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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

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Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



DRAFT International Standard

ISO/DIS 20022-4

Financial services — Universal financial industry message scheme —

Part 4: XML Schema generation

*Services financiers — Schéma universel de messages pour
l'industrie financière —*

Partie 4: Génération de schéma XML

ICS: 03.060

ISO/TC 68/SC 9

Secretariat: **AFNOR**

Voting begins on:
2025-03-05

Voting terminates on:
2025-05-28

This document is circulated as received from the committee secretariat.

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 20022-4 was prepared by Technical Committee ISO/TC 68, *Financial services*.

This second edition of ISO 20022-4 cancels and replaces ISO 20022-4:2013, which has been technically revised.

ISO 20022 consists of the following parts, under the general title *Financial services — Universal financial industry message scheme*:

- Part 1: Metamodel
- Part 2: UML profile
- Part 3: Modelling
- Part 4: XML Schema generation
- Part 5: Reverse engineering
- Part 6: Message transport characteristics
- Part 7: Registration
- Part 8: ASN.1 generation
- Part 9: Syntax Generation Requirements and Rules

ISO 20022-1, ISO 20022-2, ISO 20022-3, ISO 20022-4, ISO 20022-5, ISO 20022-6, ISO 20022-7, ISO 20022-8 and ISO 20022-9 will be implemented by the Registration Authority, at which time support for the concepts set out within them will be effective. The implementation plan should be agreed between the Registration Authority, Registration Management Group and Technical Support Group. Users and potential users of the ISO 20022 series are encouraged to familiarize themselves with the 2025 editions as soon as possible, in order to understand their impact and take advantage of their content as soon as they are implemented by the Registration Authority. For further guidance, please contact the Registration Authority.

The main technical changes are:

- Annotation is included to benefit users with meaningful information directly in the schema. Schema are generated into different folders with and without annotation. Annotations include information relevant to each concept such as full unabbreviated name, definition, identification scheme, unit code, base value, meaning when true or false, and versioning information.
- Minor versions are supported with the addition of optional attributes to indicate the draft, revision and variation of the MessageDefinition. This metadata benefits users by enabling message writers to include compatibility of content with minor versions in the same namespace as the major version.

- Identification of message content is supported by permitting an optional "id" attribute on compound content. These can be referenced by "ref" attributes on elements for MessageAssociationEnds, and Pointer types. This benefits users by making it simple to reference existing types without additional modelling, and enables extension by direct reference of content in the same message. The previous edition required explicit modelling of identifiers and references.
- CodeSets with Codes are distinguished from those without Codes or that are used to reference other code lists that are external to the schema.
- If a MessageDefinition has a root element, then a global element and type is generated for it instead of a global element named for the MessageDefinition.
- MessageBuildingBlock is specified separately to MessageElement.
- The language of the text can be indicated if it differs from the default with an optional attribute "lang" of type "language" added to generation of Text types.
- Boolean and String is generated, and Integer has been removed, to match Repository Metaclasses.
- Binary types generated as base64, or as hexBinary if a preferred text encoding is specified in the model.
- XML Schema datatypes are generated for user-defined DataTypes, but not for the Repository's XML Schema Type Library which has been replaced by ISO/IEC 11404 General Purpose Datatypes.

Editorial changes include:

- Regrouping and reordering of metaclass clauses and table entries, rather than English collation order.

Introduction

This International Standard defines a scalable, methodical process to ensure consistent descriptions of messages throughout the financial services industry.

The purpose of this International Standard is to describe precisely and completely the externally observable aspects of financial services messaging in a way that can be verified independently against operational messaging.

The trigger for the creation of this International Standard was the rapid growth in the scale and sophistication of messaging within financial services during the 1990s using ISO 15022. The financial services industry (from here on referred to as "the industry") created the first version of this International Standard as the successor to ISO 15022 in response to that trigger. Since ISO 15022, the industry has broadened the scope from securities to the entire industry for this International Standard.

This International Standard is based on open technology standards, which historically have evolved more rapidly than the industry itself. Consequently, this International Standard adopted a model-driven approach where the model of the industry's messaging can evolve separately from the evolution of the messaging technology standards. The period during which this International Standard has emerged followed the widespread adoption of the World Wide Web (the Web) for business. XML (eXtensible Mark-up Language) emerged as the *de facto* standard for document representation on the Web and it became the first syntax for ISO 20022.

The modelling process is further refined into three levels which, in addition to the messaging technology standard, is why this International Standard is based on four levels: the Scope level, the Conceptual level, the Logical level and the Physical level.

This four-level approach is based on the first four levels of the Zachman Framework. The remaining two levels of the Zachman Framework are equivalent to the implementations and the operational levels, respectively.

In ISO 20022-1, the first, second and third levels are described in UML (Unified Modelling Language) because it is widely supported and supports multiple levels of abstraction. The models created in accordance with this International Standard are technology independent in that they do not require any particular physical expression or implementation. Such models aim to describe all parts of the message exchange. The models form the definition of the protocol between participants exchanging messages. This International Standard defines a method that describes a process by which these models can be created and maintained by the modellers.

The models and the Physical level artefacts are stored in a central repository, serviced by a Registration Authority. This International Standard's repository is available on the World Wide Web and offers public access for browsing.

The Repository is organized into two areas:

- A DataDictionary containing the industry model elements likely to have further or repeated use.
- A BusinessProcessCatalogue that contains models describing specific MessageDefinitions and business processes, and physical syntax implementations.

This International Standard is organized into the following parts.

- ISO 20022-1 describes in MOF (Meta-Object Facility) the metamodel of all the models and the Repository.
- This part of ISO 20022 covers the UML profile, a grounding of general UML into a specific subset defined for this International Standard (to be used when UML is selected to define the models).
- ISO 20022-3 describes a modelling method to produce models for this International Standard.
- ISO 20022-4 covers XML schema generation rules to transform a Logical level model into a Physical level description in the syntaxes.

- ISO 20022-5 covers logical model alignment and reverse engineering of existing message syntaxes.
- ISO 20022-6 covers message transport characteristics that define the quality of service required by the business process definitions so that they can operate successfully.
- ISO 20022-7 describes the process of managing the registration of models and physical syntax implementations.
- ISO 20022-8 gives ASN.1 syntax generation rules to transform a Logical level model into a Physical level description in ASN.1.
- ISO 20022-9 describes generic syntax generation guidelines, which are used to define specific syntax generation rules such as JSON schema, etc.

Financial services — Universal financial industry message scheme —

Part 4: XML Schema generation

1 Scope

This part of ISO 20022 was prepared to complement the ISO 20022 Metamodel, as specified in ISO 20022-1, with the XML syntax transformation rules to be applied by the ISO 20022 Registration Authority in order to translate an ISO 20022 compliant MessageDefinition into an XML Schema for the description and validation of XML Messages.

It specifies the transformation rules from the Logical to the Physical level. It is a deterministic transformation, meaning that the resulting XML Schema is completely predictable for a given MessageDefinition. There is neither manual input to the transformation itself nor manual adjustment to the result of the transformation.

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 20022-1, *Financial services — Universal financial industry message scheme — Part 1: Metamodel*

RFC 5141, *A Uniform Resource Name (URN) Namespace for the International Organization for Standardization (ISO)*¹⁾

XML Schema Part 1: Structures, Second Edition, W3C Recommendation, World Wide Web Consortium.
<https://www.w3.org/TR/xmlschema-1/>

XML Schema Part 2: Datatypes, Second Edition, W3C Recommendation, World Wide Web Consortium.
<https://www.w3.org/TR/xmlschema-2/>

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 20022-1 apply.

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org>

4 Background

XML is a standard defined by W3C (the World Wide Web Consortium) that is used for the representation (i.e. the syntax) of standardized ISO 20022 MessageDefinitions. XML leaves a lot of freedom for the exact way it

1) <https://www.rfc-editor.org/info/rfc5141>

is used in a particular application. Therefore, merely stating that XML is used is not sufficient to guarantee predictability; it is also necessary to explain how it will be used.

This part of ISO 20022 contains a set of XML design rules. These design rules define how a MessageDefinition is transformed into an ISO 20022 XML Schema, which is used to validate that a message instance, as an XML document, conforms with the structure, data types and constraints of an ISO 20022 MessageDefinition. ISO 20022 XML Schema are annotated with documentation and application information to aide operational staff and software developers to understand messages.

This part of ISO 20022 also describes how a MessageSet can be converted into XML Schemas by specifying how a MessageDefinition is transformed into an XML Schema. This XML Schema will then make it possible to use a validating XML Schema parser to automatically verify that a given XML Instance complies with the constraints (or a subset of constraints) described in the MessageDefinition.

This part of ISO 20022 is limited to explaining how a given MessageDefinition will be mapped into XML Schema. How to model a MessageDefinition can be found in ISO 20022-3 Modelling.

Note Not all logical artefacts have a transformation rule.

5 ISO 20022 transformation rules for MessageSet

5.1 Preconditions

The MessageSet used as input for the transformation is a valid instance of the MessageSet meta-class.

5.2 Transformation constraints

An ISO 20022 XML Schema contains a top level annotation, which contains the following metadata:

- the ISO 20022 Registration Authority (RA) software and its build number;
- the generation date and time;
- edition of the standard.
- the MessageDefinitionIdentifier's area, function, flavour, version.
- the MessageDefinition's draft, revision and variation.

EXAMPLE

```
<xs:annotation>
  <xs:documentation>Generated by Standards Editor (build:R2.4.0) on 2024 May 08
14:52:39, ISO 20022 version : 2013</xs:documentation>
  <xs:appinfo a:generator="Standards Editor (build:R2.4.0)" a:generated="2024-05
-08T14:52:39Z" a:edition="2013"/>
</xs:annotation>
```

An ISO 20022 XML Schema is an implementation of the MessageDefinition. The MessageDefinition is always the definitive source.

The schema design approach exhibits the 'Venetian blind' pattern. XML Schema Definition (XSD) elements are locally defined within their global complexType, except for two unreferenced global elements:

- A global element named for the MessageDefinition's abbreviated name excluding the version. Its type is the complexType for the MessageDefinition.
- A global element named for the MessageDefinition's rootElement property. Its type is a complexType, also named for the rootElement property, which contains one local element named for the MessageDefinition's abbreviated name excluding the version. The type of the local element is the complexType for the MessageDefinition.

All aspects of dictionary management, e.g. reuse and pointers, are managed at the level of the MessageDefinition. These aspects, among others, are covered in ISO 20022-3.

All complexType and simpleType elements in the XML Schema appear after the root element, in alphabetical order, using the type "name" attribute as sort key.

For each MessageDefinition, an XML Schema is generated with annotation in a folder named "full", that includes the definition of each generated repository concept, its full name if abbreviated, and additional metadata about the type. Annotation is then stripped to produce another XML Schema without annotation in a folder named "bare".

5.2.1 Bare Schema without annotation

Apart from the RA administered XML comment line, a bare ISO 20022 XML Schema without annotation contains only information relevant for the validation of XML Instances by an XML Schema parser. For example, it does not contain documentation (definitions, etc.) or implementation information (relationships between similar Components, etc).

EXAMPLE

```
<xs:complexType name="DerivativesTradeReportV03">
  <xs:sequence>
    <xs:element name="RptHdr" type="TradeReportHeader4"/>
    <xs:element name="TradData" type="TradeData57Choice"/>
    <xs:element maxOccurs="unbounded" minOccurs="0" name="SplmtryData" type="Suppl
ementaryData1"/>
  </xs:sequence>
</xs:complexType>
```

5.2.2 Full Schema with annotation

A full ISO 20022 XML Schema with annotation contains documentation and metadata about each generated concept, in addition to information relevant for the validation of XML Instances by an XML Schema parser. The annotation directly benefits users, including software developers and operational staff, by providing them direct access in the schema to the unabbreviated names, definitions and meaning of concepts, along with constraints and metadata such as the units, referenced type and identification scheme.

Each Repository Concept (such as MessageElement, MessageComponentType or DataType) that is generated into an XML Schema component (such as element, complexType or simpleType) is annotated with the concept's definition, full name if abbreviated and additional metadata. The benefit of this is that people working with the schema can associate the name with its abbreviation and read the definition, without having to refer to other documentation. Including documentation saves considerable time and money in development, without affecting the speed of validation performance.

Each generated RepositoryConcept is annotated with an XML Element "xs:annotation" that contains

- an XML Element "xs:documentation" for descriptive text properties, comprising
 - the unabbreviated "name" of the concept, important understanding MessageElement and Code,
 - the "definition"; and
- an XML Element "xs:appinfo" for other properties :
 - with attributes named for each source property which contain the value of the property, qualified by a namespace for annotations "urn:iso:std:iso:20022:tech:annotation".
 - "name", for all concepts.
 - "meaningWhenFalse" and "meaningWhenTrue", for Indicator
 - "unitCode", for Quantity