Philips Medical Systems
DICOM Conformance Statement

THORAVISION 3.3

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1 Introduction

This chapter provides general information about the purpose, scope and contents of this Conformance Statement.

1.1 Scope and field of application

The scope of this DICOM Conformance Statement is to facilitate data exchange with equipment of Philips Medical Systems. This document specifies the compliance to the DICOM standard (formally called the NEMA PS 3.X-1993 standards). It contains a short description of the applications involved and provides technical information about the data exchange capabilities of the equipment. The main elements describing these capabilities are: the supported DICOM Service Object Pair (SOP) Classes, Roles, Information Object Definitions (IOD) and Transfer Syntaxes.

The field of application is the integration of the Philips Medical Systems equipment into an environment of medical devices.
This Conformance Statement should be read in conjunction with the DICOM standard and its addenda. The conformance to the DICOM standard is a key element of the Inturis Program (see [INTURIS]).

1.2 Intended audience

This Conformance Statement is intended for:
- potential clients,
- system integrators of medical equipment,
- marketing staff interested in system functionality,
- software designers implementing DICOM interfaces.

It is assumed that the reader is familiar with the DICOM standard.

1.3 Contents and structure

The DICOM Conformance Statement is contained in chapter 2 through 7 and follows the contents and structuring requirements of DICOM PS 3.2-1993 and Supplement 2 (in case of Media specifications).
Additionally, the chapters following 7 specify the details of the applied IODs.

1.4 Used definitions, terms and abbreviations

DICOM definitions, terms and abbreviations are used throughout this Conformance Statement. For a description of these, see NEMA PS 3.3-1993 and PS 3.4-1994.
The word Philips in this document refers to Philips Medical Systems.

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1.5 References

[DICOM] The Digital Imaging and Communications in Medicine (DICOM) standard:
NEMA PS 3.X (X refers to the part 1 - 13) and Supplements
National Electrical Manufacturers Association (NEMA) Publication Sales
1300 N. 17th Street, Suite 1847
Rosslyn, Va. 22209, United States of America

[INTURIS] Philips Inturis Program
Integrated Clinical Solutions
Philips Medical Systems Nederland B.V. (see address at page ii)

1.6 Important note to the reader

This Conformance Statement by itself does not guarantee successful interoperability of Philips equipment with non-Philips equipment. The user (or user's agent) should be aware of the following issues:

- **Interoperability**
  Interoperability refers to the ability of application functions, distributed over two or more systems, to work successfully together. The integration of medical devices into a networked environment may require application functions that are not specified within the scope of DICOM. Consequently, using only the information provided by this Conformance Statement does not guarantee interoperability of Philips equipment with non-Philips equipment. It is the user's responsibility to analyse thoroughly the application requirements and to specify a solution that integrates Philips equipment with non-Philips equipment.

- **Validation**
  Philips equipment has been carefully tested to assure that the actual implementation of the DICOM interface corresponds with this Conformance Statement.
  Where Philips equipment is linked to non-Philips equipment, the first step is to compare the relevant Conformance Statements. If the Conformance Statements indicate that successful information exchange should be possible, additional validation tests will be necessary to ensure the functionality, performance, accuracy and stability of image and image related data. It is the responsibility of the user (or user's agent) to specify the appropriate test suite and to carry out the additional validation tests.

- **New versions of the DICOM Standard**
  The DICOM Standard will evolve in future to meet the user's growing requirements and to incorporate new features and technologies. Philips is actively involved in this evolution and plans to adapt its equipment to future versions of the DICOM Standard. In order to do so, Philips reserves the right to make changes to its products or to discontinue its delivery.
  The user should ensure that any non-Philips provider linking to Philips equipment, also adapts to future versions of the DICOM Standard. If not, the incorporation of DICOM enhancements into Philips equipment may lead to loss of connectivity (in case of networking) and incompatibility (in case of media).

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2 Implementation model

THORAVISION 3.3 of Philips Medical Systems is an image generating system. It contains an Export function based on the DICOM Image Storage to transfer image data from the THORAVISION system to a remote system. This DICOM Export function is described in this document.

2.1 Application Data Flow Diagram

The THORAVISION DICOM Export transfers a THORAVISION image to a remote DICOM node. This is activated by an operator request or automatically if the system is configured to do so. A remote destination is selected from the user interface, followed by the selection of the image to be transferred.
Post-processed image data can be transferred (pixel value between 0 and 30,000) as an instance of the DICOM Computed Radiography IOD. The images transferred are intended for viewing purpose and VOI LUT transformation (grayscale transformation) only.
The THORAVISION DICOM Export behaves as a single Application Entity. The related Implementation Model is shown in Figure 2-1 on page 3.

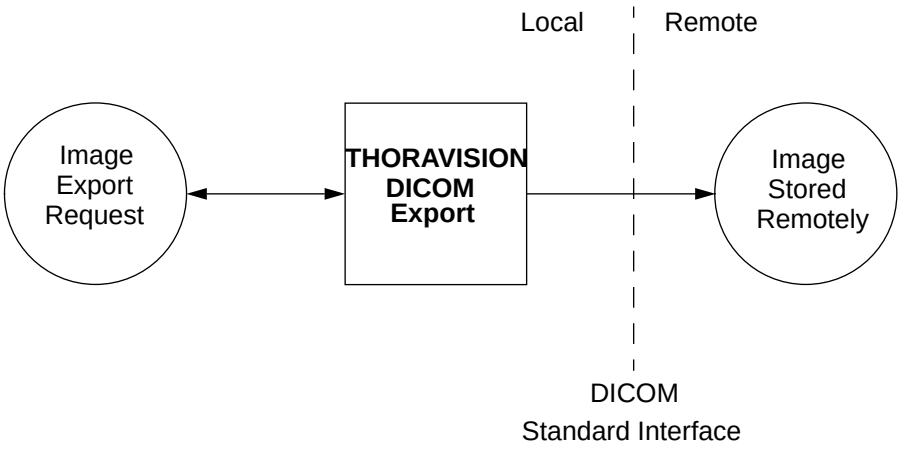

Figure 2-1: THORAVISION DICOM Export Implementation Model

2.2 Functional definition of Application Entities

The THORAVISION DICOM Export application entity acts as a Service Class User (SCU) of the Storage Service Class. After invoking it will open an association to the remote system. For each image to be transported a retrieve action from the internal THORAVISION storage will take place followed by the conversion to a DICOM message to be transferred to the remote system.

2.3 Sequencing of Real World Activities

Not applicable.

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3 AE Specifications

THORAVISION DICOM Export acts as a single Application Entity.

3.1 AE THORAVISION DICOM Export Specification

The THORAVISION Export Application Entity provides Standard Extended Conformance to the following DICOM 3.0 SOP class as an SCU:

Table 3-1: Supported SOP class by the THORAVISION Export AE as SCU

SOP class Name	*UID*
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1

3.1.1 Association Establishment Policies

3.1.1.1 General

THORAVISION Export will offer a configurable maximum PDU size in steps of 1K, 2K, 4K, 8K and 16K (default is 16K = 16384 bytes) on associations initiated by the application itself.

3.1.1.2 Number of Associations

THORAVISION Export will attempt to establish one association at a time.

3.1.1.3 Asynchronous Nature

THORAVISION Export does not support asynchronous operations and will not perform asynchronous window negotiation.

3.1.1.4 Implementation Identifying Information

The Implementation Class UID is: “1.3.46.670589.8.3.3“.
The implementation version name is: “THORAVISION 3.3”.

3.1.2 Association Initiation Policy

THORAVISION Export initiates associations as a result of the following events:

- the THORAVISION operator requests the export of one THORAVISION image to a remote system,
- the generation of a new image will result in an automatic export of that image when the system is configured in automatic store mode.

3.1.2.1 Export from THORAVISION system

3.1.2.1.1 Associated Real-World Activity

The THORAVISION Export function will be accessible through the THORAVISION User Interface.
After the transfer of an image the association is released. The transferred image will not be deleted from the system. The transfer will be repeated automatically when the transfer was unsuccessful with special response status conditions (e.g. Store SCP down).

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3.1.2.1.2 Proposed Presentation Contexts

THORAVISION Export will propose the following presentation contexts:

Table 3-2: Proposed Presentation Contexts for THORAVISION Export

Presentation Context table					
Abstract Syntax		*Transfer Syntax*		*Role*	*Extended Negotiation*
Name	*UID*	*Name List*	*UID List*		
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None

3.1.2.1.2.1 SOP Specific Conformance to Storage SOP Classes

The status of the C-STORE Response (Success, Refused, Error, Warning) will be displayed via the user interface.
Extended negotiation is not supported.
Table 3-3 lists the applied optional and extended modules and attributes of the Extended CR IOD. Conditional attributes Patient Orientation (type 2C), Image Date (type 2C), Image Time (type 2C) are always present.

Table 3-3: Applied optional/extended Modules and Attributes of the Extended CR IOD

IE	*Module*	*Optional/Extended Attributes*
Patient	Patient	Other Patient’s ID
Study	General Study	Referring Physician’s Name, Study Description
Series	General Series	-
	CR Series	Filter Type, Collimator/grid Name, Focal Spot(s), Plate Type
Equipment	General Equipment	Institution Name, Station Name, Institutional Department Name, Manufacturer’s Model name, Device Serial Number, Software Version(s), Date of Last Calibration, Time of Last Calibration
Image	General Image	Image Type, Image Comments
	Image Pixel	-
	CR Image (extended module)	KVP, Distance Source to Detector, Exposure Time, Exposure, Generator Power, Sensitivity For Extensions see “Extensions/Specializations/Privatizations” on page 7

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Table 3-3: Applied optional/extended Modules and Attributes of the Extended CR IOD (Continued)

IE	*Module*	*Optional/Extended Attributes*
	X-Ray Collimator	Collimator Shape, Collimator Left Vertical Edge, Collimator Right Vertical Edge, Collimator Upper Horizontal Edge, Collimator Lower Horizontal Edge
	VOI LUT (applied optional module)	Window Center
	Stamp (applied private module)	See “Extensions/Specializations/Privatizations” on page 7
	SOP Common	Specific Character Set

3.1.3 Association Acceptance Policy

THORAVISION 3.3 does not accept associations.

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4 Communication Profiles

4.1 TCP/IP Stack

THORAVISION Release 3.3 provides DICOM 3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM 3.0 Standard.

4.1.1 Physical Media Support

The THORAVISION system supports ISO 8802-3 10BASE5 Ethernet.

5 Extensions/Specializations/Privatizations

The applied Standard Extended CR Image Storage SOP Class is extended with additional Standard Type 3 attributes and with one private attribute, as specified in the table below.

Table 5-1: Applied extended Modules and applied extended Attributes

IE	*Module*	*Extended Attributes*
Image	CR Image (extended module)	Preprocessing Function (from standard NM Image Module), Post Processing Function (from standard NM Image Module), Pixel Spacing (from standard Image Plane Module), Image Area Dose Product (from X-Ray Acquisition Module)
	Stamp (private module)	Private Creator (private attribute), Stamp Image Sequence containing (Samples per Pixel, Photometric Interpretation, Rows, Columns, Bits Allocated, Bits Stored, High Bit, Pixel Representation, Pixel Data) All these attributes are from standard Image Pixel Module.

See the specification in Extended Computed Radiography IOD.

6 Configuration

The configuration of a THORAVISION system is done by means of updating configuration files. This should be done by Philips service engineers only.

6.1 AE Title/Presentation Address mapping

6.1.1 Local AE Titles and Presentation Addresses

The local Application Entity Title and Presentation Address are defined by updating Configuration files.

6.1.2 Remote AE Titles and Presentation Addresses

All remote applications to be selected as export destination (SCP) are configurable for the following items:

- The Application Entity Title of the remote application.
- The Presentation Address at which the remote application should accept association

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requests.
- The Remote Host Name of the system on which the remote application resides.

6.2 Configurable parameters

The maximum PDU size is configurable.
The supported Extended Character Set is configurable. Default Character Set is ISO-IR 100 which is the Latin alphabet No. 1, supplementary set.

7 Support of Extended Character Sets

THORAVISION Export supports Character Sets ISO-IR 100 (which is default), ISO-IR 101, ISO-IR 109, ISO-IR 110, ISO-IR 144, ISO-IR 127, ISO-IR 126, ISO-IR 138, ISO-IR 148.

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8 Extended Computed Radiography IOD

The modules selected from the IOD module table of DICOM 3.0 and the extended modules are given in the table below.

Table 8-1: Applied Modules in the Extended CR IOD

IE	*Module*
Patient	Patient
Study	General Study
Series	General Series
	CR Series
Equipment	General Equipment
Image	General Image
	Image Pixel
	Extended CR Image
	X-Ray Collimator
	VOI LUT
	Stamp
	SOP Common

The details of these applied modules are given in the tables below. The list of possible values are given (if applicable). The situation that an attribute is present conditionally/optionally or that an attribute may contain a zero length value, is indicated too. Conditions and Defined/Enumerated Values of DICOM 3.0 are applicable but are not shown in the tables.

Table 8-2: Patient Module

Attribute Description	*Tag*	*Note*
Patient’s Name	0010,0010	
Patient ID	0010,0020	zero length value if not entered by the operator
Patient's Birth Date	0010,0030	zero length value if not entered by the operator
Patient's Sex	0010,0040	may have a zero length value
Other Patient IDs	0010,0100	zero length value if not entered by the operator

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Table 8-3: General Study Module

Attribute Description	*Tag*	*Note*
Study Instance UID	0020,000D	
Study Date	0008,0020	
Study Time	0008,0030	
Referring Physician's Name	0008,0090	zero length value if not entered by the operator
Study ID	0020,0010	
Accession Number	0008,0050	may have a zero length value
Study Description	0008,1030	zero length value if not entered by the operator

Table 8-4: General Series Module

Attribute Description	*Tag*	*Note*
Modality	0008,0060	CR
Series Instance UID	0020,000E	
Series Number	0020,0011	1
Series Date	0008,0021	
Series Time	0008,0031	

Table 8-5: CR Series Module

Attribute Description	*Tag*	*Note*
Body Part Examined	0018,0015	CHEST
View Position	0018,5101	
Filter Type	0018,1160	
Collimator/grid Name	0018,1180	
Focal Spot	0018,1190	
Plate Type	0018,1260	may have a zero length value

Table 8-6: General Equipment Module

Attribute Name	*Tag*	*Note*
Manufacturer	0008,0070	Philips Medical Systems

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Table 8-6: General Equipment Module (Continued)

Attribute Name	*Tag*	*Note*
Institution Name	0008,0080	zero length value if not entered by the operator
Station Name	0008,1010	
Institutional Department Name	0008,1040	
Manufacturer’s Model Name	0008,1090	
Device Serial Number	0018,1000	
Software Versions	0018,1020	
Date of Last Calibration	0018,1200	may have a zero length value
Time of Last Calibration	0018,1201	may have a zero length value

Table 8-7: General Image Module

Attribute Name	*Tag*	*Note*
Image Number	0020,0013	
Patient Orientation	0020,0020	
Image Date	0008,0023	
Image Time	0008,0033	
Image Type	0008,0008	DERIVED\PRIMARY
Image Comments	0020,4000	zero length value if not entered by the operator

Table 8-8: Image Pixel Module and Extended CR Image Module[a]

Attribute Name	*Tag*	*Note*
Samples per Pixel	0028,0002	1
Photometric Interpretation	0028,0004	MONOCHROME1 or MONCHROME2
Rows	0028,0010	
Columns	0028,0011	
Bits Allocated	0028,0100	16
Bits Stored	0028,0101	15
High Bit	0028,0102	14
Pixel Representation	0028,0103	0000H

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Table 8-8: Image Pixel Module and Extended CR Image Module[a] (Continued)

Attribute Name	*Tag*	*Note*
KVP	0018,0060	
Distance Source to Detector	0018,1110	
Exposure Time	0018,1150	
Exposure	0018,1152	
Generator Power	0018,1170	
Sensitivity	0018,6000	
Preprocessing Function[b]	0018,5020	will contain 8 values separated by commas: • Scale per Decade: no meaning for DERIVED\PRIMARY image types • Chamber Average: no meaning for DERIVED\PRIMARY image types • Minimum pixel value • Median value, 1% less than minimum pixel value • Median value, 2% less than minimum pixel value • Median value, 50% less than minimum pixel value • Median value, 98% less than minimum pixel value • Maximum pixel value
Postprocessing Function[b]	0018,5021	
Pixel Spacing[b]	0028,0030	
Image Area Dose Product[b]	0018,115E	
Pixel Data	7FE0,0010	between 0 and 30,000

a. These two modules are combined because some attributes are present in both modules.
b. Additional attribute in the module; classifies the applied SOP Class as Extended SOP Class.

Table 8-9: X-Ray Collimator Module

Attribute Name	*Tag*	*Note*
Collimator Shape	0018,1700	RECTANGULAR
Collimator Left Vertical Edge	0018,1702	
Collimator Right Vertical Edge	0018,1704	
Collimator Upper Horizontal Edge	0018,1706	
Collimator Lower Horizontal Edge	0018,1708	

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Table 8-10: VOI LUT Module

Attribute Name	*Tag*	*Note*
Window Center	0028,1050	15,000
Window Width	0028,1051	30,000

Table 8-11: (Private) Stamp Module

Attribute Name	*Tag*	*Note*
Private Creator	0089,00xx	VR is LO VM is 1 Value is PMS-THORA-3.1
Stamp Image Sequence	0089,xx20	VR is SQ VM is 1
> Samples per Pixel	0028,0002	1
> Photometric Interpretation	0028,0004	MONOCHROME1 or MONOCHROME2
> Rows	0028,0010	
> Columns	0028,0011	
> Bits Allocated	0028,0100	
> Bits Stored	0028,0101	
> High Bit	0028,0102	
> Pixel Representation	0028,0103	
> Pixel Data	7FE0,0010	

Table 8-12: SOP Common Module

Attribute Name	*Tag*	*Note*
SOP Class UID	0008,0016	1.2.840.10008.5.1.4.1.1.1
SOP Instance UID	0008,0018	
Specific Character Set	0008,0005	ISO_IR 100 unless configured on other character set (see “Support of Extended Character Sets” on page 8)

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