted event	18
3.4.101	optical comparator.....	18
3.4.102	parallel link CMM.....	19
3.4.103	part.....	19
3.4.104	persistent identifier	19
3.4.105	plan element.....	19
3.4.106	plan note	19
3.4.107	plan root	19
3.4.108	point sampling strategy	19
3.4.109	process variation	19
3.4.110	product.....	19
3.4.111	product and manufacturing information (PMI).....	19
3.4.112	production	20
3.4.113	QIF persistent identifier (QPId).....	20
3.4.114	qualification	20
3.4.115	rule.....	20
3.4.116	sampling category	20
3.4.117	sampling method.....	20
3.4.118	sensor	20
3.4.119	sensor qualification.....	20
3.4.120	set.....	20
3.4.121	simple tactile probe	21
3.4.122	sine bar	21
3.4.123	stability	21
3.4.124	standard deviation	21
3.4.125	statistical study plan	21
3.4.126	statistical study results	21
3.4.127	structured light sensor	21

3.4.128	tactile probe sensor	21
3.4.129	theodolite	21
3.4.130	thread specification	22
3.4.131	tolerance	22
3.4.132	tool	22
3.4.133	touch probe	22
3.4.134	traceability	22
3.4.135	trimming contour	22
3.4.136	ultrasonic sensor	22
3.4.137	universal length measuring machine	22
3.4.138	version	22
3.4.139	weld characteristic.....	22
3.4.140	weld symbol	22
3.4.141	wire-frame	23
3.4.142	work instruction	23
3.4.143	workpiece.....	23
4	Symbols and abbreviated terms	24
5	Overview of the Quality Information Framework (QIF) information model.....	26
5.1	Purpose	26
5.2	Model based definition manufacturing quality workflow.....	26
5.3	QIF design requirements.....	29
5.4	QIF Data Quality	30
5.4.1	XML implementation	30
5.4.2	Redundancy Checks.....	34
5.4.3	Product Data Quality.....	34
5.4.4	Digital Signature	34
5.4.5	Long Term Archiving and Retrieval	35
5.5	QIF manufacturing functional requirements	36
5.6	QIF and STEP	36
5.7	QIF information model design guidelines	37
5.8	Overview of XML schema file modularity	37

5.9	Data structures	39
5.9.1	The QIFDocument element.....	39
5.9.2	Four aspects of features data	43
5.9.3	Four aspects of characteristics	49
5.9.4	Default tolerances and characteristics	52
5.9.5	Relationships between the aspects.....	54
5.10	Hierarchy of required information	59
5.10.1	QIF use of optional elements	59
5.10.2	Example: diameter characteristic	60
5.10.3	ScaleCoefficient.....	63
5.11	Actual parts and assemblies	63
5.12	Checking connections between data objects.....	65
5.13	Tracking information through the product lifecycle	68
5.13.1	Persistent Identifiers	69
5.13.2	UUIDs and QPIDs	69
5.13.3	External File References.....	69
5.13.4	QIF data flow	71
5.13.5	Using QPIDs in QIF.....	72
5.14	Linking PMI information to product shape models.....	75
5.15	Welding Characteristics and Symbols	77
5.15.1	Base parameters	78
5.15.2	Location Significance parameter	78
5.15.3	Weld Characteristic parameters	79
5.15.4	Supplementary parameters.....	81
5.15.5	Non-Destructive Testing types	81
5.15.6	Compound Welds	82
5.16	QIF handling of transforms, transformations, and coordinate systems	82
5.16.1	Coordinate Spaces	82
5.16.2	Transformation matrix	82
5.16.3	Transforms	88
5.16.4	Coordinate systems	89

5.16.5	CAD coordinate systems	92
5.16.6	Coordinate system lists	92
5.17	Feature control frames	93
5.17.1	Geometric tolerance characteristic types	93
5.17.2	Tolerance zone size	94
5.17.3	Zone shape	95
5.17.4	Zone extents	95
5.17.5	Other zone modifiers	96
5.17.6	Datum reference frames	97
5.18	QIF handling of units	98
5.18.1	Introduction	98
5.18.2	PMI units	100
5.18.3	Default units	101
5.18.4	Other units	101
5.19	Modeling slots in QIF	101
5.19.1	Introduction	101
5.19.2	Internal and external	102
5.19.3	Location and size	102
5.19.4	End types	104
5.19.5	Bottom types	107
5.19.6	Taper	107
5.19.7	Draft	108
5.19.8	Feature measurement	108
5.20	Modeling cones and conical segments in QIF	109
5.20.1	Introduction	109
5.20.2	Location, orientation and angle	109
5.20.3	Linear extents	111
5.21	Modeling pattern features in QIF	114
5.21.1	Circular pattern feature	115
5.21.2	Circular arc pattern feature	117
5.21.3	Linear pattern feature	117
5.21.4	Parallelogram pattern feature	118

5.22	Modeling threads in QIF	119
5.22.1	Thread specification types	119
5.23	Feature measurement determination	120
5.23.1	Checked and set features	120
5.23.2	Measurement and construction	120
5.23.3	Measurement points	120
5.23.4	Construction methods	120
5.24	CharacteristicDesignators - encoding "balloon" numbers in QIF	123
5.25	Attributes and Part Notes	124
5.26	Detailed requirements	126
5.26.1	XML naming and design rules (NDR)	126
5.26.2	Annotation conventions	128
6	QIF Library	130
6.1	Introduction	130
6.1.1	Changes in the QIF Library from QIF Version 2.1	131
6.2	Auxiliary.xsd	132
6.3	Characteristics.xsd	132
6.3.1	Characteristics <i>element</i>	132
6.3.2	Characteristic definitions, nominals, items, and measurements	133
6.3.3	DefaultCharacteristicDefinitions	137
6.3.4	DefaultToleranceDefinitions	137
6.3.5	CharacteristicGroups	137
6.3.6	Constraint checking for characteristics	138
6.3.7	ToleranceZones	138
6.3.8	Substitution groups in Characteristics.xsd	138
6.4	Expressions.xsd	139
6.4.1	Types Defined in Expressions.xsd	139
6.4.2	Substitution groups in Expressions.xsd	140
6.5	Features.xsd	140
6.5.1	Features <i>element</i>	140

6.5.2	Feature types.....	140
6.5.3	Constraint checking for features.....	144
6.5.4	Feature construction methods.....	145
6.5.5	Substitution groups for features	145
6.6	GenericExpressions.xsd	146
6.6.1	Arithmetic Expressions	146
6.6.2	String Expressions.....	146
6.6.3	Boolean Expressions	147
6.7	Geometry.xsd	147
6.8	IntermediatesPMI.xsd	149
6.9	Primitives.xsd.....	150
6.10	PrimitivesPD.xsd.....	151
6.11	PrimitivesPMI.xsd	151
6.12	Statistics.xsd.....	151
6.12.1	Basic Statistics Types.....	151
6.12.2	Characteristic Statistics Evaluation Types.....	153
6.13	Topology.xsd	156
6.14	Traceability.xsd.....	157
6.14.1	<i>InspectionTraceabilityType</i>	157
6.14.2	<i>PreInspectionTraceabilityType</i>	158
6.14.3	<i>ProductTraceabilityType</i>	158
6.14.4	<i>ActualProductTraceabilityType</i>	159
6.14.5	<i>ManufacturingProcessTraceabilityType</i>	159
6.15	Units.xsd.....	160
6.15.1	FileUnits.....	160
6.15.2	Conversions.....	162
6.15.3	FileUnitsExample	163
6.15.4	Instance File Example Using Units.....	164
6.16	Visualization.xsd	165
7	QIF Model Based Definition (MBD) information model	168

7.1	Foreword	168
7.2	Introduction	168
7.3	Scope	169
7.3.1	Contents of this clause	169
7.3.2	QIF MBD Information Model Application Architecture	169
7.4	QIF MBD information model requirements	171
7.5	Overview of the product data model	171
7.5.1	Design principles	171
7.5.2	Geometry	180
7.5.3	Topology	260
7.5.4	Product structure	292
7.5.5	Transformations	308
7.5.6	Auxiliary data	309
7.5.7	Visualization data	314
7.5.8	Validation properties	363
7.5.9	High level description of the product data	368
8	QIF Plans information model	370
8.1	Foreword	370
8.2	Introduction	371
8.3	Scope	372
8.3.1	Contents of this clause	372
8.3.2	Workflow of QIF Plans data for manufacturing quality	372
8.3.3	QIF Plans information model	373
8.3.4	QIF Plans scope	373
8.3.5	QIF Plans use cases	374
8.3.6	QIF Plans product definition support	376
8.4	Data types and <i>elements</i> of the QIF Plans information model	377
8.4.1	Plan	377
8.4.2	PlanElement	377
8.4.3	Action	377