INTERNATIONAL STANDARD

ISO 20616-2

First edition
2020-03

Graphic technology — File format for quality control and metadata —

Part 2: Print Quality eXchange (PQX)

Technologie graphique — Format de fichier pour le contrôle qualité et les métadonnées —

Partie 2: PQX (Print Quality eXchange)

Reference number
ISO 20616-2:2020(E)

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Published in Switzerland

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 130, *Graphic technology*.

A list of all parts in the ISO 20616 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

ISO 20616 defines standard XML schemas designed to enable the digital exchange of print quality data and metadata between trading partners within the graphic arts supply chain. In the past, a number of different non-standard data formats have been used to communicate print quality metrics. It is a general observation that many of these existing non-standard data formats describe similar types of information. Existing standard data formats cover either too much or too little scope to address industry requirements. Hence, there is an industry need for a single, standard concise set of data formats for the communication of print quality.

Each part of ISO 20616 is intended to stand alone, but may be used in conjunction with each other, should that option be chosen. The goal of ISO 20616 is to maintain the degree of flexibility required by print buyers for all kinds of print generated for all purposes from any print device while minimizing the uncertainty of the data exchanged.

This document is intended to facilitate the one-way transmission of performance data for one or more printed samples, for one or more brands or products from a single press run from print service providers to relevant stakeholders and print buyers; thus, allowing them to assess and track relevant business, production, colour and quality data of printed materials of all forms. PQX is only intended to transmit raw quality data. The PQX file intentionally excludes tolerance and evaluative information, allowing the receiver to determine acceptability by applying their own scale and tolerance values. PQX incorporates colour using the same data containers that are defined in ISO 17972-4 (CxF3_Core.xsd). While PQX and CxF are different formats with different parsing requirements, developers can use the same strategies for reading and writing colour data in a PQX file that they use for reading and writing colour data in a CxF file. PQX is compatible with both spectral and non-spectral colour data.

Some portions of this document are available as electronic files at http://standards.iso.org/iso/20616/-2/ed-1/en

— ISO20616-2PQX.xsd

— ISO20616-2pqx_lines.pdf (a printable version of the PRX XML schema with reference line numbers)

— ISO20616-2SchemaDoc.pdf (Schema diagrams and documentation)

— PQX_MasterSampleA.pqx

— PQX_MasterSampleA.pdf (a printable version of Sample A with reference line numbers)

— PQX_MasterSampleB.pqx

— PQX_MasterSampleB.pdf (a printable version of Sample B with reference line numbers)

NOTE The spelling of fields in PQX were designed to match the spelling of fields taken from ISO 17972-1 and are not altered from that used in the normative reference. A specific example is the use of the word “color” instead of “colour”.

It should be noted that Idealliance, Inc. the original creator of the PQX file format, claims no intellectual property rights, neither patent nor copyright, to the materials used in this document.

Graphic technology — File format for quality control and metadata —

Part 2:
Print Quality eXchange (PQX)

1 Scope

This document specifies an extensible file format in conformity with W3C Extensible Markup Language (XML) 1.0, for the exchange of print quality data and metadata between quality control applications including but not limited to colour measurement, process control and quality management systems.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 17972-1, *Graphic technology — Colour data exchange format — Part 1: Relationship to CxF3 (CxF/X)*

ISO 17972-3, *Graphic technology — Colour data exchange format (CxF/X) — Part 3: Output target data (CxF/X-3)*

Extensible Markup Language (XML) 1.0 (Fifth Edition), World Wide Web Consortium (W3C), W3C Recommendation, 26 November 2008. Available at https://www.w3.org/TR/2008/REC-xml-20081126/

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
CxF
electronic exchange format for colour and process control data (and the associated metadata necessary for its proper interpretation)

3.2
press run
continuous operation of a printing press for a single job

3.3
print buyer
name of the customer or entity purchasing printing services and products

3.4
print defect
imperfection that impairs worth or utility of a printed item that stems from a wide array of potential causes and varies from printing method to printing method

3.5
printer
name of the print service provider responsible for printing items purchased by a *print buyer* (3.3)

3.6
XML
Extensible Markup Language
set of rules recommended by the World Wide Web Consortium (W3C) for encoding documents in a digital format which is both human-readable and machine-readable

3.7
XML attribute
attribute
XML construct included within the start tag of an *XML element* (3.8) that modifies, or provides descriptive metadata about, that element's content

3.8
XML element
element
data structure including a start tag, an end tag, data between these tags, and, possibly, a set of *XML attributes* (3.7)

[SOURCE: ISO 13584-32:2010, 3.22, modified — Added admitted term.]

3.9
XML root element
root element
single XML element that encloses all the other elements and is therefore the sole parent element to all the other elements

3.10
XML schema
language for describing the structure and constraining the contents of XML documents

[SOURCE: ISO 25720:2009, 4.32]

3.11
XML schema parser
application that is capable of validating document schemes (content and structure) and descriptor data types against their schema definition

[SOURCE: ISO/IEC 23001-1:2006, 3.2.71]

4 Symbols and abbreviated terms

The following documentation conventions are used.

— Names of XML elements are shown in bold type; for example, **SampleCollection**.

— Names of XML attributes are shown in italics; for example, *@DisplayName*.

XML XPaths are used to identify XML elements. For example, **SampleCollection**/**Sample** refers to an element (**Sample**) that is a child of another element (**SampleCollection**).

Similarly, XML XPaths are used to refer to XML attributes. For example, **CustomerItem**/*@Id* refers to an attribute (*Id*) of an element (**CustomerItem**).

5 Requirements

5.1 General

The following general requirements shall be met when using PQX XML to exchange print quality data and metadata.

— The exchange of PQX print quality data and metadata shall conform to Extensible Markup Language (XML) 1.0 (Fifth Edition).

— If PQX quality data are exchanged as a standalone file, the file extension shall be ".pqx".

— The root element of ISO 20616-2 print quality data shall be a single **PQX** element.

— A valid **PQX** element shall contain the required namespace information in the root element: (<PQX xmlns:pqx = "http://idealliance.org/pqx" >) followed by the XML elements and XML attributes specified by ISO20616-2PQX.xsd.

— If colour quality data are being exchanged, the PQX root element shall contain the required namespace information for CxF, "xmlns:cc="http://colorexchangeformat.com/CxF3-core".

PQX quality data should be validated using an XML schema parser employing the XML schema file ISO20616-2PQX.xsd. The requirements for utilization of the ISO20616-1PQX schema shall be as specified in Annex A.

5.2 Extensibility

5.2.1 General

To provide for extensibility for this document, the specification includes two blocks modelled directly from the extensibility provided by CxF/X; **TagCollection** and **CustomResources.**

5.2.2 TagCollection

TagCollection may only be used to insert additional application-specific child elements into a PQX data structure at the agreement of all trading partners. See 5.4.32.

NOTE Use of **TagCollection** is highly discouraged.

5.2.3 CustomResources

CustomResources may only be used to insert additional application-specific data models into a PQX data structure at the agreement of all trading partners. See 5.4.33.

NOTE Use of **CustomResources** is highly discouraged.

5.3 Employing CxF

ISO 17972-1 shall be used to exchange print quality colour data and metadata. The following requirements shall be met when using the CxF schema.

— Only Core CxF data shall be employed as the data store for colour requirements data.

— CxF shall be employed as a complete CxF hierarchy.

NOTE Retaining **<cc:CxF>** as the root element ensures direct importability from colour measurement devices.

— CxF **<cc:Tags>** should only be used to customize CxF if specified by a business agreement among trading partners.

— CxF **<cc:CustomResources>** should only be used to customize CxF if specified by a business agreement among trading partners.

— CxF < **cc:PhysicalAttributes** > < **cc:CustomAttributeString** > and < **cc: CustomAttributeValue** > should only be used to customize CxF if specified by a business agreement among trading partners.

— Non-appropriate CxF elements (listed above) may be written into a PQX quality report but should only be processes by receiving systems if specified by a business agreement among trading partners.

5.4 PQX quality reporting

5.4.1 Overview

The ISO20616-2PQX schema provides the rules for the order, occurrence and datatypes for the fields that make up a print quality report. The ISO20616-2PQX schema is the immutable specification. Additional requirements that cannot be specified by an XML schema are found in the following subclauses.

NOTE A printable version of the ISO20616-2PQX schema with reference line numbers is available at http://standards.iso.org/iso/20616/-2/ed-1/en) to enable referencing of element definitions by this document. See Annexes B and C for additional information.

5.4.2 PQX element

The **PQX** element is the root element of a print quality data exchange. The **PRX** element shall be used to specify a print buyer's print quality report. The **PQX** element shall conform to rules specified by ISO20616-2PQX.xsd (lines 10–30).

Table 1 provides for references to the specifications for fields that make up the PQX element.

Table 1 — PQX field specifications

Field name	Normative specifications
PQXInfo	See 5.4.3.
PrinterInfo	See 5.4.4.
PressRunInfo	See 5.4.5.
InkCollection	See 5.4.6.
ReporterCollection	See 5.4.8.
CustomerItemCollection	See 5.4.10.
SampleCollection	See 5.4.12.
CxFSampleData	See 5.4.29.
CxFReferenceData	See 5.4.30.
DefectImageData	See 5.4.31.
TagCollection	See 5.4.32.
CustomResources	See 5.4.33.

5.4.3 PQXInfo element

The **PQXInfo** element shall be used to identify the instance of the print quality report being exchanged. The **PQXInfo** element shall conform to rules specified by ISO20616-2PQX.xsd (lines 35–47). Table 2 provides definitions and usage rules for each child element of **PQXInfo**.

Table 2 — PQXInfo element definition and usage rules

Name	Definition	Usage rules
PQXDate	The **PQXDate** element shall be used to identify date or date/time this PQX data was generated.	The **PQXDate** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 51–55).
PQXId	The **PQXId** element shall be used to provide an identifier (unique in the context of system generated identifiers assigned on the specified PQXDate) for this print quality report.	The **PQXId** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 59–63).
PQXSoftware-Version	**PQXSoftware-Version** shall be used to identify the software and version that generated this print quality report.	The **PQXSoftware-Version** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 67–71).
NOTE Concatenation of the **PQXDate**, **PQXId** and **PQXSoftware-Version** can make up a unique identifier for this print quality data report.		

5.4.4 PrinterInfo element

The **PrinterInfo** element shall be used to identify information about the printer generating the print quality report. The **PrinterInfo** element shall conform to rules specified by ISO20616-2PQX.xsd (lines 245–258). Table 3 provides definitions and usage rules for each child element of **PrinterInfo**.

Table 3 — PrinterInfo definition and usage rules

Name	Definition	Usage rules
ParentCompany	The **ParentCompany** element shall be used to identify the company that controls a smaller, entity such as a printer or quality service provider.	The **ParentCompany** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 155–159).
Printer	The **Printer** element shall be used to provide the name of the print service provider responsible for printing items purchased by a print buyer.	The **Printer** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 262–266).
LocationDesignator	The **LocationDesignator** element shall be used to provide a designation for the location of a company or party as a second level of identification for that company or party.	The **LocationDesignator** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 171–175).
ContactDesignator	The **ContactDesignator** element shall be used to provide a designation for information required to communicate with a business entity.	The **ContactDesignator** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 179–183).
NOTE 1 **LocationDesignator** can be a unique identifier, city/state/country designation, postal code, geographic coordinates or simply be a designator code employed by the printer. This element is purposefully flexible to facilitate broad printer adoption.		
NOTE 2 **ContactDesignator** can be email, street address, phone, fax, etc. or simply be a designator code employed by the printer. This element is purposefully flexible to facilitate broad printer adoption.		

5.4.5 PressRunInfo element

The PressRunInfo element shall be used to provide descriptive information about the press run. The **PressRunInfo** element shall conform to rules specified by ISO20616-2PQX.xsd (lines 270–290). Table 4 provides definition and usage rules for each child element of **PressRunInfo**.

Table 4 — PressRunInfo definition and usage rules

Name	Definition	Usage rules
DatePrinted	The **DatePrinted** element shall be used to s identify date or date/time this pressrun was conducted.	**DatePrinted** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 294–298).
PrinterLotId	The **PrinterLotId** element shall be used to provide the identifier used by the printer for the press run.	The **PrinterLotId** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 302–306).
RunLength	See 5.4.6	
PrintMethod	The **PrintMethod** element shall be used to specify the mechanism by which customer items were printed.	The **PrintMethod** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 335–339).
PrintSide	The **PrintSide** element shall be used to specify the side of the substrate where the customer image(s) is/are printed.	The **PrintSide** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 343–348).
PressLine	The **PressLine** element shall be used to specify the line within a print shop where the press run took place. .	The **PressLine** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 352–356).
PressOperator	The **PressOperator** element shall be used to identify the person running the press.	The **PressOperator** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 360–365).
Shift	The **Shift** element shall be used to specify the printer workforce period when the press run took place.	The **Shift** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 369–373).
PrinterComments	The **PrinterComments** element shall be used to provide any additional comments the printer may have about the press run.	The **PrinterComments** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 377–381).
PrinterJobDescription	The **PrinterJobDescription** element shall be used to provide a human-readable description of the press run.	The **PrinterJobDescription** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 385–389).
PrinterJobNumber	The **PrinterJobNumber** element shall be used to provide the printer-generated identifier for this press run/print job.	The **PrinterJobNumber** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 393–397).

5.4.6 RunLength element

The **RunLength** element shall be used to provide the length of the press run that produced the printed sample from which print quality data was captured. The **RunLength** element shall conform to rules specified by ISO20616-2PQX.xsd (lines 310–331). Table 5 provides additional definition and usage rules for each attribute of **RunLength**.

Table 5 — RunLength definition and usage rules

Name	Definition	Usage rules
@TotalRolls	The *@TotalRolls* attribute shall be used to provide the number of rolls of substrate used for the press run.	The *@TotalRolls* attribute shall conform to rules specified by ISO20616–2PQX.xsd (lines 315–319).
@TotalMeterage	The @TotalMeterage attribute shall be used to provide the meterage or count indicator value for the entire press run.	The *@TotalMeterage* shall conform to rules specified by ISO20616–2PQX.xsd (lines 320–324).
@UoM	The @UoM provides the linear unit of measure employed to specify meterage.	The *@UoM* shall conform to rules specified by ISO20616–2PQX.xsd (lines 325–329).

5.4.7 InkCollection/Ink element

The **InkCollection** element shall be used to provide information about all inks that were used to print customer items for quality reporting. The **InkCollection** element shall conform to rules specified by ISO20616-2PQX.xsd (lines 401–410). Table 6 provides additional definition and usage rules for the child elements and attributes that make up the **Ink** element, the sole child of **InkCollection**.

Table 6 — Ink definition and usage rules

Name	Definition	Usage rules
Ink	The **Ink** element shall be used to provide a description of the fluid or viscous substance used for this press run.	The **Ink** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 414–434).
@Id	The *@Id* attribute shall be used to provide a unique identifier for each ink in the context of this print quality report.	The *@Id* attribute shall conform to rules specified by ISO20616–2PQX.xsd (lines 428–432).
InkPrintOrder	The **InkPrintOrder** element shall be used to specify the numerical order that this ink prints among all the inks on a sample with "1" being the first ink printed on a substrate.	The **InkPrintOrder** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 438–442).
InkName	The **InkName** element shall be used to specify a word or set of words by which an ink is known to the printer.	The **InkName** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 446–450).
InkChannelName	The **InkChannelName** element shall be used to specify a word or set of words by which an ink's ink channel is known to the printer.	The **InkChannelName** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 454–458).
InkChannelType	The **InkChannelType** element shall be used to specify the classification of the ink channel.	The **InkChannelType** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 462–466).
InkType	The **InkType** element shall be used to specify the classification of the ink.	The **InkType** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 470–474).
InkPrintMethod	The **InkPrintMethod** element shall be used to specify the method by which this ink was printed on the substrate.	The **InkPrintMethod** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 478–482). **InkPrintMethod** shall be present if **PressRunInfo/PrintMethod** has a value of "hybrid" and the print buyer requests print method information. Under this condition InkPrintMethod shall be used to transmit the print method for each ink channel.

5.4.8 ReporterCollection/Reporter element

The ReporterCollection element shall be used to provide information about all the systems and/or individuals responsible for the quality data capture for the reports. The ReporterCollection element shall conform to rules specified by ISO20616-2PQX.xsd (lines 486–495). Table 7 provides additional definition and usage rules for the child elements and attributes that make up the **Reporter** element, the sole child of **ReporterCollection**.

Table 7 — Reporter definition and usage rules

Name	Definition	Usage rules
Reporter	The **Reporter** element shall be used to identify the automated system or person/company that captured PQX quality data.	The **Reporter** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 499–518).
@Id	The *@Id* attribute shall be used to provide a unique identifier for each reporter within the context of this print quality report.	The *@Id* attribute shall conform to rules specified by ISO20616–2PQX.xsd (lines 512–516).
QualityServiceProvider	See 5.4.9.	A choice among QualityServiceProvider, PrinterQA and AutomatedPressControl is specified by ISO20616–2PQX.xsd (lines 505–509).
PrinterQA	See 5.4.10.	
AutomatedPressControl	See 5.4.11.	
NOTE The **Reporter**/*@Id* attribute creates an anchor point that enables quality reports to be associated with the system or person that captured quality data.		

5.4.9 QualityServiceProvider element

The **QualityServiceProvider** element shall be used to provide information about a party, other than the printer, that was responsible for observing or measuring quality of the printed item. The **QualityServiceProvider** element shall conform to rules specified by ISO20616-2PQX.xsd (lines 532–547). Table 8 provides additional definition and usage rules for the child elements that make up the **QualityServiceProvider** element.

Table 8 — QualityServiceProvider definition and usage rules

Name	Definition	Usage rules
CompanyName	The **CompanyName** element shall be used to identify the business entity.	The **CompanyName** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 163–167).
ReportingPerson	The **ReportingPerson** element shall be used to specify the individual reporting quality.	The **ReportingPerson** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 568–572).
DateReceivedFromPrinter	The **DateReceivedFromPrinter** element shall be used to specify the date or date/time that samples were received from the printer for quality evaluation.	The **DateReceivedFromPrinter** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 576–580).
ReporterComments	The **ReporterComments** element shall be used to provide comments from the quality reporter to the print buyer.	The **ReporterComments** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 584–588).

NOTE Specification for the **LocationDesignator** element and the **ContactDesignator** element can be found in 5.4.4.

5.4.10 PrinterQA element

The PrinterQA element shall be used to provide information about the party at the printer, that was responsible for reporting quality. The PrinterQA element shall conform to rules specified by ISO20616-2PQX.xsd (lines 552–564).

NOTE Specification for the printer's QA **ReportingPerson** and **ReporterComments** elements can be found in 5.4.9. Specification for the **ContactDesignator** element can be found in 5.4.4.

5.4.11 AutomatedPressControl element

The **AutomatedPressControl** element shall be used to provide information about the press control system that was used to generate quality data. The **AutomatedPressControl** element shall conform to rules specified by ISO20616-2PQX.xsd (lines 593–608). Table 9 provides additional definition and usage rules for the child elements that make up the **AutomatedPressControl** element.

Table 9 — AutomatedPressControl definition and usage rules

Name	Definition	Usage rules
ControlSystem CompanyName	The **ControlSystemName** element shall be used to provide the name of the company that manufactures the automated control system used to generate quality data.	The **ControlSystemName** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 612–616).
ControlSystemBrand	The **ControlSystemBrand** element shall be used to provide the brand name of the automated control system used to generate quality data.	The **ControlSystemBrand** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 620–624).
ControlSystemProduct	The **ControlSystemProduct** element shall be used to provide the product name of the automated control system used to generate quality data.	The **ControlSystemProduct** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 628–632).
ControlSystemSeries	The **ControlSystemSeries** element shall be used to provide the series of the automated control system used to generate quality data.	The **ControlSystemSeries** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 636–640).
ControlSystemModel	The **ControlSystemModel** element shall be used to provide the model of the automated control system used to generate quality data.	The **ControlSystemModel** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 644–648).
ControlSystemSoftwareVersion	The **ControlSystemSoftwareVersion** element shall be used to provide the software version of the automated control system used to generate quality data.	The **ControlSystemSoftwareVersion** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 652–656).

5.4.12 CustomerItemCollection element

The **CustomerItemCollection** element shall be used to provide information about all items that were printed for a print buyer. The **CustomerItemCollection** element shall conform to rules specified by ISO20616-2PQX.xsd (lines 76–85). Table 10 provides additional definition and usage rules for the child elements that make up the **CustomerItem,** the sole child of the **CustomerItemCollection** element.

NOTE A customer item is any item printed for a print buyer, or customer. A package for a product can be a customer item. A point-of-sale sign can be a customer item. A label for a product can be a customer item. A can or bottle bearing a printed label can be a customer item.

Table 10 — CustomerItem definition and usage rules

Name	Definition	Usage rules
CustomerItem	The **CustomerItem** element shall be used to provide a description of an item printed for a customer.	The **CustomerItem** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 89–119).
@Id	*@Id* attribute shall be used to provide a unique identifier for each customer item.	The *@Id* attribute shall conform to rules specified by ISO20616–2PQX.xsd (lines 108–112).

Table 10 *(continued)*

Name	Definition	Usage rules
@IdDisplayName	The *@IdDisplayName* attribute shall be used to provide classification for the type of unique identifier the printer chooses to use to identify the item.	The *@IdDisplayName* attribute shall conform to rules specified by ISO20616–2PQX.xsd (lines 113–117).
Customer	See 5.4.13.	
Brand	The **Brand** element shall be used to provide the customer's high-level designation for a product or set of products.	The **Brand** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 123–127).
Product	The **Product** element shall be used to provide a word or words by which an item offered for sale is known.	The **Product** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 131–135).
Brand-Product	The **Brand-Product** element shall be used to provide the customer's brand and product designation (expressed as a concatenated string with a vertical bar separator) for an item offered for sale.	The **Brand-Product** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 139–143).
Agent	The **Agent** element shall be used to identify a secondary party interested in print quality such as a broker, print buyer or supplier. .	The **Agent** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 203–220).
QualitySpecEmployed	The **QualitySpecEmployed** element shall be used to provide an informational reference to the quality specification employed for the press run.	The **QualitySpecEmployed** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 224–240).
@QualitySpecName	The *@QualitySpecName* shall be used to provide the label by which the quality specification is known.	The *@QualitySpecName* attribute shall conform to rules specified by ISO20616–2PQX.xsd (lines 229–233). *@QualitySpecName* shall be present if **QualitySpecEmployed** data are included in the quality report.
@QualitySpecVersion	The *@QualitySpecVersion* shall be used to provide the version of the quality specification employed.	The *@QualitySpecVersion* attribute shall conform to rules specified by ISO20616–2PQX.xsd (lines 234–238). *@QualitySpecVersion* shall be present if **QualitySpecEmployed** data are included in the quality report.
ItemDescription	The **ItemDescription** element shall be used to provide a word or words by which an item offered for sale is known.	The **ItemDescription** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 147–151).

5.4.13 Customer element

The **Customer** element shall be used to identify the print buyer. The **Customer** element shall conform to rules specified by ISO20616-2PQX.xsd (lines 187–199).

Table 11 provides additional definition and usage rules for the child elements that make up the **Customer** element.

NOTE Specification for the **ParentCompany**, **LocationDesignator** and **ContactDesignator** elements can be found in 5.4.4. Specification for the CompanyName element can be found in 5.4.9.

5.4.14 SampleCollection element

The **SampleCollection** element shall be used to provide information about all instances of printed items that are measured, observed and reported on from a press run. The **SampleCollection** element shall conform to rules specified by ISO20616-2PQX.xsd (lines 661–670).

Table 11 provides additional definition and usage rules for the child elements and attributes that make up **Sample,** the sole child of the **SampleCollection** element.

NOTE 1 A sample is an individual customer item (or set of customer items) printed during a press run to evaluate print quality. The print quality reports exchanged using PQX are based on printed samples selected for quality evaluation by the print buyer. A sample can be thought of as being a single print impression or a set of print impressions for which print quality will be reported. A sample can be a single press sheet pulled by the press operator. A sample can be a single printed package selected to evaluate print quality. A sample can be a set of printed items that will be reported on as a unit, typically averaged.

NOTE 2 While a sample is often a single item, multiple printed items can be gathered and averaged and reported as a single print-quality data point. Hence, the XML model for the **Sample** element contains fields that document the run position, time, or interval that printed items were gathered for quality reporting.

Table 11 — Sample definition and usage rules

Name	Definition	Usage rules
Sample	The **Sample** element shall be used to provide information about a selected item or items for which quality is observed and data are being reported.	The **Sample** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 674–690).
SampleDescription	The **SampleDescription** element shall be used to provide an account of how this item or items were selected for quality reporting.	The **SampleDescription** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 694–709).
QUALITY REPORTS (SEE BELOW)	Up to four quality reports (**ColourReport**, **RegistrationReport**, **DefectReport**, **BarcodeReport**) may be reported per **Sample** element. Multiple reports of the same type shall not be allowed.	
ColourReport	See 5.4.15.	
RegistrationReport	See 5.4.17.	
DefectReport	See 5.4.20.	
BarcodeReport	See 5.4.22.	

5.4.15 ColorReport element

The ColorReport element shall be used to provide an account of the accuracy of colour reproduction on a printed sample. The **ColorReport** element shall conform to rules specified by ISO20616-2PQX.xsd (lines 2062–2076). Table 12 provides additional definition and usage rules for the **ColorReport**/*ReportType* attribute and the child elements that make up the **MeasurementSet** element, the sole child of the **ColorReport** element.

Table 12 — ColorReport MeasurementSet elementdefinition and usage rules

Name	Definition	Usage rules
@ReportType	The *@ReportType* attribute shall be used to classify the type of colour report as being direct measurements from colour charts or measurements from a set of patches that will enable tone calculation by the receiver.	The *@ReportType* attribute shall conform to rules specified by ISO20616–2PQX.xsd (lines 270–274). When *@ReportType* is equal to "tone-Calculation," the **InkCollection** shall be present.

Table 12 *(continued)*

Name	Definition	Usage rules
MeasurementSet	See 5.4.16.	

5.4.16 MeasurementSet element

The **MeasurementSet** element shall be used to provide colour measurements of a customer item taken at a single position on a sample. The **MeasurementSet** element shall conform to rules specified by ISO20616-2PQX.xsd (lines 2080–2095). Table 13 provides additional definition and usage rules for the **Measurement** element.

Table 13 — MeasurementSet definition and usage rules

Name	Definition	Usage rules
CustomerItemIdLink	The **CustomerItemIdLink** element shall be used to provide a connection from a quality report to the customer item that was printed for purposes of quality reporting.	The **CustomerItemIdLink** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 875–879).
PositionOnSample	The **PositionOnSample** element shall be used to specify a numeric descriptor for a position on a printed sample that is to be measured or observed for print quality.	The **PositionOnSample** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 884–899).
*@PositionLabe*l	The *@PositionLabel* attribute shall be used to provide the human language descriptor by which the position on a printed sample is identified using the print buyer's proprietary positional nomenclature, if that descriptor is something other than a numeric value.	The *@PositionLabel* attribute shall conform to rules specified by ISO20616–2PQX.xsd (lines 891–895).
ReporterIdLink	The **ReporterIdLink** element shall be used to provide a connection to the system or company/individual responsible for data capture for a quality report.	The **ReporterIdLink** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 523–527).
ChartType	The **ChartType** element shall be used to provide a classification for the specific, pre-defined configuration of colour patches that is being measured for colour evaluation purposes.	The **ChartType** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 2099–2103). d.
Measurement	See Table 14.	

Table 14 — Measurement definition and usage rules

Name	Definition	Usage rules
Measurement	The **Measurement** element shall be used to provide a single colour measurement taken to evaluate print quality.	The **Measurement** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 2107–2132).
@Id	The *@Id* attribute shall be used to provide a unique identifier for this colour measurement within this colour report.	The *@Id* attribute shall conform to rules specified by ISO20616–2PQX.xsd (lines 2126–2130).
MeasurementName	The **MeasurementName** element shall be used to specify a word or set of words by which this measurement is known.	The **MeasurementName** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 2189–2193).
PatchType	The **PatchType** element shall be used to specify a classification for the patch being measured.	The **PatchType** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 2136–2185).

Table 14 *(continued)*

Name	Definition	Usage rules
AveragingMethod	The **AveragingMethod** element shall be used to specify the mathematical method used to generate reporting values for this measurement.	The **AveragingMethod** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 972–976). **AveragingMethod** shall be present if two or more measurements are averaged to report a single data point.
ItemsPerAverage	The **ItemsPerAverage** element shall be used to specify the number of item sample measurements that were averaged for the same patch to generate a single reporting value.	The **ItemsPerAverage** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 980–984). When **AveragingMethod** is used to report a single data point, the report shall include either **ItemsPerAverage** or the **PatchesPerAverage**.
PatchesPerAverage	The **PatchesPerAverage** element shall be used to specify the number of measurements for the same patch on a single item that were averaged to generate a single reporting value. The **PatchesPerAverage** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 988–992).	
PQXSubstrateIdLink	The **PQXSubstrateIdLink** element shall be used to provide a connection to the measurement for the substrate, expressed as the value of the target substrate measurement identifier.	The **PQXSubstrateIdLink** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 2197–2201). **PQXSubstrateIdLink** shall be used to provide the substrate colour measurement when **ColourReport**/ *@ReportType* is “toneCalculation” and when **PatchType** is “solid”, “tint”, “build”, “grayBalance”, “special”, or “overprint”.
PrintedInkInfo	See Table 15.	
CxFSampleObjectIdLink	The **CxFSampleObjectIdLink** element shall be used to provide a connection to the CxF object in the CxF sample data block for this measurement expressed as the target CxF object identifier.	The **CxFSampleObjectIdLink** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 2205–2209).
CxFReferenceObjectId Link	The **CxFReferenceObjectIdLink** element shall be used to provide a connection to the CxF object in the CxF reference data block for this measurement expressed as the reference CxF object identifier.	The **CxFReferenceObjectIdLink** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 2213–2217).

Table 15 — PrintedInkInfodefinition and usage rules

Name	Definition	Usage rules
PrintedInkInfo	The **PrintedInkInfo** element shall be used to provide information about an ink that is required to enable tone value calculations.	The **PrintedInkInfo** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 2395–2306). **PrintedInkInfo** shall be used to provide the ink colour measurement when **ColourReport**/*@ReportType* is “toneCalculation” and when **PatchType** is not “substrate”.

Table 15 *(continued)*

Name	Definition	Usage rules
InkIdLink	The **InkIdLink** element shall be used to provide a connection to the measurement for an ink, expressed as the value of the target ink measurement identifier.	The **InkIdLink** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1060–1064).
TintValue	The **TintValue** element shall be used to specify the percentage of ink coverage.	The **TintValue** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 2310–2314).
PQXSolidInkParentIdLink	The **PQXSolidInkParentIdLink** element shall be used to provide a connection to the measurement for the solid ink parent, expressed as the value of the target ink measurement identifier.	The **PQXSolidInkParentIdLink** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 2318–2322). **PQXSolidInkParentIdLink** shall be used to provide the solid ink parent colour measurement when **ColourReport**/@ *ReportType* is "toneCalculation" and when **PatchType** is "tint", "build", "grayBalance" or "special".

5.4.17 RegistrationReport element

The **RegistrationReport** element shall be used to provide an account of the accuracy of alignment of inks on a printed sample. The **RegistrationReport** element shall conform to rules specified by ISO20616-2PQX.xsd (lines 841–850). Table 16 provides additional definition and usage rules for the child elements that make up the **RegistrationSet** element, the child of the **RegistrationReport** element.

Table 16 — RegistrationSet definition and usage rules

Name	Definition	Usage rules
RegistrationSet	The **RegistrationSet** element shall be used to provide data about the accuracy of the alignment of inks taken at a single position on a printed sample.	The **RegistrationSet** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 854–870).
MarkType	The **MarkType** element shall be used to classify the registration mark employed.	The **MarkType** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 904–908).
VarianceReport	See 5.4.18.	A **RegistrationSet** may contain both a **VarianceReport** and a **ChannelReport**. Multiple reports of the same type shall not be allowed.
ChannelReport	See 5.4.19.	

NOTE Specification for the **CustomerItemIdLink** and the **PositionOnSample** elements can be found in Table 13.

5.4.18 VarianceReport element

The **VarianceReport** element shall be used to provide an account of the quality of print registration based on the offset of each printed ink from one another. The **VarianceReport** element shall conform to rules specified by ISO20616-2PQX.xsd (lines 913–923).

Table 17 — VarianceReport definition and usage rules

Name	Definition	Usage rules
ObservedMax	The **ObservedMax** element shall be used to provide the observed maximum registration variance of all printed inks for a printed sample.	The **ObservedMax** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 927–938).
VarianceDescription	The **VarianceDescription** element shall be used to provide a visual account of the alignment of a registration mark on the printed sample.	The **VarianceDescription** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 942–946).
MeasuredMax	The **MeasuredMax** element shall be used to provide the measured maximum registration variance of all printed inks for a printed sample.	The **MeasuredMax** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 950–968).
XMaxOffset	The **XMaxOffset** shall be used to specify the maximum variance offset across the X (horizontal) axis expressed in the registration unit of measure.	The **XMaxOffset** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1004–1008).
YMaxOffset	The **YMaxOffset** element shall be used to specify the maximum variance offset across the Y (vertical) axis expressed in the registration unit of measure.	The **YMaxOffset** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1012–1016).

NOTE Specification of **ReporterIdLink** and PositionOnSample can be found in Table 13. Specification for **AveragingMethod**, **ItemsPerAverage**, **PatchesPerAverage** and **UoM** can be found in Table 14.

5.4.19 ChannelReport element

The **ChannelReport** element shall be used to provide an account of the quality of print registration based on the offset of each printed ink from a printed reference ink. The **ChannelReport** element shall conform to rules specified by ISO20616-2PQX.xsd (lines 1021–1031).

Table 18 — ChannelReport definition and usage rules

Name	Definition	Usage rules
ObservedChannel	The **ObservedChannel** element shall be used to provide the observed maximum registration variance of all printed inks relative to a reference ink channel for a printed sample.	The **ObservedChannel** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1035–1048).
ReferenceInkIdLink	The **ReferenceInkIdLink** element shall be used to provide a connection to the ink that will serve as the point of reference to which the alignment of all other ink channels will be compared for channel-based registration reporting.	The **ReferenceInkIdLink** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1052–1056).
InkIdLink	The **InkIdLink** element shall be used to provide a connection to the definition of the ink.	The **InkIdLink** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1060–1064)
AlignmentDescription	The **AlignmentDescription** element shall be used to provide an account of the registration alignment of a printed ink on the sample that comes from a visual observation of the registration mark or simply from observing the printed sample.	The **AlignmentDescription** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1068–1072).

Table 18 *(continued)*

Name	Definition	Usage rules
MeasuredChannel	The **MeasuredChannel** element shall be used to provide the measured maximum registration variance of all printed inks relative to a reference ink channel for a printed sample.	The **MeasuredChannel** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1076–1093).
ReferenceInkIdLink	See entry above.	
InkIdLink	See entry above.	
XPositionOffset	The **XPositionOffset** element shall be used to provide a numeric value in the registration unit of measure that expresses the x-axis (horizontal) position from the specified ink channel reference. from the specified ink channel reference.	The **XPositionOffset** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1097–1101).
YPositionOffset	The **YPositionOffset** element shall be used to provide a numeric value in the registration unit of measure that expresses the y-axis (vertical) alignment from the specified ink channel reference.	The **YPositionOffset** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1105–1109).

NOTE Specification of **ReporterIdLink** and PositionOnSample can be found in Table 13. Specification for **AveragingMethod**, **ItemsPerAverage**, **PatchesPerAverage** and **UoM** can be found in Table 14.

5.4.20 DefectReport/DefectSet element

The **DefectReport** element shall be used to provide an account of the print defects on a printed sample. The **DefectReport** element shall conform to rules specified by ISO20616-2PQX.xsd (lines 1114–1125).

Table 19 provides additional definition and usage rules for the **DefectSet**, the sole child element of the **DefectReport** element.

Table 19 — DefectSet definition and usage rules

Name	Definition	Usage rules
OverallVisual Appearance	The **DefectSet** element shall be used to provide a comment about the overall visual appearance of images printed for the quality press run.	The **DefectSet** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1129–1133).
DefectInspection Percentage	The **DefectInspectionPercentage** element shall be used to provide the percent of defect inspections taken throughout the press run and reflected in the defect data for this PQX report.	The **DefectInspectionPercentage** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1137–1141).
DefectSet	The **DefectSet** element shall be used to provide quality data about a defect at a specified position on a selected customer item.	The **DefectSet** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1146–1163).
BasisOfReference	The **BasisOfReference** element shall be used to provide the acceptable item used for comparison a printed item to determine presence of a print defect.	The **BasisOfReference** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1167–1171).
DefectData	See 5.4.21.	

Table 19 *(continued)*

Name	Definition	Usage rules
NoDefectFound	The **NoDefectFound** element shall be used to indicate that no defect was found.	The **NoDefectFound** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1300–1305).

NOTE Specification of the **CustomerItemIdLink**, **PositionOnSample** and **ReporterIdLink** elements can be found in Table 13.

5.4.21 DefectData element

The **DefectData** element shall be used to provide quality data about a defect found on a printed item. The **DefectData** element shall conform to rules specified by ISO20616-2PQX.xsd (lines 1175–1191).

Table 20 provides additional definition and usage rules for the **DefectData** element.

Table 20 — DefectData definition and usage rules

Name	Definition	Usage rules
DefectName	The **DefectName** element shall be used to provide a first level of categorization for a print flaw.	The **DefectName** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1195–1190).
DefectSeverity	The **DefectSeverity** element shall be used to provide values for the degree or seriousness of a print flaw on a scale of 1 to 10 with 1 being the least severe and 10 being the most severe.	The **DefectSeverity** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1203–1218).
@DisplayName	The *@DisplayName* attribute shall be used to provide a label for defect severity employing nomenclature provided by the print buyer. employing a nomenclature provided by the print buyer.	The *@DisplayName* attribute shall conform to rules specified by ISO20616–2PQX.xsd (lines 1210–1214).
DefectCategory	The **DefectCategory** element shall be used to provide a second level classification for print defect types.	The **DefectCategory** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1276–1280).
DefectSize	The **DefectSize**element shall be used to provide data that documents the height/width or area of a defect.	The **DefectSize** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1222–1238).
DefectXMeasure	The **DefectXMeasure** element shall be used to provide the width of a defect along the X (horizontal) axis in the defect unit of measure.	he **DefectXMeasure** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1243–1247).
DefectYMeasure	The **DefectYMeasure** element shall be used to provide the height of a defect along the Y (vertical) axis in the defect unit of measure.	The **DefectYMeasure** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1252–1256).
DefectArea	The **DefectArea** element shall be used to specify the area (or average area) of a defect.	The **DefectArea** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1260–1264).
DefectDescription	The **DefectDescription** element shall be used to provide an account of the nature of the defect.	The **DefectDescription** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1268–1272).
DefectImageIdLink	The **DefectImageIdLink** element shall be used to provide a connection to the unique identifier for an image of the defect so it may be retrieved from the defect image data block.	The **DefectImageIdLink** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1284–1288).

Table 20 *(continued)*

Name	Definition	Usage rules
DefectCount	The **DefectCount** element shall be used to provide the count or frequency for a defect being reported in this defect set.	The **DefectCount** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1292–1296).

NOTE Specification of **UoM** can be found in 5.4.16.

5.4.22 BarcodeReport element

The **BarcodeReport** element shall be used to provide an account of the quality of the printed barcode on a sample. The **BarcodeReport** element shall conform to rules specified by ISO20616-2PQX.xsd (lines 1310–1319). Table 21 provides additional definition and usage rules for the child elements that make up the **VerificationSet** element, the sole child element of the **BarcodeReport** element.

Table 21 — VerificationSet definition and usage rules

Name	Definition	Usage rules
VerificationSet	The **VerificationSet** element shall be used to provide an account of the quality of the printed barcode on a sample.	The **VerificationSet** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1324–1339).
Barcode1DEntry	See 5.4.24.	
Barcode2DEntry	See 5.4.26.	

NOTE Specification of the **CustomerItemIdLink** and **PositionOnSample** elements can be found in Table 13.

5.4.23 Barcode parameter reporting attribute

The PQX barcode report was designed to directly exchange barcode verification data output by ISO-compliant barcode verification software. Each entry of a barcode report enforces ISO standard reporting requirements for linear and two-dimensional barcode symbols.

Table 22 — Barcode parameter reporting attribute definition and usage rules

Name	Definition	Usage rules
@ISONumericReporting	The *@ISONumericReporting* attribute shall be used to provide the ISO numeric score for each barcode parameter. employing a nomenclature provided by the print buyer.	The *@ISONumericReporting* attribute shall conform to rules specified by ISO20616–2PQX.xsd (lines 2363–2367).

NOTE The @ISONumericReporting attribute is required for each barcode parameter specified in any barcode entry. For example, the overall symbol grade is reported using this attribute: < OverallSymbolGrade ISONumericReporting = ”3.0” > .

5.4.24 Barcode1DEntry element

The **Barcode1DEntry** element shall be used to provide an account of the quality of a linear barcode. The **Barcode1DEntry** element shall conform to rules specified by ISO20616-2PQX.xsd (lines 1344–1357).

Table 23 provides additional definition and usage rules for the child elements that make up the **Barcode1DReport** element.

Table 23 — Barcode1DReport definition and usage rules

Name	Definition	Usage rules
BarcodeSymbology	The **BarcodeSymbology** element shall be used to provide a classification of a barcode image.	The **BarcodeSymbology** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1576–1580).
ISO1DVerification	The **ISO1DVerification** element shall be used to provide ISO quality data scores for the print quality of a linear barcode.	The **ISO1DVerification** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1362–1378).
OverallSymbolGrade	The **OverallSymbolGrade** element shall be used to provide an overall grade for the print quality of a barcode. 0.0/08/660 is an example. 2.0/06/660 (C) is another example.	The **OverallSymbolGrade** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1380–1385).
MinimumReflectance	The **MinimumReflectance** element shall be used to provide the minimum amount of reflective difference between the printed barcode and the background.	The **MinimumReflectance** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1387–1395).
SymbolContrast	The **SymbolContrast** element shall be used to grade the percent of maximum reflectance (Rmax) minus the percent of minimum reflectance (rMin).	The **SymbolContrast** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1397–1404).
MinimumEdgeContrast	The **MinimumEdgeContrast** element shall be used to grade the percent of contrast difference in every transition, from light to dark and back to light, across the barcode.	The **MinimumEdgeContrast** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1406–1413).
Modulation	The **Modulation** element shall be used to document how a scanner "sees" wide elements (bars or spaces) in relationship to narrow elements or the consistency of the reflectance of dark to light areas throughout the barcode.	The **Modulation** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1415–1422).
BarcodeDefects	The **BarcodeDefects** element shall be used to capture the percent of voids in the bars or artefacts in the spaces between bars resulting in an inability to verify the barcode.	The **BarcodeDefects** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1424–1431).
Decodability	The **Decodability** element shall be used to indicate the measure of how easily a scanner can decode the barcode.	The **Decodability** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1433–1440).
Decode	The **Decode** element shall be used to provide a pass/fail statement about whether the bars and spaces in a barcode represent the intended characters.	The **Decode** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1442–1446).
Traditional1DVerification	See Table 24.	See ISO20616–2PQX.xsd.

NOTE Specification of the **ReporterIdLink** elements can be found in Table 13.

5.4.25 Traditional1DVerification element

The **Traditional1DVerification** element shall be used to provide traditional general, or ungraded, quality data scores based on width measurements of bars and spaces compared to ideal values for the print quality of a linear barcode. The **Traditional1DVerification** element shall conform to rules

specified by ISO20616-2PQX.xsd (lines 1450–1472). Table 24 provides additional definition and usage rules for the child elements that make up the **Traditional1DVerification** element.

NOTE Traditional verification fields include fields output by barcode verification software prior to the publication of standard ISO verification fields. Some print buyers and printers find these fields useful for determining faults in the printing process that result in errors in barcode readability. PQX optionally allows these fields to be included in the quality report as they provide diagnostic information that can be used to improve the printer's ability to produce readable barcodes. Field values are designed to provide the flexibility to accommodate the output of existing barcode verifiers.

Table 24 — Traditional1DVerification definition and usage rules

Name	Definition	Usage rules
MaximumReflectance	The **MaximumReflectance** element shall be used to provide the maximum reflective difference between the printed barcode and the background.	The **MaximumReflectance** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1476–1480).
GlobalThreshold	The **GlobalThreshold** element shall be used to provide **c**aptures the point half way between the highest detected reflectance or Rmax value and the lowest detected reflectance or Rmin value where the actual decoding of a barcode takes place.	The **GlobalThreshold** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1484–1488).
AverageBarGain	The **AverageBarGain** element shall be used to indicate the amount of physical spreading of a printed bar due to ink wicking and/or impression force or pressure.	The **AverageBarGain** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1492–1496).
PrintContrastSignal	The **PrintContrastSignal** element shall be used to specify the ratio of the background (space) reflectance minus the bar reflectance to the background (space) reflectance as a percentage.	The **PrintContrastSignal** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1500–1504).
LowestScanGrade	The **LowestScanGrade** element shall be used to specify the lowest scan reflectance profile grade measured where the scan reflectance profile grade is the lowest grade of minimum reflectance, minimum edge contrast, symbol contrast, modulation, defects, decodability and decode.	The **LowestScanGrade** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1508–1512).
QuietZone	The **QuietZone** element shall be used to specify the damage to the required minimum blank space preceding (left margin) and trailing (right margin) of a barcode.	The **QuietZone** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1516–1520).
LeftMargin	The **LeftMargin** element shall be used to indicate the presence of a minimum blank space preceding a barcode.	The **LeftMargin** shall conform to rules specified by ISO20616–2PQX.xsd (lines 1524–1528).
RightMargin	The **RightMargin** element shall be used to indicate the presence of a minimum blank space trailing a barcode.	The **RightMargin** shall conform to rules specified by ISO20616–2PQX.xsd (lines 1532–1536).
CheckCharacter	The **CheckCharacter** element shall be used to indicate the presence (where applicable) of a correctly calculated security digit added to prevent undetected errors.	The **CheckCharacter** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1540–1544).

Table 24 *(continued)*

Name	Definition	Usage rules
Aperature	The **Aperature** element shall be used to indicate the diameter of the circular opening on a verifier that provides the field of view for barcode verification.	The **Aperature** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1548–1564).
Magnification	The **Magnification** element shall be used to provide the factor used to vary the nominal size of each barcode to ensure it is scannable.	The **Magnification** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1568–1572).

NOTE Specification of the **ReporterIdLink** elements can be found in Table 13.

5.4.26 Barcode2DEntry element

The **Barcode2DEntry** element shall be used to provide an account of the quality of the printed 2-dimensional barcode on a sample. The **Barcode2DEntry** element shall conform to rules specified by ISO20616-2PQX.xsd (lines 1587–1602). Table 25 provides additional definition and usage rules for the child elements that make up the **Barcode2DReport** element.

Table 25 — Barcode2DEntry definition and usage rules

Name	Definition	Usage rules
BarcodeSymbology	See Table 23.	The **BarcodeSymbology** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1576–1580).
Codewords	The **Codewords** element shall be used to provide the ASCII codewords contained within the barcode.	The **Codewords** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 2005–2010).
ISO2DVerification	The **ISO2DVerification** element shall be used to provide ISO quality data scores for the print quality of a two-dimensional barcode.	The **ISO2DVerification** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1607–1628). See ISO20616–2PQX.xsd.
UnusedErrorCorrection	The **UnusedErrorCorrection** element shall be used to provide the measure of the amount of available error correction (reading safety margin) of a symbol.	The **UnusedErrorCorrection** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1994–2000).
CodewordYield	The **CodewordYield** element shall be used to indicate interference between adjacent rows in a 2D barcode.	The **CodewordYield** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 2014–2022).
GridNonuniformity	The **GridNonuniformity** element shall be used to provide the measure of the largest vector deviation of the grid intersections.	The **GridNonuniformity** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 2026–2034).
AxialNonuniformity	The **AxialNonuniformity** element shall be used to provide the measure of uneven scaling of the 2D barcode symbol.	The **AxialNonuniformity** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 2038–2046).
FixedPatternDamage	The **FixedPatternDamage** element shall be used to provide the measure of any damage to the finder patterns, quiet zones, clock tracks, timing, navigation and other fixed patterns that scanners use to locate and decode a barcode symbol.	The **FixedPatternDamage** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 2050–2058).

Table 25 *(continued)*

Name	Definition	Usage rules
FPDDetails	See 5.4.27.	
Traditional2DVerification	See 5.4.28.	

NOTE Specification of the ReporterIdLink elements can be found in Table 13. Specification of the OverallSymbolGrade, MinimumReflectance, SymbolContrast, MinimumEdgeContrast, Modulation, BarcodeDefects, Decodability and Decode elements can be found at 5.4.24.

5.4.27 FPDDetails element

The **FPDDetails** element shall be used to provide the details of a barcode fixed pattern damage on a sample. The **FPDDetails** element shall conform to rules specified by ISO20616-2PQX.xsd (lines 1828–1849). Table 26 provides additional definition and usage rules for the child elements that make up the **FPDDetails** element.

NOTE All FPDDetails elements report barcode quality using ISO numeric rankings per ISO/IEC 15416. Using this ranking scale, 0.0 is the value assigned to the lowest quality and 4.0 is the value assigned to the highest quality.

Table 26 — FPDDetails definition and usage rules

Name	Definition	Usage rules
LeftLSide	The **LeftLSide** element shall be used to capture the damage occurring in the left solid side of the L border of a Data Matrix 2D barcode.	The **LeftLSide** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1853–1861).
BottomLSide	The **BottomLSide** element shall be used to capture the damage occurring in the bottom solid side of the L border of a Data Matrix 2D barcode.	The **BottomLSide** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1865–1873).
QuietZone	The **LeftQZ** element shall be used to capture the damage to the required minimum blank space at the left of a 2D barcode.	The **LeftQZ** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1877–1885).
LeftQZ	The **TopQZ** element shall be used to capture the damage to the required minimum blank space at the top of a 2D barcode.	The **TopQZ** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1889–1896).
RightQZ	The **RightQZ** element shall be used to capture the damage to the required minimum blank space at the right of a 2D barcode.	The **RightQZ** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1900–1908).
BottomQZ	The **BottomQZ** element shall be used to capture the damage to the required minimum blank space at the bottom of a 2D barcode.	The **BottomQZ** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1912–1920).
TransitionRatio	The **TransitionRatio** element shall be used to capture the ratio between the number of transitions on the clock track and the associated solid area of the 2D barcode.	The **TransitionRatio** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1924–1932).
TopTR	The **TopTR** element shall be used to capture the ratio between the number of transitions on the top clock track and the associated solid area of the 2D barcode.	The **TopTR** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1936–1943).
RightTR	The **RightTR** element shall be used to capture the ratio between the number of transitions on the right clock track and the associated solid area of the 2D barcode.	The **RightTR** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1947–1955).

Table 26 *(continued)*

Name	Definition	Usage rules
ClockTrack	The **ClockTrack** element shall be used to capture the ratio between the number of transitions on the clock track and the associated solid area of the 2D barcode.	The **ClockTrack** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1959–1967).
TopCT	The **TopCT** element shall be used to capture the damage to the top clock track of a data matrix 2D barcode.	The **TopCT** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1971–1979).
RightCT	The **RightCT** element shall be used to capture the damage to the right clock track of a data matrix 2D barcode.	The **RightCT** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1983–1990).

5.4.28 Traditional2DVerification element

The **Traditional2DVerification** element shall be used to provide traditional general, or ungraded quality data 2-dimentional barcode quality on a sample. The **VerificationSet** element shall conform to rules specified by ISO20616-2PQX.xsd (lines 1633–1661).

Table 27 provides additional definition and usage rules for the child elements that make up the **Traditional2DVerification** element.

NOTE Traditional verification fields include fields output by barcode verification software prior to the publication of standard ISO verification fields. Some print buyers and printers find these fields useful for determining faults in the printing process that result in errors in barcode readability. PQX optionally allows these fields to be included in the quality report as they provide diagnostic information that can be used to improve the printer's ability to produce readable barcodes. As per ISO20616-2PQX.xsd, all fields are optional. Field values are designed to provide the flexibility to accommodate the output of existing barcode verifiers.

Table 27 — Traditional2DVerification definition and usage rules

Name	Definition	Usage rules
MatrixSize	The **MatrixSize** element shall be used to capture the dimension of a 2D barcode in horizontal element count by vertical element count.	The **MatrixSize** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1665–1670).
NominalXUniformity	The **NominalXDimension** element shall be used to capture the width of the narrow element in a barcode.	The **NominalXDimension** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1674–1679).
ContrastUniformity	The **ContrastUniformity** element shall be used to capture the degree of uniformity of the light and dark barcode elements.	The **ContrastUniformity** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1683–1688).
PrintGrowth	The **PrintGrowth** element shall be used to captures the deviation as a percentage (larger or smaller) of actual element size from intended element size due to printing problems.	The **PrintGrowth** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1692–1696).
HorizontalBWG	The **HorizontalBWG** element shall be used to capture the percent of horizontal spreading (bar width growth) of a printed 2D barcode element.	The **HorizontalBWG** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1700–1705).
VerticalBWG	The **VerticalBWG** element shall be used to capture the percent of vertical spreading (bar width growth) of a printed 2D barcode element.	The **VerticalBWG** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1709–1714).

Table 27 *(continued)*

Name	Definition	Usage rules
EncodedCharacterCount	The **EncodedCharacterCount** element shall be used to capture the number of data characters that are encoded in a barcode.	The **EncodedCharacterCount** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1718–1723).
DataCodewordCount	The **DataCodewordCount** element shall be used to capture the number of data codewords that are encoded in a barcode.	The **DataCodewordCount** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1727–1732).
TotalCodewordCount	The **TotalCodewordCount** element shall be used to capture the number of data and non-data codewords a barcode can carry.	The **TotalCodewordCount** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1736–1741).
ErrorCapacityUsed	The **ErrorCapacityUsed** element shall be used to capture the capacity, as a percent, of a 2D barcode codewords used to correct for errors or missing data, in a barcode.	The **ErrorCapacityUsed** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1745–1750).
ErrorCorrectionBudget	The **ErrorCorrectionBudget** element shall be used to capture the level of error correction, as a percent, encoded into a 2D barcode symbol.	The **ErrorCorrectionBudget** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1754–1759).
ErrorCorrectionUse	The **ErrorCorrectionUse** element shall be used to capture the number of 2D barcode codewords used for error correction.	The **ErrorCorrectionUse** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1763–1768).
ErrorsCorrected	The **ErrorsCorrected** element shall be used to capture the number of errors corrected by the barcode verification scanner.	The **ErrorsCorrected** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1772–1777).
ErrorCorrectionType	The **ErrorCorrectionType** element shall be used to capture the error correction algorithm employed.	The **ErrorCorrectionType** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1781–1786).
ImageType	The **ImageType** element shall be used to capture the characteristics of a barcode symbol image.	The **ImageType** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1790–1795).
AverageGrade	The **AverageGrade** element shall be used to capture the average grade for the for the fixed pattern based on the grades for the L-sides, quiet zones and the overall grade for the clock track and adjacent solid pattern.	The **AverageGrade** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1799–1804).
WavelengthOfLight	The **WaveLengthOfLight** element shall be used to capture the aperture reference number (from ISO/IEC 15416 for linear scanning techniques, or the diameter in thousandths of an inch (to the nearest thousandth) of the synthetic aperture.	The **WaveLengthOfLight** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1808–1813).
AngleOfLight	The **AngleOfLight** element shall be used to capture the angle of incidence (relative to the plane of the barcode symbol) of the illumination of the barcode verifier.	The **AngleOfLight** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 1817–1823).

NOTE Specification of the **Aperature** element can be found in 5.4.25.

5.4.29 CxFSampleData element

The CxFSampleData element shall be used to include colour sample data. The CxFSampleData element shall conform to rules specified by ISO20616-2PQX.xsd (lines 2221–2230). CxFSampleData file layout shall conform to ISO 17972-3.

5.4.30 CxFReferenceData element

The CxFReferenceData element shall be used to include colour reference data. The CxFReferenceData element shall conform to rules specified by ISO20616-2PQX.xsd (lines 2234–2243). CxFReferenceData file layout shall conform to ISO 17972-3.

5.4.31 DefectImageData element

The **DefectImageData** element shall be used to provide linkages to the defect images generated from on-press camera-based defect detection systems. The **DefectImageData** element shall conform to rules specified by ISO20616-2PQX.xsd (lines 2326–2335). Table 28 provides additional definition and usage rules for **DefectImage,** the child of the **DefectImageData** element.

Table 28 — DefectImageData definition and usage rules

Name	Definition	Usage rules
DefectImage	The **DefectImage** element shall be used to provide identification and access information for a defect image generated by an on-press camera-based defect tracking system.	The **DefectImage** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 2339–2355).
@Id	The *@Id* attribute shall be used to assign unique identification (within the scope of the PQX file) for a defect image.	The *@Id* attribute shall conform to rules specified by ISO20616–2PQX.xsd (lines 2344–2348).
@ImageLink	The *@ImageLink* attribute shall be used to provide addressability of the defect image.	The *@ImageLink* attribute shall conform to rules specified by ISO20616–2PQX.xsd (lines 2350–2353).

5.4.32 TagCollection element

The **TagCollection** element shall be used to define a collection of custom PQX tags that can provide extensibility. The **TagCollection** element shall conform to rules specified by ISO20616-2PQX.xsd (lines 2247–2277). Table 29 provides additional definition and usage rules for **Tag,** the child of the **TagCollection** element.

Table 29 — TagCollection definition and usage rules

Name	Definition	Usage rules
@Name	The *@Name* attribute shall be used to provide a label for this collection of custom tags.	The *@Name* attribute shall conform to rules specified by ISO20616–2PQX.xsd (lines 2371–2375).
Tag	The **Tag** element shall be used to express custom print quality metadata expressed as a name/value pair.	The **Tag** element shall conform to rules specified by ISO20616–2PQX.xsd (lines 2353–2369)
@Name	The *@Name* attribute shall be used to provide a label for this custom tag.	The *@Name* attribute shall conform to rules specified by ISO20616–2PQX.xsd (lines 2358–2362).
@Value	The *@Value* attribute shall provide an equivalence for a custom PQX tag.	The *@Value* attribute shall conform to rules specified by ISO20616–2PQX.xsd (lines 2364–2367).

5.4.33 CustomResources element

The **CustomResources** element shall be used to provide extensibility to the PQX element by allowing the inclusion of any structured XML-encoded content from any namespace. The **CustomResources** element shall conform to rules specified by ISO20616-2PQX.xsd (lines 2281–2291).

NOTE **CustomResources** has no predefined data structure. The purpose of this element is to provide extensibility of the PQX data structure by allowing the inclusion of XML data structures from outside user-designated XML schemas. This element can be used include print quality data that is considered application specific in nature and not generally of use to all other applications.