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Non-destructive testing — Generic NDE data format model

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National foreword

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Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled "International Standards Correspondence Index", or by using the "Find" facility of the BSI Standards Electronic Catalogue.

Summary of pages

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Non-destructive testing - Generic NDE data format model

This CEN Report was approved by CEN on 26 May 2000. It has been drawn up by the Technical Committee CEN/TC 138.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

Foreword

This CEN Report has been prepared by Technical Committee CEN/TC 138 « Non-destructive testing », the secretariat of which is held by AFNOR.

Taking into account the specific character of this CEN report, it was decided to give some explanations in an introduction given in the 3 languages.

Introduction

This CR assumes knowledge of the Object Modelling Technique (OMT) and of NDE.

There is a growing interest to manage the results of non-destructive testing (NDT) by the use of computers with data in a digital form. As a result, the NDT activities are undergoing an evolution which makes them face new needs, such as the handling of huge volumes of digital data and the growing complexity of analysis processes, involving, in many cases, multitechnique procedures.

The NDT service business is evolving towards a more open market, in which the prime contractor requires transparent access to the data provided by the supplier, in order to ensure the comparison of data obtained from different sources and at different periods of time. Existing formats are often proprietary formats released by instrument manufacturers, generally dealing with a unique NDT method and not including complementary information on acquisition : consequently, they often fail to meet emerging requirements.

It is a natural evolution to express the need of a standard format model for the exchange of non-destructive examination (NDE) data, which can be recognized by all involved in the main NDT methods.

The expected characteristics of such a format are the following :

— exchange : the format can be used mainly for data exchange, but could be used for real-time data processing ;

— multitechnique : the format must take into account the different forms taken by the data (e.g. time/amplitude vectors for ultrasonics A-scans, complex values for eddy currents, 2-D images for radiography) ;

— traceability : the format must include all the relevant complementary information on the acquisition (e.g. date of the acquisition, component name, procedure identification, list of NDT equipment, ...) ;

— reproducibility : the format must contain all information allowing the reproduction of the acquisition (e.g. set-up parameters) ;

— completeness : the format must contain all information necessary for data analysis (e.g. probe position) ;

— compatibility with NDT standards.

The objective of this technical report is to define a format model for the organisation of NDE data for exchange (transmission, comparison, remote computer-processing) and computer-processing (traceability, archiving, retrieval, signal processing, comparative analysis). The format described is independent of the system and method used. It applies to digital data issued from the NDE methods on which general standards are being defined in CEN/TC138 working groups, i.e. radiology, ultrasonics, eddy currents, penetrant testing, magnetic particle testing, leak testing, acoustic emission, visual inspection. However, other methods (thermography, Barkhausen noise, shearography, microwave testing,...) may comply with this organisation with additional definitions required to ensure satisfactory performance. Interpretation of data is outside the scope of the technical report.

Digital data can be obtained in each of the main NDT methods in the following ways :

Radiography	Computed radiography Computed tomography Digitised film radiography Radioscopy
Ultrasonics	Digital equipment
Eddy currents	Digital equipment
Penetrant testing	Digital camera
Magnetic particle testing	Digital camera
Leak Testing	Digital recording device
Acoustic emission	Digital equipment
Visual inspection	Digital camera

It is important to note that this technical report proposes a format model. It can be implemented practically in many ways. To do so, a standard or a document describing the application programming interfaces is necessary.

The examination data is described as an integration of acquisition data (made of the NDE data and of setting and positionning data) and of complementary data, which are all the other data relevant to the examination, e.g. the data necessary to identify the inspection conditions, the examination object or the testing equipment.

The working method used in this report is the Object Modelling Technique (OMT), a recognised object modelling approach.

This technical report :

— defines the objects : one must be very careful, during the interpretation of the document, to distinguish between the object names and the actual terms used in the definitions ; some ambiguities may arise from the fact that these names are sometimes identical ; to avoid that, a specific typology has been adopted throughout the document ;

— defines the relationships between objects ;

— defines the attributes of the objects (dictionary).

A generic overview of the model can be seen on Figure I.1. This representation gathers the objects in object groups and gives a global view of the model. It can be observed that a set of data on which the format is applied relates to a single examination. A different examination will then create a different data set.

The examination is made on an object (i.e. the volume of the component on which NDE information is required), using a procedure and a data organisation (i.e. the definition of the structure of acquisition data). The procedure defines the equipment. The acquisition data is produced by the equipment and arranged according to the data organisation related to the equipment.

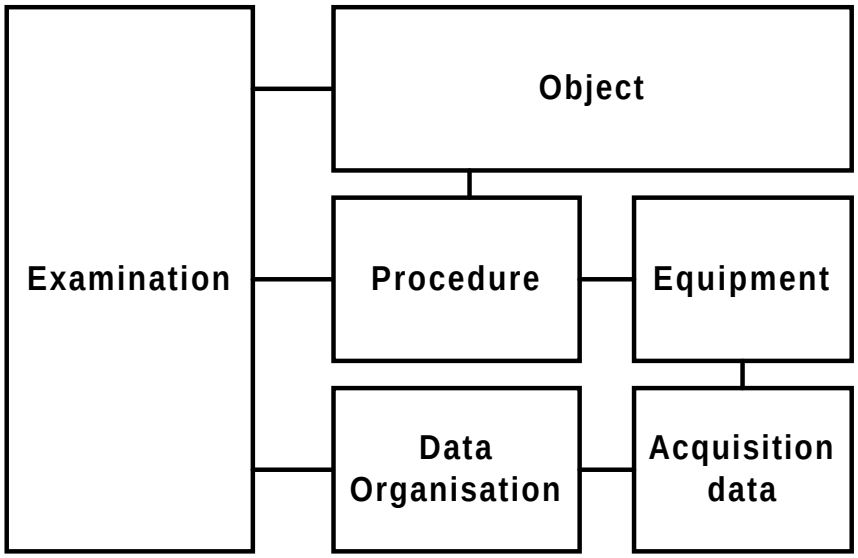

Figure I.1 — Generic overview of the model

Figure I.2 represents the main view of the model, including all the objects and relationships, the detailed definition of which is given in paragraph 8.2.1. The object groups of Figure I.1 have also been represented on Figure I.2, for easier comprehension. This main view is common to all the NDT methods.

The characteristics specific to each method are included in the DEVICE object. A DEVICE is an element of a NDT equipment. The technical report aims to define standard DEVICE objects for the standardised NDT methods. This model intends to be open to new techniques or to the evolution of conventional techniques, and the possibility is given to define "non-standard devices", under restrictions which are given in the document ("general rules for use").

Finally, this report provides a detailed model of the acquisition data, which describes all the possible forms which can be taken by NDE data : 0D (scalar or complex), 1D (sampled - cf. ultrasonics A-scans - or unsampled - cf. ultrasonics time/amplitude data), 2D (images) or 3D (volumes).

In annex B, a formal description of the model can be found, using the Express language, based on the STEP (STandard for the Exchange of Product model data) standardised approach (ISO 10303).

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If this report is translated, the Object Modelling Technique (OMT) terminology (written in capitals) shall remain in English.

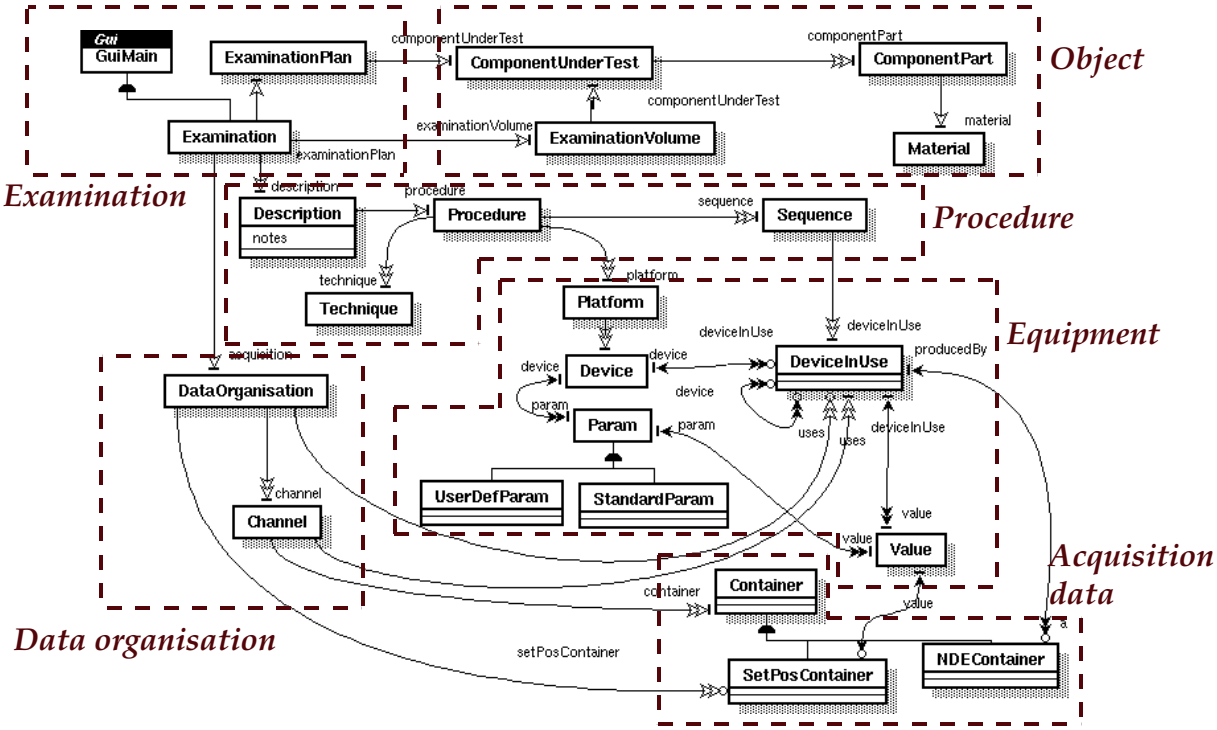


Figure I.2 — Main view of the model (DOM representation)

1 SCOPE

So far, existing formats for non-destructive examination (NDE) data are specific to a given system and method, and do not include all the necessary information to allow an exchange of the data.

This technical report defines a format model for NDE data organisation, in order for them to be exchanged (transmission, comparison, remote computer-processing) and computer-processed (traceability, archiving, retrieval, signal processing, comparative analysis). This format is independent of the used system and method. It applies to digital data issued from the following NDE methods : radiology, ultrasonics, eddy currents, penetrant testing, magnetic particle testing, leak testing, acoustic emission, visual inspection. Other methods (thermography, Barkhausen noise, shearography, microwave testing, ...) may comply with this model with additional definitions required to ensure satisfactory performance.

Interpretation of data is outside the scope of this technical report.

2 REFERENCES

This CEN Report incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this CEN Report only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

ISO 10303, *Industrial automation systems and integration – Production data representation and exchange, (STEP : STandard for the Exchange of Product model data)*

EN 462-1, *Non-destructive testing – Image quality of radiographs – Part 1: Image quality indicators (wire type) - Determination of image quality value*

EN 462-2, *Non-destructive testing – Image quality of radiographs – Part 2: Image quality indicators (step/hole type) - Determination of image quality value*

EN 462-5, *Non-destructive testing – Image quality of radiographs – Part 5: Image quality indicators (duplex wire type), determination of image unsharpness value*

EN 12543-2, *Non-destructive testing – Characteristics of focal spots in industrial X-ray systems for use in non-destructive testing - Part 2: Pinhole camera radiographic method*

EN 12679, *Non-destructive testing – Determination of the size of industrial radiographic sources – Radiographic method*

3 DEFINITIONS RELATED TO THE MODELLING METHOD

STEP : STandard for the Exchange of Product model data (ISO 10303) bearing on the representation and exchange of the product data, aiming to integrate conception and development processes.

Domain : in the STEP methodology, the domain describes what is inside the limits of application of the model.

Analysis model : the definition of the objects constituting the domain and of the relationships between them.

4 CONVENTIONS AND SYMBOLS

SMALL CAPITALS are used in this document to refer to model objects, as defined in the OMT (Object Modeling Technique) formalism. UNDERSCORED SMALL CAPITALS refer to object groups.

Bold characters refer to terms defined in the "Terminology" see clause 7.

5 GENERAL REQUIREMENTS FOR COMPLIANCE

A NDE data format complies with this technical report if it satisfies to the following conditions :

— it is organised according to the model described hereafter ;

— the attributes of the objects are fulfilled as described in the dictionary ;

— all numerical values are expressed in the SI system.

6 CHARACTERISTICS OF NDE DATA

From a general point of view, **examination data** is made of acquisition data and complementary data.

Acquisition data, which is all the data acquired during the **examination,** can be :

— NDE data, which has been derived from the various NDE methods and can be scalar (0-dimensional), 1-dimensional, 2-dimensional or 3-dimensional ;

— setting and position data.

Complementary data is all the other data relevant to the examination, e.g. the data necessary to identify the inspection conditions, the examination object, the testing equipment, the requested position of the equipment relative to the examination object.

All data must be in a digital form.

7 TERMINOLOGY RELATED TO NDE

This clause contains the definition of terms related to NDE which are necessary for this standard.

Component : a part of a construction or a manufactured product.

Data set : a collection of data.

Equipment : all devices (e.g. probes, instruments, filters, cables, robots, etc.) and inspection media (e.g. dye penetrant, magnetic particle media, film, etc.) useable to perform an examination.

Examination : testing of a component in accordance with a standard, a specification or a procedure.

Examination data : information available from an examination.

NDE Method : discipline applying a physical principle in nondestructive testing (e.g. ultrasonic method).

NDE Technique : a specific way of utilizing a NDE method (e.g. ultrasonic immersion technique).

Operating procedure : the detailed list of the requirements of the examination and of the sequential operations necessary to perform it.

Set : an assembly of equipments/devices used to perform a specific examination.

Testing : activities associated with the preparation, performance and control of nondestructive examination.

8 NDE FORMAT MODEL - Functional description

8.1 Domain description

The domain of the NDE format model shall include the following basic information :

— the geometry of the **component** ;

— the NDE **set** : description and set-up ;

— the position of each inspecting device relative to a reference system ;

— the general examination information : date, environment, operator, historical data ... ;

— the examination **operating procedure** ;

— the acquisition data.

The **data set** described by the NDE data format shall correspond to a single examination.

8.2 Main view of the model

8.2.1 Generic overview

DEFINITION OF OBJECT GROUPS :

EXAMINATION : the identification of the **examination** to be performed**.**

OBJECT : the volume of the **component** on which NDE information is required.

procedure : the description of the way the OBJECT is examined.

equipment : the complete combined **equipment** used to perform the **examination**.

DATA ORGANISATION : the definition of the structure of acquisition data.

These five object groups constitute the complementary data of the examination.

ACQUISITION data : the acquisition data produced during the **examination**.

An **EXAMINATION** is made on an **object**, using an **PROCEDURE** and an **DATA ORGANISATION**. The **PROCEDURE** defines the **EQUIPMENT**. The **ACQUISITION DATA** is produced by the **EQUIPMENT** and arranged according to the **DATA ORGANISATION** related to the **EQUIPMENT**.

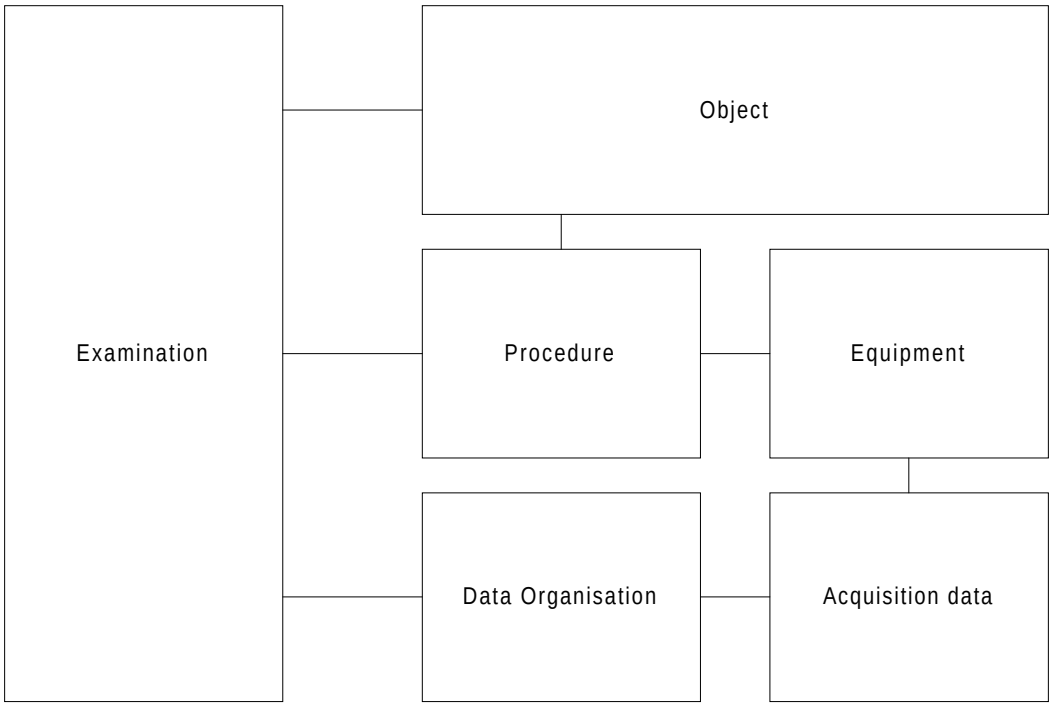


Figure 1 — Generic overview of the domain

8.2.2 Objects definitions and relationships

8.2.2.1 Definitions

The generic object groups comprise the objects defined as follows :

EXAMINATION :

EXAMINATION PLAN : the description of the way the COMPONENT UNDER TEST is examined.

examination : the **examination** performed on the examination volume.

OBJECT :

component under test : the **component** including the examination volume.

examination volume : the volume of the component under test on which NDE data is required.

component part : basic volume of the component under test which is made of a unique material.

material : the material constituting a component part. It corresponds to a set of known physical properties.

PROCEDURE :

DESCRIPTION : the generic description of the **examination**.

PROCEDURE : the operating procedure used to perform the examination.

SEQUENCE : set of consecutive operations of the **operating procedure**.

TECHNIQUE : the NDE technique used to perform the examination.

EQUIPMENT :

PLATFORM : a set of given equipment.

DEVICE : each element of an equipment.

PARAMETER : a characteristic of the DEVICE which can be set to a value.

STANDARD PARAMETER : a PARAMETER defined in this document (chapter 8.3).

user-defined parameter : a parameter, defined by the user, which is not a standard parameter.

VALUE : a value or a set of values given to a PARAMETER.

DEVICE IN USE : a DEVICE with a given set of VALUE used within a SEQUENCE.

DATA ORGANISATION :

DATA ORGANISATION : the organisation of the acquisition data of the **examination**.

CHANNEL : an indication of a grouping of acquisition data produced by a particular assembly of DEVICE IN USE.

ACQUISITION DATA :

CONTAINER : a set of acquisition data.

SETPOS CONTAINER : a set of values related to the setting and the positioning of a DEVICE IN USE.

NDE CONTAINER : a set of NDE data coming from a DEVICE IN USE.

8.2.2.2 Relationships

The following diagram describes the relationships between objects.

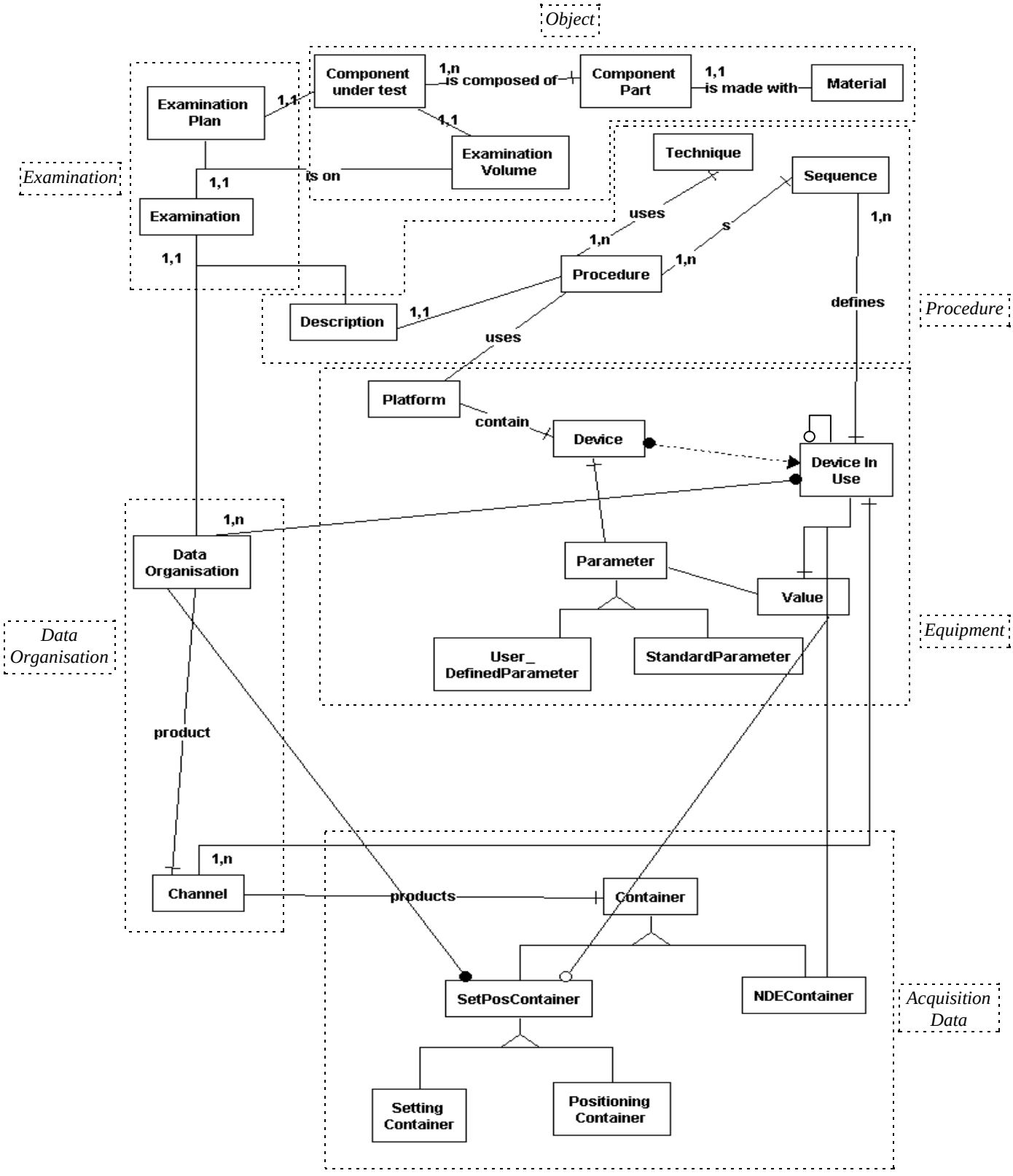


Figure 2 — Relationships between objects (main view of the model)

Relationships between objects :

— a COMPONENT UNDER TEST is examined according to a unique EXAMINATION PLAN ;

— an examination plan refers to a unique component under test ;

— an examination belongs to a unique examination plan ;

— an examination refers to a unique examination volume ;

— an examination volume is part of a unique component under test (read only) ;

— a component under test consists of one or more component part ;

— a component part belongs to a unique component under test ;

— a COMPONENT PART is made of a unique MATERIAL ;

— an examination consists of a unique description and of a unique data organisation ;

— a DESCRIPTION relates to a unique PROCEDURE ;

— a PROCEDURE consists of one or more TECHNIQUE ;

— a PROCEDURE consists of one or more SEQUENCE ;

— a PROCEDURE uses one or more PLATFORM ;

— a PLATFORM is composed of one or more DEVICE ;

— a DEVICE can belong to one or more PLATFORM ;

— a DEVICE generates zero or more DEVICE IN USE ;

— a DEVICE IN USE is generated by a unique DEVICE (read only) ;

— a sequence has one or more device in use ;

— a device has one or more parameter ;

— a PARAMETER belongs to a unique DEVICE (read only) ;

— a PARAMETER has a unique VALUE during one SEQUENCE. A PARAMETER has one or more VALUE during one EXAMINATION ;

— a VALUE belongs to a unique PARAMETER (read only) ;

— a DEVICE IN USE is associated with zero or more other DEVICE IN USE ;

— a DEVICE IN USE is characterised by one or more VALUE ;

— a VALUE characterises a unique DEVICE IN USE (read only) ;

— a data organisation defines one or more channel ;

— a DATA ORGANISATION has zero or more DEVICE IN USE (read only) ;

— a data organisation has zero or more setpos container ;

— a CHANNEL has one or more DEVICE IN USE (read only) ;

— a channel has one or more container ;

— a container can be a setpos container or a nde container ;

— a SETPOS CONTAINER is used for a unique VALUE (read only) ;

— a VALUE can be entered into zero or one SETPOS CONTAINER ;

— a NDE CONTAINER is produced by a unique DEVICE IN USE (read only) ;

— a device in use produces zero or more nde container ;

In the above description, “ read only ” means that the relationship allows to access from the first object to the second, but not to change it.

8.2.3 Dictionary

In the following tables, the type refers to the physical nature of the data. The encoding type shall be specified by the implementation.

The "notes" attribute can be used, for each object, to add precision.

NOTE all quantities shall be expressed in the SI system.

OBJECT NAME	ATTRIBUTE	TYPE	COMMENTS
EXAMINATION PLAN			
	test plan ID name	string	
	revision number	string	
	prime contractor	string	name and contract reference
	notes	string	
EXAMINATION			
	ID name	string	
	date of completion	string	
	examining company(ies) name(s)	string	
	operator(s) name(s)	string	
	environmental conditions	string	e.g. temperature, humidity, lighting, irradiation , electromagnetic compatibility (EMC), radio-frequency interference (RFI) ...
	original (or native) record file name	string	
	original (or native) record file format	string	
	original (or native) record file storage medium	string	e.g. floppy disk, CD, ...
	notes	string	

OBJECT NAME	ATTRIBUTE	TYPE	COMMENTS
COMPONENT UNDER TEST			
	name	string	
	ID number	string	
	site	string	
	owner	string	
	manufacturer	string	name, reference code
	manufacturing date	string	
	manufacturing procedure	string	
	component reference system	string	description of the geometrical system used as a reference for the component during the examination (can be a reference to a drawing)
	notes	string	can contain a list of selected parameters of the component geometry, to be defined in the application document
COMPONENT PART			
	name	string	
	ID number	string	must be sufficient to locate the part with respect to the component under test
	manufacturer	string	name, reference code
	notes	string	

OBJECT NAME	ATTRIBUTE	TYPE	COMMENTS
MATERIAL			
	name	string	
	grade	string	
	material properties file ID	string	
	material properties file format	string	e.g. ASCII
	notes	string	*can contain a list of selected properties of the material, to be defined in the application document*
EXAMINATION VOLUME			
	name	string	
	examination volume reference system	string	
	position with respect to the component under test reference system	string	
	description	string	must describe as precisely and quantitatively as possible the boundaries of the examination volume
	surface description	string	e.g. grinding condition, polish, ...
	CAD file name	string	
	CAD file format	string	e.g. IGES, STEP, DXF, ...
	notes	string	
DESCRIPTION			
	notes	string	

OBJECT NAME	ATTRIBUTE	TYPE	COMMENTS
PROCEDURE			
	name	string	
	ID number	string	
	revision number	string	
	number of sequences	integer	
	reference of calibration block(s)	string	to be completed if the procedure includes a calibration sequence or if the procedure is a calibration procedure
	notes	string	
TECHNIQUE			
	name	string	
	method	string	e.g. radiography, ultrasonics, eddy currents, penetrant testing, magnetic particle testing, leak testing, acoustic emission, visual testing, ...
	description	string	how the technique is applied to the examination
	notes	string	
SEQUENCE			
	sequence number	string	
	description	string	includes number of operations and description of elementary operations
	notes	string	

OBJECT NAME	ATTRIBUTE	TYPE	COMMENTS
PLATFORM			
	name	string	
	platform reference system	string	
	position of platform reference system with respect to component reference system	string	
	notes	string	
DEVICE			
	name	string	
	manufacturer	string	
	model	string	
	serial number	string	
	ID number	string	
	last calibration date(s)	string	for some devices, e.g. x-ray tube, the calibration of different parameters (e.g. focal spot size and tube voltage) can occur at different dates
	reference(s) of the calibration report	string	
	last verification date	string	
	reference of the verification certificate	string	
	standard / non standard	flag	
	notes	string	

Object name	Attribute	Type	Comments
PARAMETER			
	name	string	specified in the application document
	adjustable / non adjustable	flag	
VALUE			
	value	to be specified	to be expressed in SI units
DATA ORGANISATION			
	number of channels	integer	
	description of channel organisation	string	e.g. multiplexed (+ description), sequential (+ description)
	notes	string	
CHANNEL			
	name	string	
	notes	string	
CONTAINER	no attribute		
NDE CONTAINER	no attribute		
SETPOS CONTAINER	no attribute		

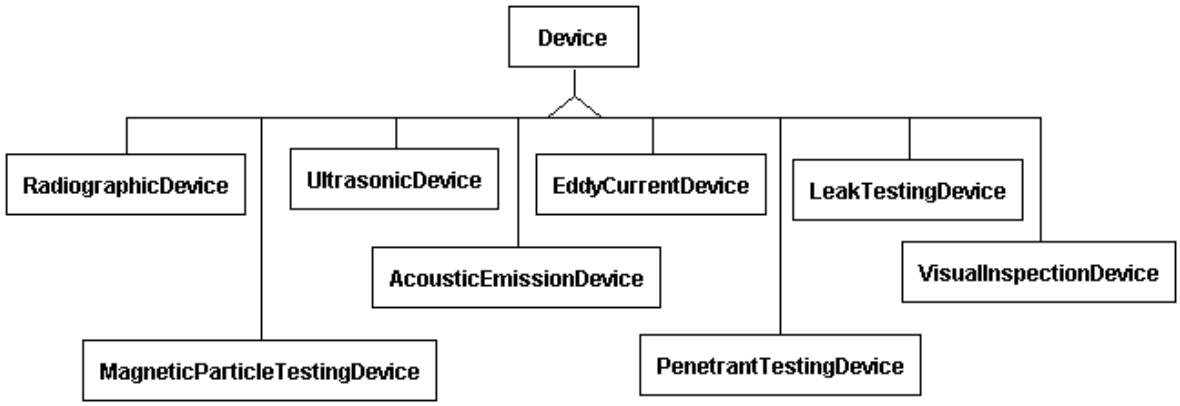
The DEVICE IN USE attributes are the attributes of the DEVICE object.

If the flag in the DEVICE object is "standard", the corresponding PARAMETER objects are STANDARD PARAMETER objects given in chapter 8.3 for this particular device.

If it is "non standard", the corresponding PARAMETER objects are USER-DEFINED PARAMETER objects.

The CONTAINER description is detailed in chapter 8.4.

8.3 Parameters of standard devices



8.3.1 Detailed view of the radiographic testing device

The radiographic DEVICE is defined for the film radiography, real-time radiography, computer tomography and computed radiography techniques.

8.3.1.1 Definition of objects

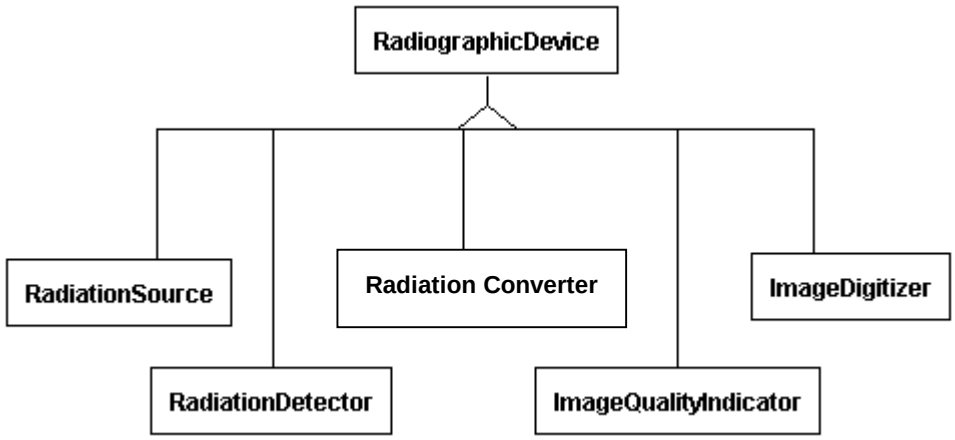


Figure 3 - Radiographic testing standard devices

Radiographic DEVICE constitutes of the following items.

RADIATION SOURCE : the source of penetrating radiation. It can be :

— Gamma source (Ir 192, Co 60, Yb 169, Se 75) ;

— Xray generator ;

— Neutron.

IMAGE QUALITY INDICATOR (IQI) : the means of measuring contrast sensitivity and resolution of the radiographic image. It can be a family of any of the following :

— Wire type IQI (EN 462-1) ;

— Step hole IQI (EN 462-2) ;

— Duplex wire IQI (EN 462-5).

RADIATION CONVERTER : it transforms radiation into a detectable image (visible radiographic image). It can be :

— X ray film ;

— Metallic screen ;

— Imaging plate ;

— Imaging intensifier ;

— Scintillator screen.

RADIATION DETECTOR : transforms the visible radiographic image into electronic signals. It delivers the analogue acquisition data. It can be :

— Photomultiplier ;

— CCD arrays ;

— Photodiodes arrays ;

— CCD X ray sensitive devices ;

— Imaging tube devices ;

— X-ray film system.

IMAGE DIGITIZER : device which transforms an analogue image into a digital image.

8.3.1.2 List of parameters

DEVICE NAME	PARAMETER	TYPE OF VALUE (when available)	COMMENTS
RADIATION SOURCE			
	Source type	string	radio-element, e.g. γ ray source : Ir 192, Se 75,Yb169, Co 60 x-ray source, e.g. X-ray tube, neutron source, linear accelerator, betatron
	last activity measurement date	string	(γ)
	peak radiation used	real	
	radiation dose rate	real	value of last activity measurement
	source size	real	
	standard for source size determination	string	e.g. EN 12543-2, EN 12679
	source-object distance	real	
	filter material	string	
	filter thickness	real	
	collimator	string	
	tube current	real	
	tube voltage	real	
	exposure time	real	

DEVICE NAME	**PARAMETER**	**TYPE OF VALUE (when available)**	**COMMENTS**
IQI			
	conformance schedule	string	Name of standard specification, e.g. EN 462-1, EN 462-2, EN 462-5)
	IQI value	real	
RADIATION CONVERTER			
	class	string	X-ray film system class, Imaging plate, Image intensifier, Scintillator screen, ...
	multiple film	string	absence or presence; type of films
	front screen description	string	
	back screen description	string	
	input image window spatial resolution	real	
	output image window spatial resolution	real	
	radiographic density range	string	e.g. 2.0-3.5 O.D.
	calibration standard	string	

DEVICE NAME	PARAMETER	TYPE OF VALUE (when available)	Comments
RADIATION DETECTOR			
	type	string	
	dynamic range contrast sensitivity	string	e.g. 500:1, 1.8 %
	input horizontal resolution	real	
	input vertical resolution	real	
	maximum light level	real	
	dark signal noise	real	e.g. 15.10^{-3} V/°C
	gamma exponent	real	
	temperature drift	real	variation over a period of time
	automatic processing	flag	yes or no (no = manual)
	developer type	string	
	developer temperature	real	
	developer time	real	

DEVICE NAME	PARAMETER	TYPE OF VALUE (when available)	COMMENTS
IMAGE DIGITIZER			
	type	string	e.g. film scanning, ...
	horizontal resolution	real	Line pairs per mm.
	vertical resolution	real	Line pairs per mm.
	dynamic range (in bits)	integer	e.g. 8 bits, 12 bits, ...
	Input transfer function	string	
	Output transfer function	string	
	transfer function	array of reals	mapping of output signal to input signal ratio, linear, non-linear
	horizontal pixel number	integer	
	vertical pixel number	integer	
	maximum number of horizontal lines	integer	
	maximum number of vertical lines	integer	
	pre image conditioning applied	string	Background subtraction, integration, averaging, image sharpening etc.
	image gain characteristics	string	Minimum signal level, maximum signal level.
	image offset characteristics	string	Signal level conditioning.

8.3.2 Detailed view of the ultrasonic testing device

8.3.2.1 Definition of objects

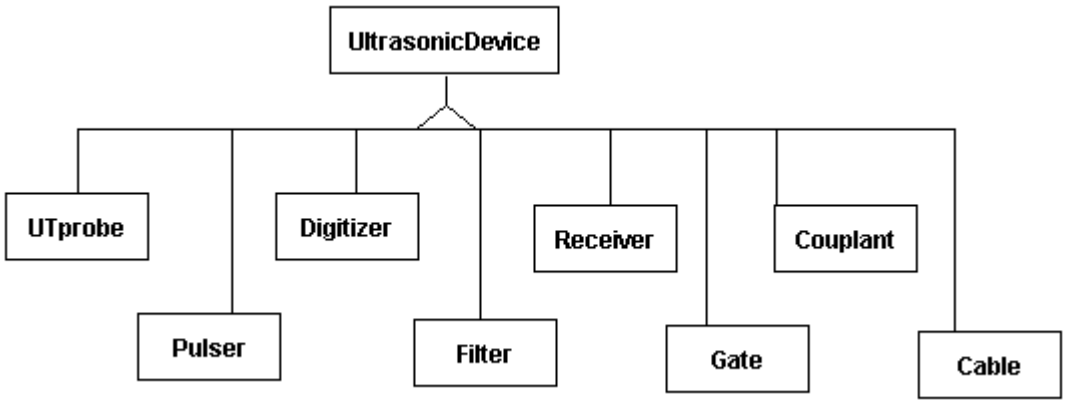


Figure 4 - Ultrasonic testing standard devices

PULSER : device which produces an electrical pulse to drive a probe.

UT PROBE : electro-acoustic device which transforms the electrical pulse into an acoustic signal and vice-versa.

RECEIVER : device which receives and amplifies the analogue electrical signal coming from the probe.

DIGITIZER : device which transforms an electrical analogue signal into a digital signal.

FILTER : device which transforms the frequency response of the electrical signal.

GATE : device which selects a time period and, in some cases, a level threshold of the electrical signal.

COUPLANT : medium interposed between the probe and the examination object.

CABLE : the electrical link between analogue devices.

8.3.2.2 List of parameters

DEVICE NAME	Parameter	TYPE OF VALUE (when available)	COMMENTS
PULSER			
	pulse type	string	shape of the pulse, e.g. spike, square, ...
	repetition rate	real	
	pulse amplitude	real	defined as an attribute of UT PROBE object in case of multiple cells probe
	pulse width	real	
	pulse rise time	real	
	negative pulse	flag	yes, no
	pulse damping factor	real	in percentage
	burst frequency	real	when pulse is a burst
	burst width	real	when pulse is a burst
	trigger mode	string	internal time-based, external
	trigger delay	real	defined as an attribute of UT PROBE object in case of multiple cells probe

DEVICE NAME	Parameter	TYPE OF VALUE (when available)	COMMENTS
UT PROBE			
	multi-element	flag	yes, no
	total number of cells	integer	
	number of cells per aperture	integer	
	combination law	array (n , 4)	for each cell : pulser amplitude, pulser trigger delay, receiver gain, digitizer trigger delay
	probe reference system	string	description of the probe reference system
	emergence point position	array of reals	
	measured beam diameter	real	
	use	string	transmission, reception, combined transmission/reception
	type	string	contact, immersion, ...
	number of focal points	integer	0 for non-focussed probe
	lower frequency	real	
	upper frequency	real	
	peak frequency	real	
	wave mode	string	longitudinal, shear, surface, ...
	angle of incidence	real	for contact probe
	beam focal length	array of reals	
	focal area size	array of reals	
	divergence angle	real	
	squint angle	real	
	wedge material	string	for contact probe

DEVICE NAME	PARAMETER	TYPE OF VALUE (when available)	COMMENTS
UT PROBE (Cont'd)			
	ultrasonic velocity in wedge material	real	for contact probe
	wedge thickness	real	for contact probe
RECEIVER			
	lower frequency	real	
	upper frequency	real	
	amplifier type	string	linear, logarithmic, ...
	gain	real	in dB, for linear amplifiers - defined as an attribute of UT PROBE object in case of multiple cells probe
	offset	real	in dB, for logarithmic amplifiers
	pre-amplifier gain	real	in dB, for logarithmic amplifiers
	rectifier mode	string	off, negative waves, positive waves, full waves
	sensitivity	real	
	signal to noise ratio	real	in dB
	DAC compensation	flag	yes, no
	DAC curve	array of reals	gain vs. time
	DAC trigger mode	string	internal time-based, external, ...
	DAC trigger delay	real	

DEVICE NAME	PARAMETER	TYPE OF VALUE (when available)	COMMENTS
DIGITIZER			
	sampling frequency	real	
	trigger mode	string	internal time-based, external, ...
	trigger delay	real	defined as an attribute of UT PROBE object in case of multiple cells UT probe
	dynamic range (in bits)	integer	e.g. 8 bits, 12 bits, ...
	lower input voltage	real	
	upper input voltage	real	
	lower digital output	real	
	upper digital output	real	
	number of samples per trigger event	integer	

DEVICE NAME	Parameter	TYPE OF VALUE (when available)	COMMENTS
FILTER			
	numerical filter	flag	yes, no
	class	string	low-pass, high pass, band-pass, ...
	type	string	FIR, Butterworth, ...
	cut-off frequency	real	for low-pass or high-pass filters
	lower frequency	real	
	upper frequency	real	
	slope (in dB/decade)	integer	e.g. 80 dB/decade
	maximum input voltage	real	
GATE			
	starting delay	real	
	duration	real	Gate width
	gate level	real	threshold level
	trigger mode	string	internal time-based, external, ...

DEVICE NAME	PARAMETER	TYPE OF VALUE (when available)	COMMENTS
COUPLANT			
	couplant material	string	
	coupling thickness	real	
	ultrasonic velocity at 20 °C	real	
	temperature	real	
CABLE			
	cable type	string	
	cable length	real	
	attenuation factor (dB/m)	real	
	resistance / meter	real	
	capacitance / meter	real	
	cut-off frequency	real	

8.3.3 Detailed view of the eddy current testing device

The eddy current DEVICE is defined for the conventional eddy current and pulsed eddy current techniques.

8.3.3.1 Definition of objects

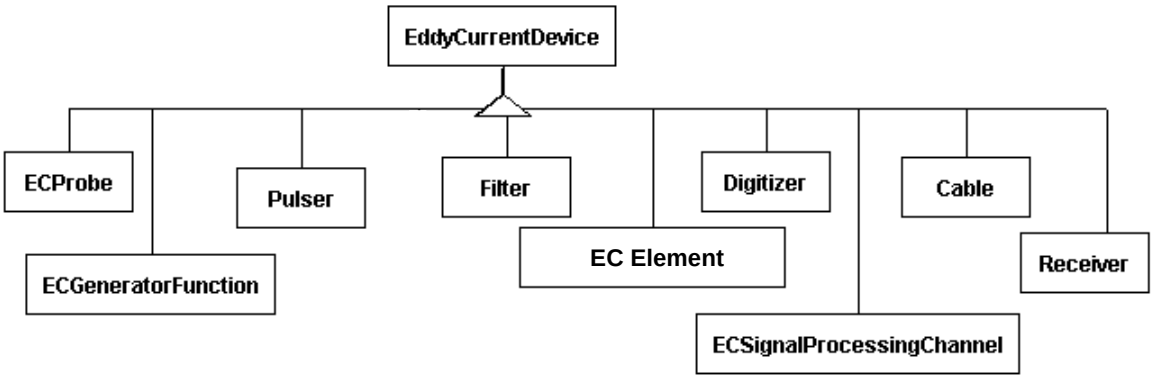


Figure 5 - Eddy current testing standard devices

EC GENERATOR FUNCTION : the device which produces the electrical excitation of the probe.

EC PROBE : the electromagnetic device which transforms the electrical signal into a magnetic field and vice versa.

EC ELEMENT : the electromagnetic device inside the probe wich transform the electrical signal into a magnetic field and reciprocally

EC SIGNAL PROCESSING CHANNEL : the device which transforms the analogue high frequency electrical signal coming from the probe into a demodulated signal.

PULSER : device which produces an electrical pulse to drive a probe (see 8.3.2).

RECEIVER : device which receives and amplifies the analogue electrical signal coming from the probe (see 8.3.2).

FILTER : device which transforms the frequency response of the electrical signal (see 8.3.2).

DIGITIZER : device which transforms an electrical analogue signal into a digital signal (see 8.3.2).

CABLE : the electrical link between analogue devices (see 8.3.2).

8.3.3.2 List of parameters

DEVICE NAME	PARAMETER	TYPE OF VALUE (when available)	COMMENTS
EC GENERATOR FUNCTION			
	number of frequencies	integer	
	type of multiplexing	string	for multifrequency generators
	current driven generator	flag	yes, no (i.e. voltage driven)
	output amplitude	real	
	frequency	array of real	
EC SIGNAL PROCESSING CHANNEL			
	channel frequency	real	useful for multifrequency analysis
	absolute channel	flag	yes, no (i.e. differential)
	type of balance	string	external probe, electronic circuit, ...
	value of balancing	complex	
	gain adjustment value (in dB)	real	
	phase adjustment value	real	
	active filter	flag	yes, no
	description of filter	string	
	output range	complex	

DEVICE NAME	PARAMETER	TYPE OF VALUE (when available)	COMMENTS
EC PROBE			
	family	string	surface probe, encircling probe, inner probe, ...
	function	string	separate transmit/receive, combined transmit/receive
	measurement mode	string	absolute, differential, pseudo-differential, double differential
	specific features	string	focussed, shielded, saturation unit, remote field, anisotopic, ...
	saturation current	real	when saturation unit is present
	reference system	string	description of the probe reference system
	probe preferred orientation w/r to probe reference system	array	
	number of elements	integer	
EC ELEMENT			
	element function	string	transmit, receive, combined transmit/receive
	type of element	string	e.g. air-cored coil, ferrite-cored coil (stick or pot), magneto-resistive element, Hall probe...
	element reference system	string	
	position of element reference system w/r to probe reference system	array of reals	

8.3.4 Detailed view of the penetrant testing device

8.3.4.1 Definition of objects

Apart from the objects specific to the penetrant testing method, and listed hereafter, all the visual inspection devices are relevant to this method (see 8.3.8).

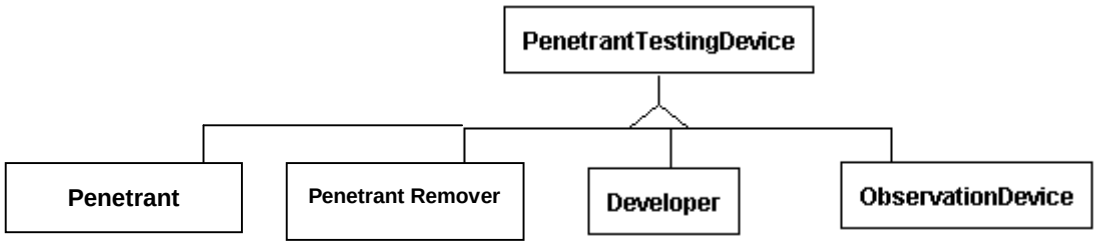


Figure 6 - Penetrant testing standard devices

Penetrant testing DEVICE constitutes of the following items.

PENETRANT : medium used to penetrate into the examination volume.

PENETRANT REMOVER : medium used to remove excess penetrant.

DEVELOPER : medium used to extract the dye penetrant from the examination volume.

OBSERVATION DEVICE : device used to make the result of the inspection observable.

8.3.4.2 List of parameters

DEVICE NAME	PARAMETER	TYPE OF VALUE (when available)	COMMENTS
PENETRANT			
	type of penetrant	string	
	type of application	string	
	time of application	real	
	temperature	real	
PENETRANT REMOVER			
	type of penetrant remover	string	
	type of application	string	
	time of application	real	
	temperature	real	
DEVELOPER			
	type	string	e.g. dry, wet
	time of application	real	
	pressure of application	real	for wet developers
	temperature	real	
OBSERVATION DEVICE			
	type	string	e.g. colour contrast, fluorescent

8.3.5 Detailed view of the magnetic particle testing device

8.3.5.1 Definition of objects

Apart from the objects specific to the magnetic particle inspection method, and listed hereafter, all the visual inspection devices are relevant to this method (see 8.3.8).

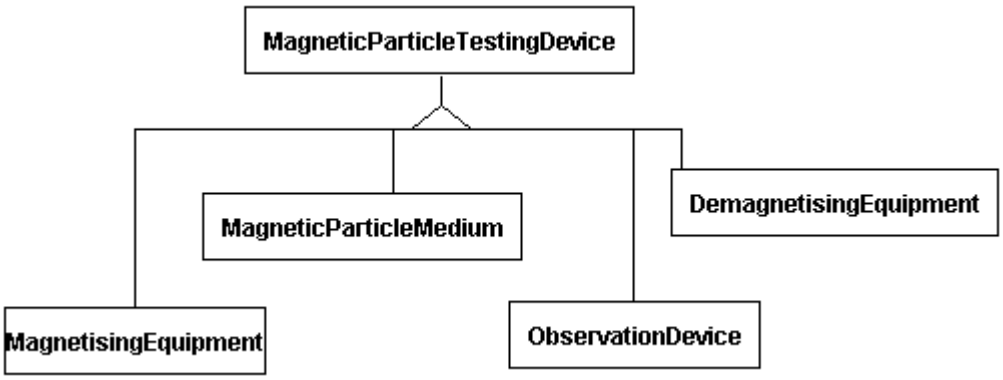


Figure 7 - Magnetic particle testing standard devices

Magnetic particle testing DEVICE constitutes of the following items.

MAGNETISING EQUIPMENT : equipment used to magnetise the examination volume.

MAGNETIC PARTICLE MEDIUM : medium containing magnetic particles.

DEMAGNETISING EQUIPMENT : equipment used to demagnetise the examination volume.

OBSERVATION DEVICE : device used to make the result of the inspection observable.

8.3.5.2 List of parameters

DEVICE NAME	PARAMETER	TYPE OF VALUE (when available)	COMMENTS
MAGNETISING EQUIPMENT			
	description	string	
MAGNETIC PARTICLE MEDIUM			
	type	string	e.g. dry, wet
	concentration	real	
DEMAGNETISING EQUIPMENT			
	description	string	
OBSERVATION DEVICE			
	type	string	e.g. visible, fluorescent

8.3.6 Detailed view of the leak testing device

There is no specific standard DEVICE attached to this method.

8.3.7 Detailed view of the acoustic emission testing device

There is no specific standard DEVICE attached to this method.

8.3.8 Detailed view of the visual inspection device

The visual inspection DEVICE is defined for the for non contact / contact visual inspection, thermal imaging systems.

8.3.8.1 Definition of objects

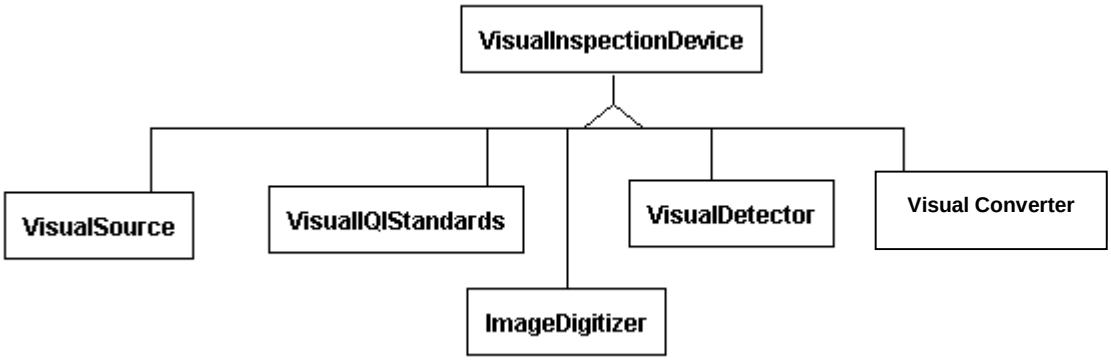


Figure 8 - Visual inspection standard devices

Visual inspection DEVICE constitutes of the following items.

VISUAL SOURCE : the source of penetrating radiation. It can be :

— Illumination visible light source (3400° or 5400° Kelvin, or white light source)

— Laser illumination source

— Spectral matched colour lamp sources

— Infrared illumination sources

— Ultra violet illumination source

IMAGE QUALITY INDICATOR (IQI) : the means of measuring and checking calibration sensitivity and resolution of the visual image. It can be a family of any of the following :

— CIE chromaticity colour bar charts.

— Image resolution test chart.

VISUAL CONVERTER : it transforms physical object image into fixed plane visible image suitable for visual detection by the visual detector. It can be :

— Optical lens units

— Direct Contact imaging

— Fibreoptics converters

— Optical wavelength filters

— Electrooptic wavelength converters

— Light deflection scanner units

— Light measuring photometer

VISUAL DETECTOR : it transforms the visible image into electronic signal. It delivers the analogue acquisition data. It can be :

— Photomultiplier

— Image acquisition digitizer

— CCD array

— Photodiode array

— Electro optics

— Imaging tube device

IMAGE DIGITIZER : device which transforms an analogue image into a digital image

8.3.8.2 List of parameters

DEVICE NAME	PARAMETER	TYPE OF VALUE (when available)	COMMENTS
VISUAL SOURCE			
	Spectral wavelength Type	string	Visible spectrum (nm)
	Peak light output	real	
	Angle of emergence	real	
	Beam spread angle	real	
	Colour temperature of illumination unit	real	
	Wattage of source	real	
	Lamp life	real	
	last activity measurement date	string	
	Measured light output at given distance	real	
VISUAL IQI STANDARD			
	Conformance Schedule	string	Name of standard specification, e.g. CEN, CIE , Image SMPTE charts
	IQI type	string	e.g. test charts, resolution
	Horizontal size	real	
	Vertical size	real	
	Distance from the illumination source	real	
	Calibration standard	string	Custom defined, or specified

DEVICE NAME	PARAMETER	Type of value (when available)	COMMENTS
VISUAL CONVERTER			
	class Type	string	
	Transfer functions	string	
	Visual attenuation	real	dB
	Output window Horizontal size	real	
	Output window vertical size	real	
	Resolution of the convertors at centre	real	
	Resolution of the convertors at edges	real	
	Focal length	real	
	Focal speed of lens	real	
	Lens aperture setting	flag	On= Yes , OFF= NO
	Input filter type	string	UV, Infrared , light filters e.g....
	Output filter type	string	
	Antireflection coatings	flag	On= Yes , OFF= NO
	Spherical aberration correction	flag	On= Yes , OFF= NO
	Internal antireflection filter	flag	On= Yes , OFF= NO
	Anti lens flare features	flag	On= Yes , OFF= NO
	Refractive index of material	real	
	Type of optical material	string	

DEVICE NAME	PARAMETER	TYPE OF VALUE (when available)	COMMENTS
VISUAL DETECTOR			
	Class	string	CCD,Photodiodes, Imaging Tube
	Sensor phosphor screen type	string	PbO, Ledicons, Input windows type
	Spectral wavelength, peak wavelength	real	
	Spectral minimum bandwidth, wavelength	real	
	Spectral maximum bandwidth, wavelength	real	
	Filter type	string	
	Filter wavelength	real	
	Actual Image horizontal size	real	
	Actual Image vertical size	real	
	Image horizontal resolution	real	
	Image vertical resolution	real	
	Number of Horizontal pixels	integer	SSD
	Number of Vertical pixels	integer	SSD
	Horizontal pixel size	integer	SSD
	Vertical pixel size	integer	SSD
	Horizontal interpixel gap	real	SSD

DEVICE NAME	PARAMETER	TYPE OF VALUE (when available)	COMMENTS
VISUAL DETECTOR (cont'd)			
	Vertical interpixel gap	real	SSD
	Maximum signal bandwidth	real	
	DC signal gain	real	
	ALC control	flag	On= Yes , OFF= NO
	Gain setting	real	db.
	Aperture correction	flag	On= Yes , OFF= NO
	Image sharpening filtration	flag	On= Yes , OFF= NO
	Input/Output transfer characteristics	string	Gamma curve, logarithmic, linear, e.g...
	Maximum dark signal	real	

8.4 Detailed view of the acquisition data

8.4.1 Objects definitions and relationships

8.4.1.1 Definitions

0D CONTAINER : a NDE CONTAINER with data values of scalar or complex type.

1D CONTAINER : a NDE CONTAINER with data values with single dimension.

2D CONTAINER : a NDE CONTAINER with 2-dimensional data values.

3D CONTAINER : a NDE CONTAINER with 3-dimensional data values.

SAMPLED CONTAINER : a 1D CONTAINER with data values obtained with a constant sampling step (e.g. A-scans in ultrasonics).

UNSAMPLED CONTAINER : a 1D CONTAINER with data values obtained with an arbitrary sampling (e.g time-amplitude technique in ultrasonics).

0D ITEM: elementary item of a 0D CONTAINER.

SCALAR ITEM : 0D ITEM of scalar type.

COMPLEX ITEM : 0D ITEM of complex type.

SAMPLED ITEM : elementary item of a SAMPLED CONTAINER.

UNSAMPLED ITEM : elementary item of an UNSAMPLED CONTAINER.

COUPLE : each couple of values constituting an UNSAMPLED ITEM. A couple is under the shape (variable 1, variable 2).

IMAGE : elementary item of a 2D CONTAINER.

VOLUME : elementary item of a 3D CONTAINER.

SET-UP CONTAINER : SETPOS CONTAINER with values of parameters related to the setting of a DEVICE IN USE.

POSITIONING CONTAINER : SETPOS CONTAINER with values of parameters related to the positioning of a DEVICE IN USE when there is an explicit acquisition of the position.

SYNCHRONISATION CONTAINER : SETPOS CONTAINER with values of parameters related to the positionning of a DEVICE IN USE when the acquisition of the position is related to a synchronisation system.

POSITION ITEM : elementary item of a POSITIONING CONTAINER.

The STRING, SCALAR, INT, BOOLEAN, FLOAT objects represent the type of the corresponding data.

8.4.1.2 Relationships

The relationships between objects are expressed in the following diagram (Figure 9)

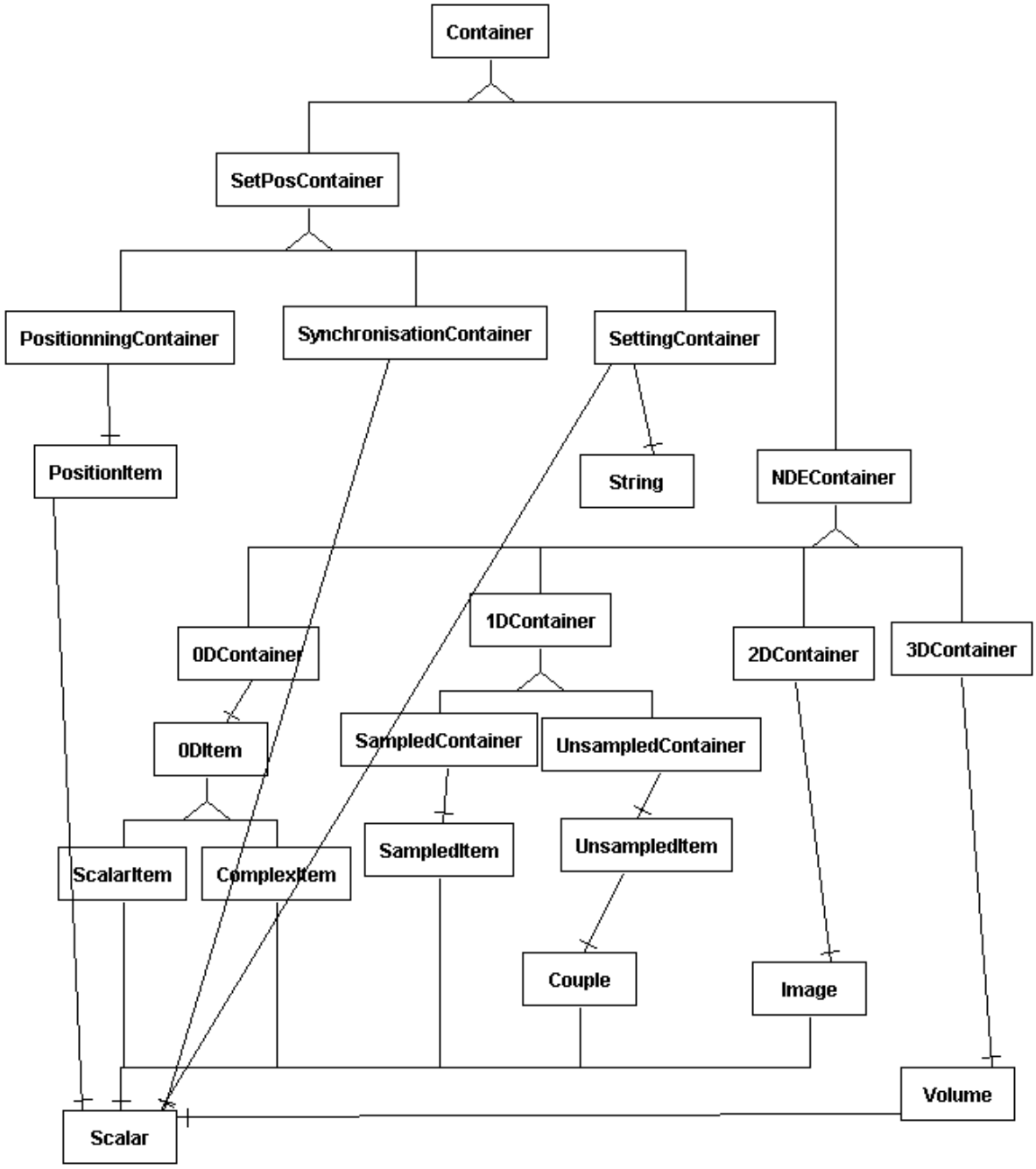


Figure 9 - Detailed view of the acquisition data

8.4.2 Dictionary

OBJECT NAME	ATTRIBUTE	TYPE	COMMENTS
0D CONTAINER			
	arithmetic format	string	e.g. signed or unsigned integer 8 bits, signed or unsigned integer 16 bits (MSB or LSB), signed or unsigned integer 32 bits (incl. byte order), boolean, float 32 bits, float 64 bits
1D CONTAINER	no attribute		
SAMPLED CONTAINER			
	number of samples per item	integer	
	arithmetic format	string	
UNSAMPLED CONTAINER			
	maximum number of couples	integer	
	name of variable 1	string	
	arithmetic format - variable 1	string	
	name of variable 2	string	
	arithmetic format - variable 2	string	

OBJECT NAME	ATTRIBUTE	TYPE	COMMENTS
2D CONTAINER			
	number of rows	integer	
	number of columns	integer	
	arithmetic format	string	
3D CONTAINER			
	number of rows	integer	
	number of columns	integer	
	number of slices	integer	
	arithmetic format	string	
0D ITEM	no attribute		
SCALAR ITEM	no attribute		
COMPLEX ITEM	no attribute		
SAMPLED ITEM	no attribute		
UNSAMPLED ITEM	no attribute		
COUPLE	no attribute		
IMAGE	no attribute		

OBJECT NAME	ATTRIBUTE	TYPE	COMMENTS
VOLUME	no attribute		
SET-UP CONTAINER			
	arithmetic / non arithmetic	flag	
	arithmetic format	string	if arithmetic
SYNCHRONISATION CONTAINER			
	arithmetic format	string	
POSITIONING CONTAINER			
	arithmetic format	string	
	type of coordinates	string	e.g. cartesian, cylindrical, spherical
POSITION ITEM	no attribute		
STRING	length	integer	
	contents	string	
SCALAR			
	value	specified in arithmetic format	

8.5 General rules for use

Each attribute must be completed. Under circumstances when some information is not available, the attribute is the string "not available".

The attribute "notes" shall be only used to contain information complementary to the explicitely defined attributes and, thus, shall not be a substitute to these attributes.

The DEVICE object shall be chosen in the first place among the standard DEVICE objects (cf. § 8.3). The use of non-standard DEVICE objects shall be reserved to two cases :

— the DEVICE is a new object justified by the use of a method not explicitely covered by the scope of the document or the use of a new technique from a method explicitely covered by the scope.

— the DEVICE is an object obtained from a standard DEVICE object by the addition of new attributes to the original attributes, due to innovations brought to the DEVICE.

When a non-standard DEVICE is used, its parameters shall be defined in the application document in a way analogous to the one described in this standard for standard DEVICE objects (cf. § 8.3).

Bibliography

EN 462-3, *Non-destructive testing – Image quality of radiographs – Part 3: Image quality classes for ferrous metals*

EN 473, *Non destructive testing - Qualification and certification of NDT personnel – General principles*

prEN 1330, *Non destructive testing - Terminology*

EN 444, *Non-destructive testing – General principles for radiographic examination of metallic materials by X- and gamma-rays*

EN 583-1, *Non-destructive testing – Ultrasonic examination – Part 1 : General principles*

prEN 12084, *Non destructive testing – Eddy current examination – General principles and basic guidelines*

EN 571-1, *Non destructive testing – Penetrant testing – Part 1 : General principles*

prEN ISO 9934-1, *Non-destructive testing – Magnetic particle testing – Part 1 : General principle* (ISO/DIS 9934-1:1996)

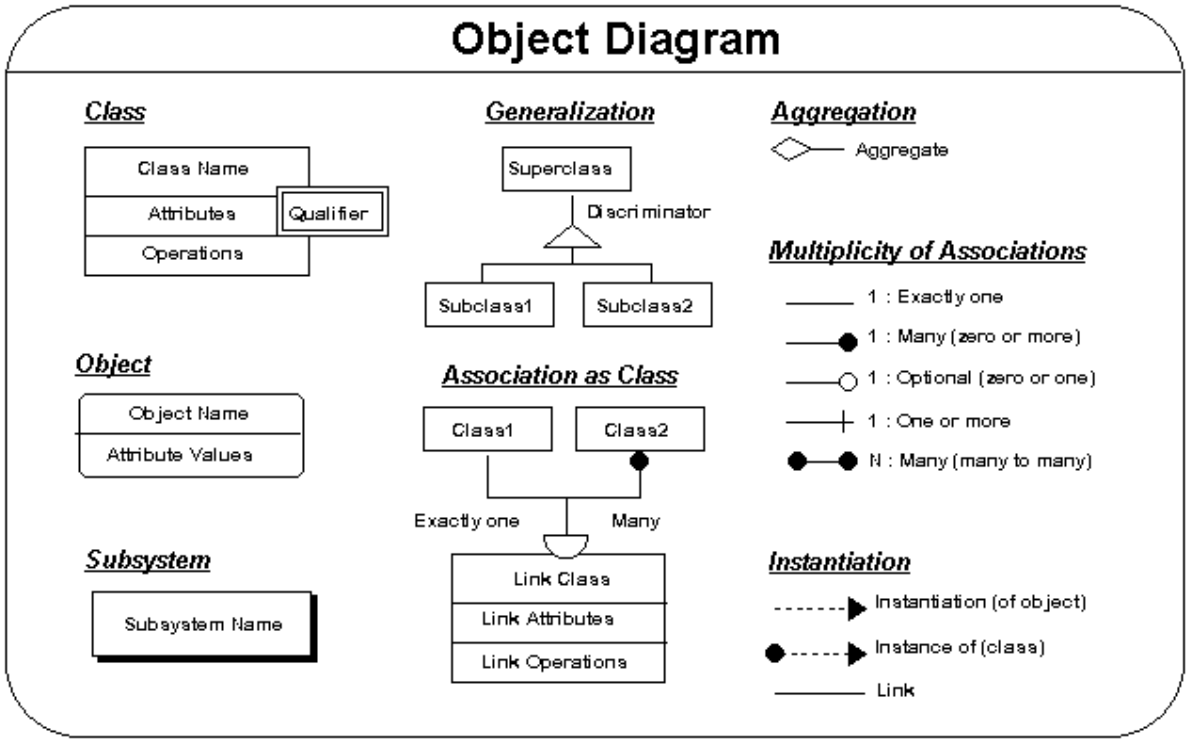
EN 1779, *Non-destructive testing – Leak testing – Criteria for method and technique selection*

prEN 13554, *Non-destructive testing – Acoustic emission – General principles*

prEN 13018, *Non-destructive testing – Visual testing – General principles*

Annex A

APPENDIX 1 : DIAGRAM FORMALISM



Annex B

APPENDIX 2 : FORMAL DESCRIPTION OF ANALYSIS MODEL – Data model objects

This appendix is the translation of the generic NDE data format model into EXPRESS language, which is the standardised formal language of STEP (ISO 10303).

Annex B contents

B.1 Type Device_type

Syntax

```
TYPE device_type = ENUMERATION OF
   (standard,
    non_standard);
END_TYPE;
```

B.2 Type flag_type

Syntax

```
TYPE flag_type = ENUMERATION OF
   (yes,
    no);
END_TYPE;
```

B.3 Type parameter_type

Syntax

```
TYPE parameter_type = ENUMERATION OF
   (adjustable,
    non_adjustable);
END_TYPE;
```

B.4 Type int_type

Syntax

```
TYPE int_type = INTEGER;
END_TYPE;
```

B.5 Type real_type

Syntax

```
TYPE real_type = REAL;
END_TYPE;
```

B.6 Type bool_type

Syntax

```
TYPE bool_type = BOOLEAN;
END_TYPE;
```

B.7 Type string_type

Syntax

```
TYPE string_type = STRING;
END_TYPE;
```

B.8 Type scalar_type

Syntax

```
TYPE scalar_type = SELECT (
   int_type,
   real_type,
   bool_type);
END_TYPE;
```

B.9 Type value_type

Syntax

```
TYPE value_type = SELECT (
   int_type,
   real_type,
   string_type);
END_TYPE;
```

B.10 Type setting_container_type

Syntax

```
TYPE setting_container_type = ENUMERATION OF
   (arithmetic,
    non_arithmetic);
END_TYPE;
```

B.11 Acoustic Emission Device

Entity Acoustic_Emission_Device

Syntax

```
ENTITY Acoustic_Emission_Device
  SUBTYPE OF (Device);
END_ENTITY;
```

B.12 Cable

Entity Cable

Syntax

```
ENTITY Cable
  SUBTYPE OF (UltraSonic_Device, Eddy_Current_Device);
   cable_type            : STRING;
```

```
   cable_length          : REAL;
   attenuation_factor    : REAL;
   resistance_per_meter  : REAL;
   capacitance_per_meter : REAL;
   cut_off_frequency     : REAL;
END_ENTITY;
```

B.13 Channel

Entity Channel

Syntax

```
ENTITY Channel;
   name           : STRING;
   notes          : STRING;
   the_containers : SET[1:?] OF Container;
   the_devices    : SET[1:?] OF Device_In_Use;
END_ENTITY;
```

B.14 Complex

Entity Complex

Syntax

```
ENTITY Complex;
   Real_Part      : REAL;
   Imaginary_Part : REAL;
END_ENTITY;
```

B.15 Complex_Item

Entity Complex_Item

Syntax

```
ENTITY Complex_Item
  SUBTYPE OF (Item_0D);
   the_scalars : SET[1:?] OF Scalar;
END_ENTITY;
```

B.16 Component_Part

Entity Component_Part

Syntax

```
ENTITY Component_Part;
   name                   : STRING;
   id_number              : STRING;
   manufacturer           : STRING;
   notes                  : STRING;
   a_material             : Material;
   a_component_under_test : Component_Under_Test;
UNIQUE
   UR1 : a_component_under_test ;
   UR2 : a_material;
```

```
END_ENTITY;
```

B.17 Component_Under_Test

Entity Component_Under_Test

Syntax

```
ENTITY Component_Under_Test;
   name                       : STRING;
   id_number                  : STRING;
   site                       : STRING;
   owner                      : STRING;
   manufacturer               : STRING;
   manufacturing_date         : STRING;
   manufacturing_procedure    : STRING;
   component_reference_system : STRING;
   notes                      : STRING;
INVERSE
   the_component_parts        : SET[1:?] OF Component_Part FOR
a_component_under_test;
   an_examination_plan        : Examination_Plan FOR a_component_under_test;
END_ENTITY;
```

B.18 Container

Entity Container

Syntax

```
ENTITY Container
   ABSTRACT SUPERTYPE OF ( ONEOF (NDE_Container, SetPosContainer));
END_ENTITY;
```

B.19 Container_0D

Entity Container_0D

Syntax

```
ENTITY Container_0D
  SUBTYPE OF (NDE_Container);
   arithmetic_format : STRING;
   the_items         : SET[1:?] OF Item_0D;
END_ENTITY;
```

B.20 Container_1D

Entity Container_1D

Syntax

```
ENTITY Container_1D
  ABSTRACT SUPERTYPE OF (ONEOF (Sampled_Container,
                                Unsampled_Container))
  SUBTYPE OF (NDE_Container);
```

```
END_ENTITY;
```

B.21 Container_2D

Entity Container_2D

Syntax

```
ENTITY Container_2D
  SUBTYPE OF (NDE_Container);
   number_of_rows    : INTEGER;
   number_of_columns : INTEGER;
   arithmetic_format : STRING;
   the_images        : SET[1:?] OF Image;
END_ENTITY;
```

B.22 Container_3D

Entity Container_3D

Syntax

```
ENTITY Container_3D
  SUBTYPE OF (NDE_Container);
   number_of_rows    : INTEGER;
   number_of_columns : INTEGER;
   number_of_slices  : INTEGER;
   arithmetic_format : STRING;
   the_volumes       : SET[1:?] OF Volume;
END_ENTITY;
```

B.23 Couplant

Entity Couplant

Syntax

```
ENTITY Couplant
  SUBTYPE OF (UltraSonic_Device);
   couplant_material               : STRING;
   coupling_thickness              : REAL;
   ultrasonic_velocity_at_20_deg_C : REAL;
   temperature                     : REAL;
END_ENTITY;
```

B.24 Couple

Entity Couple

Syntax

```
ENTITY Couple;
   the_scalars : SET[1:?] OF Scalar;
END_ENTITY;
```

B.25 Data_Organization

Entity Data_Organization

Syntax

```
ENTITY Data_Organization;
    number_of_channels               : INTEGER;
    channel_organization_description : STRING;
    notes                            : STRING;
    the_channels                     : SET[1:?] OF Channel;
    the_devices                      : SET[0:?] OF Device_In_Use;
    the_setposcontainer              : SET[0:?] OF SetPosContainer;
END_ENTITY;
```

B.26 Demagnetising_Equipment

Entity Demagnetising_Equipment

Syntax

```
ENTITY Demagnetising_Equipment
  SUBTYPE OF (Magnetic_Particle_Testing_Device);
   demagnetising_equipment_description : STRING;
END_ENTITY;
```

B.27 Description

Entity Description

Syntax

```
ENTITY Description;
   notes       : STRING;
   a_procedure : Procedures;
UNIQUE
   UR1 : a_procedure;
END_ENTITY;
```

B.28 Developer

Entity Developer

Syntax

```
ENTITY Developer
  SUBTYPE OF (Penetrant_Testing_Device);
   developer_type          : STRING;
   time_of_application     : REAL;
   pressure_of_application : REAL;
   temperature             : REAL;
END_ENTITY;
```

B.29 Device

Entity Device

Syntax

```
ENTITY Device
  ABSTRACT SUPERTYPE OF ( ONEOF (Radiographic_Device,
                                 Magnetic_Particle_Testing_Device,
                                 Ultrasonic_Device,
                               Acoustic_Emission_Device,
                               Eddy_Current_Device,
                               Penetrant_Testing_Device,
                               Leak_Testing_Device,
                               Visual_Inspection_Device ) );
    Name                          : STRING;
    Manufacturer                  : STRING;
    Model                         : STRING;
    serial_number                 : STRING;
    id_number                     : STRING;
    last_calibration_date         : STRING;
    ref_calibration_report        : STRING;
    last_verification_date        : STRING;
    ref_verification_certificate  : STRING;
    device_state                  : device_type;
    notes                         : STRING;
    the_parameters                : SET[1:?] OF Parameter;
INVERSE
    the_platforms                 : SET[1:?] OF Platform FOR the_devices;
    generated_devices_in_use      : SET[0:?] OF Device_In_Use FOR instance_of_device;
WHERE
    WR1 : ( (device_state = standard) AND (SIZEOF(the_parameters) =
            (SIZEOF (QUERY (elt <* the_parameters |  TYPEOF(elt) =
'StandardParameter')))) )
          OR
          ( (device_state = non_standard) AND (SIZEOF(the_parameters) =
            (SIZEOF (QUERY (elt <* the_parameters |  TYPEOF(elt) =
'User_DefinedParameter')))) );
END_ENTITY;
```

B.30 Device_In_Use

Entity Device_In_Use

Syntax

```
ENTITY Device_In_Use;
    instance_of_device        : Device;
    associated_devices_in_use : SET[0:?] OF Device_In_Use;
INVERSE
    associated_values         : SET[1:?] OF Values for a_device_in_use;
    produced_NDEContainer     : SET[0:?] OF NDE_Container FOR produced_by;
UNIQUE
    UR1 : instance_of_device;
END_ENTITY;
```

B.31 Digitizer

Entity Digitizer

Syntax

```
ENTITY Digitizer
 SUBTYPE OF (UltraSonic_Device, Eddy_Current_Device);
    sampling_frequency            : REAL;
    trigger_mode                  : STRING;
```

```
    trigger_delay                : LIST[0:?] OF REAL;
    dynamic_range_in_bits        : INTEGER;
    lower_input_voltage          : REAL;
    upper_input_voltage          : REAL;
       lower_digital_output        : REAL;
       upper_digital_output        : REAL;
       nb_samples_per_trigger_event  : INTEGER;
END_ENTITY;
```

B.32 EC_Element

Entity EC_Element

Syntax

```
ENTITY EC_Element
  SUBTYPE OF (Eddy_Current_Device);
   element_function          : STRING;
   type_of_element           : STRING;
   element_reference_system  : STRING;
   position                  : LIST[0:?] OF REAL;
END_ENTITY;
```

B.33 EC_Generator_Function

Entity EC_Generator_Function

Syntax

```
ENTITY EC_Generator_Function
  SUBTYPE OF (Eddy_Current_Device);
    frequencies_number        : INTEGER;
    multiplexing_type         : STRING;
    current_driven_generator  : flag_type;
    output_amplitude          : REAL;
    frequency                 : LIST[0:?] OF REAL;
END_ENTITY;
```

B.34 EC_Probe

Entity EC_Probe

Syntax

```
ENTITY EC_Probe
  SUBTYPE OF (Eddy_Current_Device);
    Family              : STRING;
    EC_probe_function   : STRING;
    measurement_mode    : STRING;
    specific_features   : STRING;
    saturation_current  : REAL;
    reference_system    : STRING;
    orientation         : LIST OF REAL;
    nb_of_elements      : INTEGER;
END_ENTITY;
```

B.35 EC_Signal_Processing_Channel

Entity EC_Signal_Processing_Channel

Syntax

```
ENTITY EC_Signal_Processing_Channel
   SUBTYPE OF (Eddy_Current_Device);
    channel_frequency         : REAL;
    absolute_channel          : flag_type;
    type_of_balance           : STRING;
    value_of_balancing        : Complex;
    gain_adjustement_value    : REAL;
    phase_adjustement_value   : REAL;
    active_filter             : flag_type;
    filter_description        : STRING;
    output_range              : Complex;
END_ENTITY;
```

B.36 Eddy_Current_Device

Entity Eddy_Current_Device

Syntax

```
ENTITY Eddy_Current_Device
  ABSTRACT SUPERTYPE OF  ( ONEOF (EC_Probe,
                                  EC_Generator_Function,
                                  Pulser,
                                  EC_Element,
                                  Filter,
                                  Digitizer,
                                  EC_Signal_Processing_Channel,
                                  Cable,
                                  Receiver) )
  SUBTYPE OF (Device);
END_ENTITY;
```

B.37 Examination

Entity Examination

Syntax

```
ENTITY Examination;
   id_name                   : STRING;
   date_of_completion        : STRING;
   examining_companies_names : STRING;
   operators_names           : STRING;
   environmental_conditions  : STRING;
   notes                     : STRING;
   an_examination_plan       : Examination_Plan;
   an_examination_volume     : Examination_Volume;
   a_description             : Description;
   a_data_organization       : Data_Organization;
UNIQUE
   UR1 : an_examination_plan;
   UR2 : an_examination_volume;
   UR3 : a_description;
   UR4 : a_data_organization;
END_ENTITY;
```

B.38 Examination_Plan

Entity Examination_Plan

Syntax

```
ENTITY Examination_Plan;
    test_plan_id_name       : STRING;
    revision_number         : STRING;
    prime_contractor        : STRING;
    notes                   : STRING;
    a_component_under_test  : Component_Under_Test;
UNIQUE
   UR1: a_component_under_test;
END_ENTITY;
```

B.39 Examination_Volume

Entity Examination_Volume

Syntax

```
ENTITY Examination_Volume;
    Name                    : STRING;
    reference_systeme       : STRING;
    position                : STRING;
    a_description           : STRING;
    surface_description     : STRING;
    Cad_file_name           : STRING;
    Cad_file_format         : STRING;
    Notes                   : STRING;
    a_component_under_test  : Component_Under_Test;
UNIQUE
   UR1 : a_component_under_test;
END_ENTITY;
```

B.40 Filter

Entity Filter

Syntax

```
ENTITY Filter
  SUBTYPE OF (UltraSonic_Device, Eddy_Current_Device);
    numerical_filter    : flag_type;
    class               : STRING;
    filter_type         : STRING;
    cut_off_frequency   : REAL;
    lower_frequency     : REAL;
    upper_frequency     : REAL;
    slope               : INTEGER;
    max_input_voltage   : REAL;
END_ENTITY;
```

B.41 Gate

Entity Gate

Syntax

```
ENTITY Gate
  SUBTYPE OF (UltraSonic_Device);
   starting_delay   : REAL;
   duration         : REAL;
   gate_level       : REAL;
   trigger_mode     : STRING;
END_ENTITY;
```

B.42 Image

Entity Image

Syntax

```
ENTITY Image;
   the_scalars : SET[1:?] OF Scalar;
END_ENTITY;
```

B.43 Image_Digitizer

Entity Image_Digitizer

Syntax

```
ENTITY Image_Digitizer
  SUBTYPE OF (Radiographic_Device, Visual_Inspection_Device);
   image_digitizer_type            : STRING;
   horizontal_resolution           : REAL;
   vertical_resolution             : REAL;
   dynamic_range_in_bits           : INTEGER;
   transfer_function               : LIST[0:?] OF REAL;
   input_transfer_function         : STRING;
   output_transfer_function        : STRING;
   horizontal_pixel_number         : INTEGER;
   vertical_pixel_number           : INTEGER;
   max_number_of_horizontal_lines  : INTEGER;
   max_number_of_vertical_lines    : INTEGER;
   pre_image_conditioning_applied  : STRING;
   image_gain_characteristics      : STRING;
   image_offset_characteristics    : STRING;
END_ENTITY;
```

B.44 Image_Quality_Indicator

Entity Image_Quality_Indicator

Syntax

```
ENTITY Image_Quality_Indicator
  SUBTYPE OF (Radiographic_Device);
   conformance_schedule   : STRING;
   IQI_value              : REAL;
END_ENTITY;
```

B.45 Item_0D

Entity Item_0D

Syntax

```
ENTITY Item_0D
  ABSTRACT SUPERTYPE OF (ONEOF (Scalar_Item, Complex_Item) );
END_ENTITY;
```

B.46 Leak_Testing_Device

Entity Leak_Testing_Device

Syntax

```
ENTITY Leak_Testing_Device
  SUBTYPE OF (Device);
END_ENTITY;
```

B.47 Magnetic_Particle_Medium

Entity Magnetic_Particle_Medium

Syntax

```
ENTITY Magnetic_Particle_Medium
  SUBTYPE OF (Magnetic_Particle_Testing_Device);
   medium_type    : STRING;
   concentration  : REAL;
END_ENTITY;
```

B.48 Magnetic_Particle_Testing_Device

Entity Magnetic_Particle_Testing_Device

Syntax

```
ENTITY Magnetic_Particle_Testing_Device
    ABSTRACT SUPERTYPE OF ( ONEOF (Magnetising_Equipment,
                                   Magnetic_Particle_Medium,
                                   Observation_Device,
                                   Demagnetising_Equipment))
    SUBTYPE OF (Device);
END_ENTITY;
```

B.49 Magnetising_Equipment

Entity Magnetising_Equipment

Syntax

```
ENTITY Magnetising_Equipment
  SUBTYPE OF (Magnetic_Particle_Testing_Device);
   magnetising_equipment_description : STRING;
END_ENTITY;
```

B.50 Material

Entity Material

Syntax

```
ENTITY Material;
    Name                              : STRING;
    Grade                             : STRING;
    material_properties_file_id       : STRING;
    material_properties_file_format   : STRING;
    notes                             : STRING;
END_ENTITY;
```

B.51 NDE_Container

Entity NDE_Container

Syntax

```
ENTITY NDE_Container
  ABSTRACT SUPERTYPE OF ( ONEOF(Container_0D,
                                Container_1D,
                                Container_2D,
                                Container_3D) )
  SUBTYPE OF (Container);
   produced_by : Device_In_Use;
UNIQUE
   UR1 : produced_by;
END_ENTITY;
```

B.52 Observation_Device

Entity Observation_Device

Syntax

```
ENTITY Observation_Device
  SUBTYPE OF (Penetrant_Testing_Device, Magnetic_Particle_Testing_Device);
   observation_device_type : STRING;
END_ENTITY;
```

B.53 Parameter

Entity Parameter

Syntax

```
ENTITY Parameter
  SUPERTYPE OF (ONEOF (User_DefinedParameter, StandardParameter) );
   name        : STRING;
   param_state : parameter_type;
   the_values  : SET[1:?] OF Values;
END_ENTITY;
```

B.54 Penetrant

Entity Penetrant

Syntax

```
ENTITY Penetrant
  SUBTYPE OF (Penetrant_Testing_Device);
   type_of_penetrant   : STRING;
   type_of_application : STRING;
   time_of_application : REAL;
   temperature         : REAL;
END_ENTITY;
```

B.55 Penetrant_Remover

Entity Penetrant_Remover

Syntax

```
ENTITY Penetrant_Remover
  SUBTYPE OF (Penetrant_Testing_Device);
   type_of_penetrant_remover  : STRING;
   type_of_application        : STRING;
   time_of_application        : REAL;
   temperature                : REAL;
END_ENTITY;
```

B.56 Penetrant_Testing_Device

Entity Penetrant_Testing_Device

Syntax

```
ENTITY Penetrant_Testing_Device
  ABSTRACT SUPERTYPE OF (ONEOF(Penetrant,
                               Developer,
                               Penetrant_Remover,
                               Observation_Device))
  SUBTYPE OF (Device);
END_ENTITY;
```

B.57 Platform

Entity Platform

Syntax

```
ENTITY Platform;
    name              : STRING;
    reference_systeme : STRING;
    position          : STRING;
    notes             : STRING;
    the_devices       : SET[1:?] OF Device;
END_ENTITY;
```

B.58 Position_Item

Entity Position_Item

Syntax

```
ENTITY Position_Item;
   the_scalars : SET[1:?] OF Scalar;
END_ENTITY;
```

B.59 Positionning_Container

Entity Positionning_Container

Syntax

```
ENTITY Positionning_Container
 SUBTYPE OF (SetPosContainer);
    arithmetic_format   : STRING;
    type_of_coordinates : STRING;
    the_position_item   : SET[1:?] OF Position_Item;
END_ENTITY;
```

B.60 Procedures

Entity Procedures

Syntax

```
ENTITY Procedures;
    Name                    : STRING;
    id_number               : STRING;
    revision_number         : STRING;
    sequences_number        : INTEGER;
    ref_of_calibration_block : OPTIONAL STRING;
    notes                   : STRING;
    the_techniques          : SET[1:?] OF Technique;
    the_sequences           : SET[1:?] OF Sequence;
    the_platforms           : SET[1:?] OF Platform;
END_ENTITY;
```

B.61 Pulser

Entity Pulser

Syntax

```
ENTITY Pulser
  SUBTYPE OF (Ultrasonic_Device, Eddy_Current_Device);
   pulse_type               : STRING;
   repetition_rate           : REAL;
   pulse_amplitude          : LIST [0:?] OF REAL;
   pulse_width              : REAL;
   pulse_rise_time          : REAL;
   negative_pulse           : flag_type;
   pulse_damping_factor     : REAL;
   burst_frequency          : OPTIONAL REAL;
   burst_width              : OPTIONAL REAL;
   trigger_mode             : STRING;
   trigger_delay            : LIST [0:?] OF REAL;
END_ENTITY;
```

B.62 Radiation_Converter

Entity Radiation_Converter

Syntax

```
ENTITY Radiation_Converter
  SUBTYPE OF (Radiographic_Device);
   Class                                : STRING;
   multiple_film                        : STRING;
   front_screen_description             : STRING;
   back_screen_description              : STRING;
   input_image_window_spatial_resolution  : REAL;
   output_image_window_spatial_resolution : REAL;
   radiographic_density_range           : STRING;
   calibration_standard                 : STRING;
END_ENTITY;
```

B.63 Radiation_Detector

Entity Radiation_Detector

Syntax

```
ENTITY Radiation_Detector
  SUBTYPE OF (Radiographic_Device);
   detector_type                      : STRING;
   dynamic_range_contrast_sensitivity  : STRING;
   input_horizontal_resolution        : REAL;
   input_vertical_resolution          : REAL;
   maximum_light_level                : REAL;
   dark_signal_noise                  : REAL;
   gamma_exponent                     : REAL;
   temperature_drift                  : REAL;
   automatic_processing               : flag_type;
   developer_type                     : STRING;
   developer_temperature              : REAL;
   developer_time                     : REAL;
END_ENTITY;
```

B.64 Radiation_Source

Entity Radiation_Source

Syntax

```
ENTITY Radiation_Source
  SUBTYPE OF (Radiographic_Device);
   source_type                              : STRING;
   last_activity_measurement_date           : STRING;
   peak_radiation_used                      : REAL;
   radiation_dose_rate                      : REAL;
   source_size                              : REAL;
   standard_for_source_size_determination : STRING;
   source_object_distance                   : REAL;
   filter_material                          : STRING;
   filter_thickness                         : REAL;
   collimator                               : STRING;
   tube_current                             : REAL;
   tube_voltage                             : REAL;
   exposure_time                            : REAL;
END_ENTITY;
```

B.65 Radiographic_Device

Entity Radiographic_Device

Syntax

```
ENTITY Radiographic_Device
  ABSTRACT SUPERTYPE OF (ONEOF (Radiation_Source,
                                Radiation_Converter,
                                Radiation_Detector,
                                Image_Digitizer,
                                Image_Quality_Indicator))
  SUBTYPE OF (Device);
END_ENTITY;
```

B.66 Receiver

Entity Receiver

Syntax

```
ENTITY Receiver
  SUBTYPE OF (UltraSonic_Device, Eddy_Current_Device);
   lower_frequency    : REAL;
   upper_frequency    : REAL;
   amplifier_type     : STRING;
   gain               : LIST[0:?] OF REAL;
   offset             : REAL;
   pre_amplifier_gain : REAL;
   rectifier_mode     : STRING;
   sensitivity        : REAL;
   signal_noise_ratio : REAL;
   DAC_compensation   : flag_type;
   DAC_curve          : LIST[0:?] OF REAL;
   DAC_trigger_mode   : STRING;
   DAC_trigger_delay  : REAL;
END_ENTITY;
```

B.67 Sampled_Container

Entity Sampled_Container

Syntax

```
ENTITY Sampled_Container
  SUBTYPE OF (Container_1D);
    number_of_sample_per_item  : INTEGER;
    arithmetic_format          : STRING;
    the_sampled_items          : SET[1:?] OF Sampled_Item;
END_ENTITY;
```

B.68 Sampled_Item

Entity Sampled_Item

Syntax

```
ENTITY Sampled_Item;
   the_scalars : SET[1:?] OF Scalar;
END_ENTITY;
```

B.69 Scalar

Entity Scalar

Syntax

```
ENTITY Scalar;
   a_value : scalar_type;
END_ENTITY;
```

B.70 Scalar_Item

Entity Scalar_Item

Syntax

```
ENTITY Scalar_Item
  SUBTYPE OF (Item_0D);
   the_scalars : SET[1:?] OF Scalar;
END_ENTITY;
```

B.71 Sequence

Entity Sequence

Syntax

```
ENTITY Sequence;
   a_number       : STRING;
   a_description  : STRING;
   notes          : STRING;
   the_devices    : SET[1:?] OF Device_In_Use;
END_ENTITY;
```

B.72 SetPosContainer

Entity SetPosContainer

Syntax

```
ENTITY SetPosContainer
   ABSTRACT SUPERTYPE OF ( ONEOF (Positionning_Container,
                                  Synchronisation_Container,
                                  Setting_Container)
)
  SUBTYPE OF (Container);
   a_value : Values;
UNIQUE
   UR1 : a_value;
END_ENTITY;
```

B.73 Setting_Container

Entity Setting_Container

Syntax

```
ENTITY Setting_Container
 SUBTYPE OF (SetPosContainer);
    Flag               : setting_container_type;
    arithmetic_format  : STRING;
    the_string         : SET[1:?] OF Strings;
    the_scalars        : SET[1:?] OF Scalar;
END_ENTITY;
```

B.74 StandardParameter

Entity StandardParameter

Syntax

```
ENTITY StandardParameter
    SUBTYPE OF (Parameter);
END_ENTITY;
```

B.75 String

Entity String

Syntax

```
ENTITY String;
    length   : INTEGER;
    contents : STRING;
END_ENTITY;
```

B.76 Synchronisation_Container

Entity Synchronisation_Container

Syntax

```
ENTITY Synchronisation_Container
  SUBTYPE OF (SetPosContainer);
   arithmetic_format : STRING;
   the_scalars       : SET[1:?] OF Scalar;
END_ENTITY;
```

B.77 Technique

Entity Technique

Syntax

```
ENTITY Technique;
   Name           : STRING;
   Method         : STRING;
   a_description  : STRING;
   notes          : STRING;
END_ENTITY;
```

B.78 Ultrasonic_Device

Entity Ultrasonic_Device

Syntax

```
ENTITY Ultrasonic_Device
  ABSTRACT SUPERTYPE OF (ONEOF (UT_Probe,
                                Pulser,
                                Digitizer,
                                Filter,
                                Receiver,
                                Gate,
                                Couplant,
                                Cable))
  SUBTYPE OF (Device);
END_ENTITY;
```

B.79 Unsampled_Container

Entity Unsampled_Container

Syntax

```
ENTITY Unsampled_Container
  SUBTYPE OF (Container_1D);
   maximum_number_of_couples    : INTEGER;
   name_of_variable_1           : STRING;
   arithmetic_format_variable_1 : STRING;
   name_of_variable_2           : STRING;
   arithmetic_format_variable_2 : STRING;
```

B.72 SetPosContainer

Entity SetPosContainer

Syntax

```
ENTITY SetPosContainer
   ABSTRACT SUPERTYPE OF ( ONEOF (Positionning_Container,
                                  Synchronisation_Container,
                                  Setting_Container)
)
  SUBTYPE OF (Container);
   a_value : Values;
UNIQUE
   UR1 : a_value;
END_ENTITY;
```

B.73 Setting_Container

Entity Setting_Container

Syntax

```
ENTITY Setting_Container
 SUBTYPE OF (SetPosContainer);
    Flag               : setting_container_type;
    arithmetic_format  : STRING;
    the_string         : SET[1:?] OF Strings;
    the_scalars        : SET[1:?] OF Scalar;
END_ENTITY;
```

B.74 StandardParameter

Entity StandardParameter

Syntax

```
ENTITY StandardParameter
    SUBTYPE OF (Parameter);
END_ENTITY;
```

B.75 String

Entity String

Syntax

```
ENTITY String;
    length   : INTEGER;
    contents : STRING;
END_ENTITY;
```

B.83 Values

Entity Values

Syntax

```
ENTITY Values;
    a_value         : value_type;
    a_device_in_use : Device_In_Use;
INVERSE
    the_setposcontainer : SET[0:?] OF SetPosContainer FOR a_value;
UNIQUE
    a_device_in_use ;
END_ENTITY;
```

B.84 Visual_Converter

Entity Visual_Converter

Syntax

```
ENTITY Visual_Converter
   SUBTYPE OF (Visual_Inspection_Device);
    class_type                          : STRING;
    transfer_functions                  : STRING;
    visual_attenuation                  : REAL;
    output_window_horizontal_size       : REAL;
    output_window_vertical_size         : REAL;
    resolution_of_converters_at_centre  : REAL;
    resolution_of_converters_at_edges   : REAL;
    focal_length                        : REAL;
    focal_speed_of_lens                 : REAL;
    lens_aperture_settings              : flag_type;
    input_filter_type                   : STRING;
    output_filter_type                  : STRING;
    antireflection_coatings             : flag_type;
    spherical_aberration_correction     : flag_type;
    internal_antireflection_filter      : flag_type;
    anti_lens_flare_features            : flag_type;
    refractive_index_of_material        : REAL;
    type_of_optical_material            : STRING;
END_ENTITY;
```

B.85 Visual_Detector

Entity Visual_Detector

Syntax

```
ENTITY Visual_Detector
   SUBTYPE OF (Visual_Inspection_Device);
    class_type                          : STRING;
    sensor_phosphor_screen_type         : STRING;
    spectral_peak_wavelength            : REAL;
    spectral_minimum_bandwidth          : REAL;
    spectral_maximum_bandwidth          : REAL;
    filter_type                         : STRING;
    filter_wavelength                   : REAL;
```

```
    actual_image_horizontal_size          : REAL;
    actual_image_vertical_size            : REAL;
   image_horizontal_resolution            : REAL;
   image_vertical_resolution              : REAL;
   number_of_horizontal_pixels            : INTEGER;
   number_of_vertical_pixels              : INTEGER;
   horizontal_pixel_size                  : INTEGER;
   vertical_pixel_size                    : INTEGER;
   horizontal_interpixel_gap              : REAL;
   vertical_interpixel_gap                : REAL;
   maximum_signal_bandwidth               : REAL;
   DC_signal_gain                         : REAL;
   ALC_control                            : flag_type;
   gain_setting                           : REAL;
   aperture_correction                    :    flag_type;
   image_sharpening_filtration            :    flag_type;
   input_output_transfer_characteristics  : STRING;
   maximum_dark_signal                    : REAL;
END_ENTITY;
```

B.86 Visual_Inspection_Device

Entity Visual_Inspection_Device

Syntax

```
ENTITY Visual_Inspection_Device
   ABSTRACT SUPERTYPE OF (ONEOF(Visual_Source,
                                Visual_IQI_Standard,
                                Image_Digitizer,
                                Visual_Detector,
                                Visual_Converter))
   SUBTYPE OF (Device);
END_ENTITY;
```

B.87 Visual_IQI_Standard

Entity Visual_IQI_Standard

Syntax

```
ENTITY Visual_IQI_Standard
 SUBTYPE OF (Visual_Inspection_Device);
   conformance_schedule               : STRING;
   IQI_type                           : STRING;
   horizontal_size                    : REAL;
   vertical_size                      : REAL;
   distance_from_illumination_source  : REAL;
   calibration_standard               : STRING;
END_ENTITY;
```

B.88 Visual_Source

Entity Visual_Source

Syntax

```
ENTITY Visual_Source
  SUBTYPE OF (Visual_Inspection_Device);
   spectral_wavelength_type                  : STRING;
   peak_light_output                         : REAL;
   angle_of_emergence                        : REAL;
   beam_spread_angle                         : REAL;
   colour_temperature_of_illumination_unit   : REAL;
   wattage_of_source                         : REAL;
   lamp_life                                 : REAL;
   last_activity_measurement_date            : STRING;
   measured_light_output_at_given_distance   : REAL;
END_ENTITY;
```

B.89 Volume

Entity Volume

Syntax

```
ENTITY Volume;
   the_scalars : SET[1:?] OF Scalar;
END_ENTITY
```

Bibliography

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