

**Philips Medical Systems
DICOM Conformance Statement**

DSI Release 5.1.1

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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) customers,
- 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.

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
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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).

2 Implementation model

The DSI (Digital Spot Imaging) is a digital fluorography modality. It is part of an X-ray system. The main functions are:

- image acquisition and display
- image review and processing
- image handling, storage and networking
- administration of patient, physician and examination data

The main application areas are:

- R/F examinations
- vascular and non-vascular examinations
- angiography examinations
- tomography examinations
- interventional procedures

DSI Release 5.1 contains a DICOM Export function (to transfer DSI image data to a remote system) and a DICOM RIS interface (to retrieve an up-to-date Worklist from Radiology Information System).

2.1 Application Data Flow Diagram

The DSI contains one Application Entity able to export DICOM images and handle Modality Worklists. The related Implementation Model is shown in Figure 2-1 on page 8.

2.1.1 Description of the DSI DICOM Export Functionality

The DSI DICOM Export function is activated by an operator request. A remote destination is selected from the user interface, followed by the selection of the examination.

With DSI systems an examination corresponds to the DICOM Patient and Study level. Each examination contains one or more runs, corresponding to the DICOM Series level. Each run contains one or more images, corresponding to the DICOM Image level. This relationship is depicted in Figure 2-2 on page 8. DSI can contain up to 14 examinations, maximum 1280 runs per examination and maximum 1280 images per run.

The DSI DICOM Export transfers a complete examination to a remote DICOM node. The transfer of a subset of images in an examination is possible. During the DICOM store operation it is possible to perform a cancel operation on the store.

Image data to be transferred are instances of the DICOM X-Ray Radiofluoroscopic (XRF) or Secondary Capture (SC) classes. The following cases can be distinguished:

- The remote system supports both XRF and SC classes.
Result will be that all fluoroscopy and exposure images are exported as XRF images and all other images (like external video) as SC images.
- The remote system supports the XRF class only.
Result will be that all fluoroscopy and exposure images are exported as XRF images and all

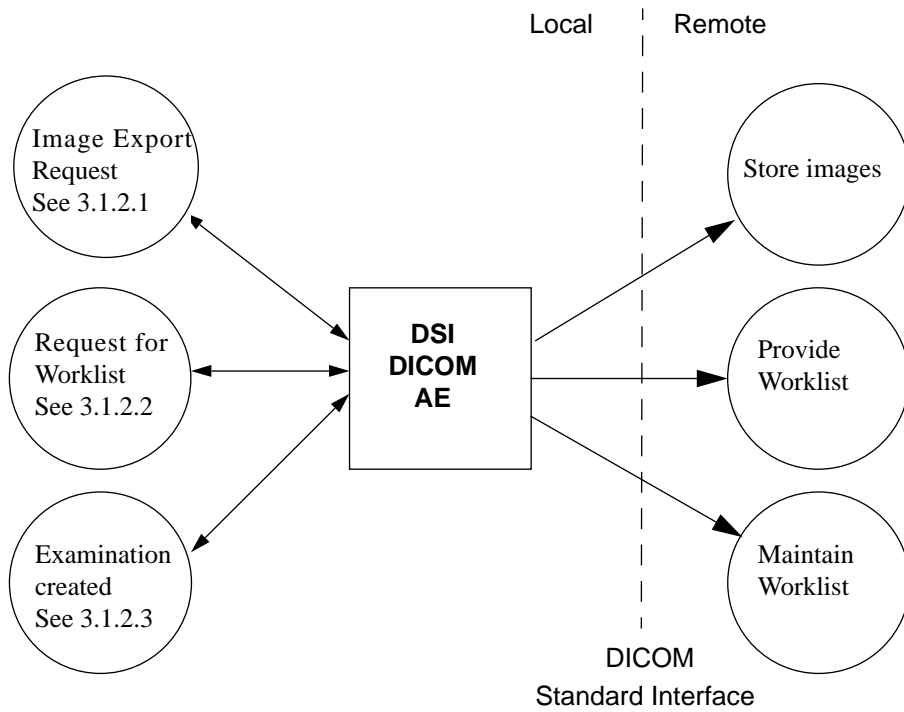


Figure 2-1: DSI DICOM Implementation Model

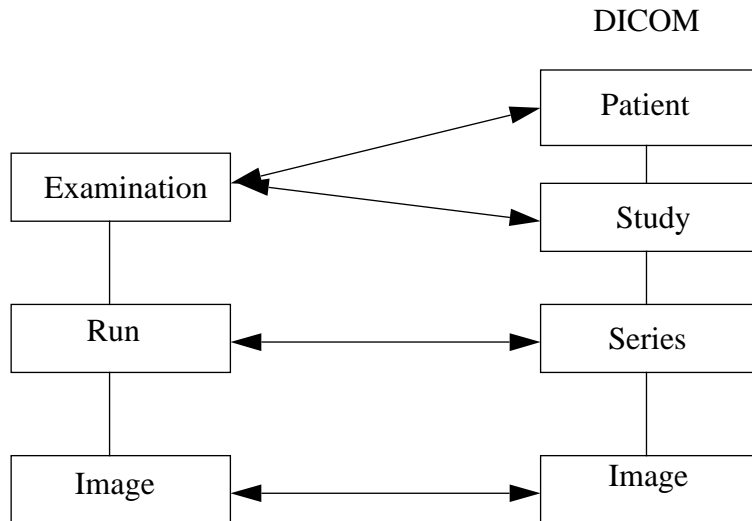


Figure 2-2: Relationship between the DSI and DICOM levels

- other images (like external video) are **not** exported.
- The remote system supports the SC class only.
Result will be that all images are exported as SC images.
 - The remote system supports neither the XRF nor SC class.
Result will be that none of the image types can be exported.

During the DICOM export of an exposure or fluoroscopy image as XRF image the following image processing is performed by DSI: video invert, subtraction, pixel shift.

During the DICOM export of an exposure or fluoroscopy image as SC image the following image processing is performed by DSI: video invert, contrast, brightness, edge enhancement, subtraction, pixel shift.

During the DICOM export of an external video image as SC image the following image processing is performed by DSI: video invert, contrast, brightness, edge enhancement.

In case of a subtracted run the DICOM Export first stores the mask image, followed by the subtracted images from that run. No explicit indication is sent with the subtracted images, as to which image was used as the mask image. The image number in the run can be used as an implicit indication.

Other remarks:

- Images shown zoomed on the DIS are exported as normal (i.e. non zoomed) images. Annotations on zoomed images are not sent. DSI annotations on normal images are exported as Image Comments.
- The images are intended for viewing purpose only.
- The compatibility of image data re-imported (by media exchange) of the exported DICOM image data in an earlier stage is not defined.
- DSI logs certain events related to the DICOM export at three different levels, see the service manual of the DSI system.
- Measurement data is not exported.

2.1.2 Description of the DSI DICOM Modality Worklist Functionality

DSI is able to retrieve the modality Worklist from a RIS. This is done at request of the operator. From the received list a selection of one Worklist item is made; the examination to be performed.

After selecting a Worklist item, the RIS is informed about this creation of the study component.

The DSI can only display a maximum of 42 patients in the worklist.

2.2 Functional definition of Application Entities

The DSI DICOM 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 DSI storage will take place followed by the conversion to a DICOM message to be transferred to the remote system.

The DSI DICOM Application Entity acts also as a Service Class User (SCU) of the Basic Worklist Management Service Class and the Study Component Management Service Class. After invoking it will open an Association to the remote system (usually a RIS) to request for the up-to-date modality Worklist.

After selecting a Worklist item, a new Association to the remote system is opened and that system is informed about the creation of a Study Component.

2.3 Sequencing of Real World Activities

The Request for Worklist should be done first, before a Study Component can be created. Then the generated images may be exported. However, export of DICOM images is also possible without the Worklist and Study Component activities.

3 AE Specifications

DSI contains one Application Entity.

3.1 DSI DICOM AE Specification

The DSI DICOM Application Entity provides Standard Conformance to the following DICOM 3.0 SOP classes as an SCU:

Table 3-1: Supported SOP classes by the DSI DICOM AE as SCU

| <i>SOP class Name</i> | <i>UID</i> |
|--|------------------------------|
| Secondary Capture Image Storage ^a | 1.2.840.10008.5.1.4.1.1.7 |
| X-Ray Radiofluoroscopic Image Storage ^a | 1.2.840.10008.5.1.4.1.1.12.2 |
| Modality Worklist Information Model - FIND | 1.2.840.10008.5.1.4.31 |
| Study Component Management | 1.2.840.10008.3.1.2.3.2 |

- a. See section 2.1 on page 7 for the mapping of the DSI image types to these DICOM XRF and SC SOP Classes.

The DSI DICOM Application Entity does not support DICOM 3.0 SOP classes as an SCP.

3.1.1 Association Establishment Policies

3.1.1.1 General

The maximum PDU size of DSI is fixed on 16K (is 16384 bytes). See also the important remark about the PDU size of the remote systems in section 6.2 on page 20.

3.1.1.2 Number of Associations

DSI will attempt to establish one Association at a time. DSI does not accept Associations.

3.1.1.3 Asynchronous Nature

DSI does not support asynchronous operations and will not perform asynchronous window negotiation.

3.1.1.4 Implementation Identifying Information

The Implementation Class UID is: "1.3.46.670589.6.1.1.5.1.1".

The Implementation Version Name is: "DSI R511, 971231".

3.1.2 Association Initiation Policy

DSI initiates Associations as a result of the following events:

- The DSI operator requests for DICOM export, see section 3.1.2.1 on page 12;
- The DSI operator requests for the DSI Worklist, see section 3.1.2.2 on page 15;
- The DSI operator has selected a Worklist item from the received DSI Worklist (i.e. an examination to perform), see section 3.1.2.3 on page 17.

3.1.2.1 Export from DSI system

3.1.2.1.1 Associated Real-World Activity

The DSI operator is able to request for export of one examination or a list of examinations to a remote system. See section 2.1 on page 7 for the definition of an examination. The complete examination or a subset is transferred to the remote system.

The DSI DICOM Export function will be accessible through the DSI F2 Copy page. With the F4 Config page the remote DICOM system is selected from a list of maximum of five configurable nodes.

The current transfer can be aborted by the DSI F2 Cancel function.

After the transfer the Association is released.

3.1.2.1.2 Proposed Presentation Contexts

DSI will propose the following presentation contexts:

Table 3-2: Proposed Presentation Contexts at Image Export

| <i>Presentation Context table</i> | | | | | |
|-----------------------------------|-----------------------|------------------------------|---------------------|-------------|-----------------------------|
| <i>Abstract Syntax</i> | | <i>Transfer Syntax</i> | | <i>Role</i> | <i>Extended Negotiation</i> |
| <i>Name</i> | <i>UID</i> | <i>Name List</i> | <i>UID List</i> | | |
| See Note ^a | See Note ^a | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| See Note ^a | See Note ^a | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | None |
| See Note ^a | See Note ^a | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | SCU | None |

- a. Any of the Image Storage SOP classes listed in Table 3-1, “Supported SOP classes by the DSI DICOM AE as SCU,” on page 11

3.1.2.1.2.1 SOP Specific Conformance to Storage SOP Classes

DSI provides standard conformance.

Extended negotiation is not supported.

Table 3-3 lists the applied optional modules and attributes in the XRF images. A detailed overview of the applied XRF Image IOD is given section 8 on page 22.

Table 3-3: Applied optional Modules and Attributes of the XRF Image IOD

| <i>IE</i> | <i>Module</i> | <i>Conditional Attributes</i> | <i>Optional Attributes</i> |
|-----------|---|--|--|
| Patient | Patient | | - |
| Study | General Study | | Study Description |
| Series | General Series | Laterality. | Series Date, Series Time, Performing Physician's Name, Protocol Name |
| Equipment | General Equipment | | Institution Name, Station Name, Manufacturer's Model name, Device Serial Number, Software Version(s) |
| Image | General Image | Image Date, Image Time, Patient Orientation | Acquisition Date, Acquisition Time, Acquisition Number, Image Comments |
| | Image Pixel | | - |
| | Display Shutter (applied optional Module) | Shutter Left Vertical Edge, Shutter Right Vertical Edge, Shutter Upper Horizontal Edge, Shutter Lower Horizontal Edge, Center of Circular Shutter, Radius of Circular Shutter. | - |
| | X-Ray Image | | - |
| | X-Ray Acquisition | Exposure | - |
| | VOI LUT (applied optional Module) | Window Width | Window Center |
| | SOP Common | | Specific Character Set |

Table 3-4 lists the applied optional modules and attributes in the SC images. A detailed overview of the applied SC Image IOD is given section 9 on page 27.

Table 3-4: Applied optional Modules and Attributes of the SC Image IOD

| <i>IE</i> | <i>Module</i> | <i>Conditional Attributes</i> | <i>Optional Attributes</i> |
|-----------|---------------|-------------------------------|----------------------------|
| Patient | Patient | | - |
| Study | General Study | | Study Description |

Table 3-4: Applied optional Modules and Attributes of the SC Image IOD (Continued)

| <i>IE</i> | <i>Module</i> | <i>Conditional Attributes</i> | <i>Optional Attributes</i> |
|-----------|----------------|--|--|
| Series | General Series | Laterality | Series Date, Series Time, Performing Physician's Name, Protocol Name |
| Equipment | SC Equipment | | Secondary Capture Device Manufacturer, Secondary Capture Device Manufacturer's Model Name, Secondary Capture Software Version(s) |
| Image | General Image | Image Date, Image Time, Patient Orientation. | Acquisition Date, Acquisition Time, Acquisition Number, Image Comments |
| | Image Pixel | | - |
| | SC Image | | Date of Secondary Capture, Time of Secondary Capture |
| | SOP Common | | Specific Character Set |

During the selection and export of an examination, the user interface shows the status:

Export flag examination flagged for DICOM export
 Export busy examination being exported
 Export done examination exported successfully
 Export error error while exporting examination
 Export cancel export of examination being cancelled
 Not exported export of examination cancelled

DSI will stop the transfer of the image data and release the Association as soon as it receives an unsuccessful or warning C-STORE Response status, or when the Association is aborted by the remote system. The reason will be logged, the user interface of the DSI console will show the status "Export Error".

If a RIS connection is present, Patient and Study related information will be retrieved by DSI from the RIS and will be put in the image headers of the exported images. See also section 8 on page 22 and section 9 on page 27.

The UIDs in the composite images are generated when the related Study, Series and Image are created. This means that two exports of the same image will have the same UIDs. The Study UID may be retrieved from the RIS via the Worklist.

3.1.2.2 Request for a Modality Worklist

3.1.2.2.1 Associated Real-World Activity

This DSI function will be triggered at request of the operator. An Association will be set-up to the pre-configured remote system (the RIS). After receiving the Worklist the Association is released.

3.1.2.2.1.1 Proposed Presentation Contexts

DSI will propose the following presentation contexts:

Table 3-5: Proposed Presentation Contexts for Request for Modality Worklist

| <i>Presentation Context table</i> | | | | | |
|--|------------------------|---------------------------|---------------------|-------------|-----------------------------|
| <i>Abstract Syntax</i> | | <i>Transfer Syntax</i> | | <i>Role</i> | <i>Extended Negotiation</i> |
| <i>Name</i> | <i>UID</i> | <i>Name List</i> | <i>UID List</i> | | |
| Modality Worklist Information Model - FIND | 1.2.840.10008.5.1.4.31 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| Modality Worklist Information Model - FIND | 1.2.840.10008.5.1.4.31 | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | None |
| Modality Worklist Information Model - FIND | 1.2.840.10008.5.1.4.31 | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | SCU | None |

3.1.2.2.1.2 SOP Specific Conformance to Modality Worklist Management

DSI provides standard conformance.

No optional Matching keys are supported (i.e. no optional Matching Keys will be present in the C-FIND Requests).

No optional Return Keys are supported (i.e. no optional Return Keys will be present in the C-FIND Requests) except the optional attribute Code Meaning (0008, 0104) in the Requested Procedure Code Sequence.

If more than 42 worklist items are received (via C-FIND Responses) as result of a worklist request, DSI will cancel the request by sending a C-CANCEL-FIND Request.

A detailed overview of all requested Matching and Return keys with additional attribute information is given in section 10 on page 31. The possibly used matching types (like Single Value, Wildcarding, Range matching) are specified there too.

The status of the C-FIND Responses (Success, Refused, Error, Warning) is logged. Only general status messages are displayed on the user interface, like "RIS not responding" and "No patient available from RIS".

The following non-printable characters (hexa-decimal coded) are not supported in the received Worklist data:

00H through 1FH,

7FH

80H through 9FH,

A0H, A6H, A8H, A9H, AAH, AEH

B1H, B4H, B8H, B9H, BEH

C0H, C1H, C2H, C3H, C8H, CAH, CBH, CCH, CDH, CEH, CFH

D0H, D2H, D3H, D4H, D5H, D9H, DAH, DBH, DDH, DEH

E3H

F0H, F5H, FDH, FEH

If one or more of these non-printable characters are present in the strings of received Worklist data, the string is not accepted.

If non-printable characters are present in the Patient Name or if this attribute is empty, the worklist entry is not accepted. In case the Patient Name only contains spaces, this Worklist entry and all succeeding Worklist entries will be skipped.

3.1.2.3 Create a Study Component

3.1.2.3.1 Associated Real-World Activity

This DSI function will be triggered when a Worklist item is selected, i.e. a Study Component will be created. An Association will be set-up to the pre-configured remote system (usually a RIS). After informing the remote system about the created Study Component, the Association is released.

3.1.2.3.1.1 Proposed Presentation Contexts

DSI will propose the following presentation contexts:

Table 3-6: Proposed Presentation Contexts for Create a Study Component

| <i>Presentation Context table</i> | | | | | |
|--------------------------------------|-------------------------|---------------------------|---------------------|-------------|-----------------------------|
| <i>Abstract Syntax</i> | | <i>Transfer Syntax</i> | | <i>Role</i> | <i>Extended Negotiation</i> |
| <i>Name</i> | <i>UID</i> | <i>Name List</i> | <i>UID List</i> | | |
| Study Component Management SOP Class | 1.2.840.10008.3.1.2.3.2 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |
| Study Component Management SOP Class | 1.2.840.10008.3.1.2.3.2 | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCU | None |
| Study Component Management SOP Class | 1.2.840.10008.3.1.2.3.2 | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | SCU | None |

3.1.2.3.1.2 SOP Specific Conformance to Study Component Management

DSI provides standard conformance.

Only the N-CREATE Service Element is used (as SCU), so no use of the N-GET and N-SET Service Elements.

No optional attributes are applied in the N-CREATE Service Element. The Specific Character Set (conditional in DICOM) will always be present.

A detailed overview of all applied attributes with additional attribute information is given in section 11 on page 33.

The status of the DIMSE Responses (Success, Refused, Error, Warning) is logged. No status messages are displayed on the user interface.

3.1.3 Association Acceptance Policy

DSI does not accept Associations.

4 Communication Profiles

4.1 TCP/IP Stack

DSI 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 DSI system supports ISO 8802-3 10BASE5 Ethernet.

5 Extensions/Specializations/Privatizations

Not applicable.

6 Configuration

The configuration of a DSI system is done by means of a configuration program. It is intended to be used by Philips service engineers only.

6.1 AE Title/Presentation Address mapping

6.1.1 Local AE Titles and Presentation Addresses

The local (so of DSI itself) Application Entity Title, local System Name and local (System) IP Address are selected by the service configuration program.

6.1.2 Remote AE Titles and Presentation Addresses

All remote applications to be selected as image export destination or as Worklist supplier are configurable for the following items:

- The Application Entity Title of the remote application.
- The IP Address and Port Number at which the remote application should accept Association requests.
- The Remote Host Name (i.e. System name) of the system on which the remote application resides.

The Remote Host Name is used in the remote DICOM system list with the F4 Config page.

6.2 Configurable parameters

- The PDU size of DSI (i.e. the maximum allowed size of PDU messages received by DSI) is fixed on 16K.

For optimal performance of the communication DSI - remote system, it is advised to configure the PDU size on the remote system as large as possible: unlimited and 64K are preferred (in that order). PDU size of 32K on the remote system should **not** be taken due to an implementation restriction of DSI.

- “Hospital Name” (configurable) is mapped on “Institution Name” see Table 8-5 on page 23.
- “System Name” (configurable) is mapped on “Station Name” see Table 8-5 on page 23.

7 Support of Extended Character Sets

DSI supports the Extended Character Set “ISO_IR 100” (Latin alphabet No 1, supplementary set) for the Image Export function.

The support of characters at import of Modality Worklist data is specified in section 3.1.2.2.1.2 on page 15.

8 Overview of the applied X-Ray Fluoroscopy (XRF) Image IOD

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

Table 8-1: Applied Modules in the XRF IOD

| <i>Information Entity</i> | <i>Module</i> |
|---------------------------|-------------------|
| Patient | Patient |
| Study | General Study |
| Series | General Series |
| Equipment | General Equipment |
| Image | General Image |
| | Image Pixel |
| | Display Shutter |
| | X-Ray Image |
| | X-Ray Acquisition |
| | VOI LUT |
| | 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: X-Ray Radiofluoroscopic Image Storage SOP Class - Patient Module

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|-----------------------|------------|---------------------------------------|
| Patient's Name | 0010,0010 | Received from RIS or entered by user. |
| Patient ID | 0010,0020 | Received from RIS or entered by user. |
| Patient's Birth Date | 0010,0030 | Received from RIS or entered by user. |
| Patient's Sex | 0010,0040 | Received from RIS or entered by user. |

Table 8-3: X-Ray Radiofluoroscopic Image Storage SOP Class - General Study Module

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|----------------------------|------------|--|
| Study Date | 0008,0020 | |
| Study Time | 0008,0030 | |
| Accession Number | 0008,0050 | Zero length value if not received from RIS. |
| Referring Physician's Name | 0008,0090 | Zero length value if not received from RIS. |
| Study Description | 0008,1030 | Not present if not entered by user. |
| Study Instance UID | 0020,000D | Generated at creation of the Study (Component) or received from RIS. |
| Study ID | 0020,0010 | Zero length value. |

Table 8-4: X-Ray Radiofluoroscopic Image Storage SOP Class - General Series Module

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|-----------------------------|------------|--|
| Series Date | 0008,0021 | |
| Series Time | 0008,0031 | |
| Modality | 0008,0060 | Applied value(s): RF |
| Performing Physician's Name | 0008,1050 | Received from RIS, entered by user or is empty if not known. |
| Protocol Name | 0018,1030 | Not present if not entered by user. |
| Series Instance UID | 0020,000E | Generated at creation of the Series. |
| Series Number | 0020,0011 | |
| Laterality | 0020,0060 | Always zero length value. |

Table 8-5: X-Ray Radiofluoroscopic Image Storage SOP Class - General Equipment Module

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|-----------------------|------------|---|
| Manufacturer | 0008,0070 | Applied value(s): Philips Medical Systems |
| Institution Name | 0008,0080 | |
| Station Name | 0008,1010 | |

Table 8-5: X-Ray Radiofluoroscopic Image Storage SOP Class - General Equipment Module (Continued)

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|---------------------------|------------|------------------------------|
| Manufacturer's Model Name | 0008,1090 | Applied value(s): DSI R5.1.1 |
| Device Serial Number | 0018,1000 | |
| Software Version(s) | 0018,1020 | |

Table 8-6: X-Ray Radiofluoroscopic Image Storage SOP Class - General Image Module

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|-----------------------|------------|---|
| Acquisition Date | 0008,0022 | |
| Image Date | 0008,0023 | |
| Acquisition Time | 0008,0032 | |
| Image Time | 0008,0033 | |
| Acquisition Number | 0020,0012 | |
| Image Number | 0020,0013 | 1 |
| Patient Orientation | 0020,0020 | Always zero length value. |
| Image Comments | 0020,4000 | Contains also the DSI image annotations on normal (i.e. non zoomed) images in the format --(x,y) text --. This attribute is not present if not entered by user and if no annotations are present. |

Table 8-7: X-Ray Radiofluoroscopic Image Storage SOP Class - Image Pixel Module

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|----------------------------|------------|---|
| Samples per Pixel | 0028,0002 | Applied value(s): 1 |
| Photometric Interpretation | 0028,0004 | Applied value(s): MONOCHROME2 |
| Rows | 0028,0010 | The actual size in 60 Hz DSI systems is smaller: 480 or 960. Applied value(s): 1024, 512 |
| Columns | 0028,0011 | Equal to the value of Rows (512 or 1024). The actual image size in 60 Hz DSI systems is smaller: 480 or 960. Applied value(s): 1024, 512 |
| Bits Allocated | 0028,0100 | Applied value(s): 8 |

Table 8-7: X-Ray Radiofluoroscopic Image Storage SOP Class - Image Pixel Module (Continued)

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|-----------------------|------------|-------------------------|
| Bits Stored | 0028,0101 | Applied value(s): 8 |
| High Bit | 0028,0102 | Applied value(s): 7 |
| Pixel Representation | 0028,0103 | Applied value(s): 0000H |
| Pixel Data | 7FE0,0010 | |

Table 8-8: X-Ray Radiofluoroscopic Image Storage SOP Class - Display Shutter Module

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|-------------------------------|------------|---|
| Shutter Shape | 0018,1600 | Applied value(s): CIRCULAR RECTANGULAR or a combination of both. |
| Shutter Left Vertical Edge | 0018,1602 | |
| Shutter Right Vertical Edge | 0018,1604 | |
| Shutter Upper Horizontal Edge | 0018,1606 | |
| Shutter Lower Horizontal Edge | 0018,1608 | |
| Center of Circular Shutter | 0018,1610 | |
| Radius of Circular Shutter | 0018,1612 | |

Table 8-9: X-Ray Radiofluoroscopic Image Storage SOP Class - X-Ray Image Module

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|------------------------------|------------|--|
| Image Type | 0008,0008 | Applied value(s): ORIGINAL\PRIMARY \ SINGLE PLANE |
| Pixel Intensity Relationship | 0028,1040 | Applied value(s): DISP |

Table 8-10: X-Ray Radiofluoroscopic Image Storage SOP Class - X-Ray Acquisition Module

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|-----------------------|------------|---------------------------|
| KVP | 0018,0060 | Always zero length value. |

Table 8-10: X-Ray Radiofluoroscopic Image Storage SOP Class - X-Ray Acquisition Module (Continued)

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|-----------------------|------------|---------------------------|
| Exposure | 0018,1152 | always zero length value. |
| Radiation Setting | 0018,1155 | Applied value(s): GR, SC |

Table 8-11: X-Ray Radiofluoroscopic Image Storage SOP Class - VOI LUT Module

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|-----------------------|------------|---|
| Window Center | 0028,1050 | This attribute is related to the DSI Contrast / Brightness. |
| Window Width | 0028,1051 | This Attribute is related to the DSI Contrast / Brightness. |

Table 8-12: X-Ray Radiofluoroscopic Image Storage SOP Class - SOP Common Module

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|------------------------|------------|---|
| Specific Character Set | 0008,0005 | Applied value(s): ISO_IR 100 |
| SOP Class UID | 0008,0016 | Applied value(s): 1.2.840.10008.5.1.4.1.1.12.2 |
| SOP Instance UID | 0008,0018 | |

9 Overview of the applied Secondary Capture (SC) Image IOD

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

Table 9-1: Applied Modules in the SC IOD

| <i>Information Entity</i> | <i>Module</i> |
|---------------------------|----------------|
| Patient | Patient |
| Study | General Study |
| Series | General Series |
| Equipment | SC Equipment |
| Image | General Image |
| | Image Pixel |
| | SC Image |
| | 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 9-2: Secondary Capture Image Storage SOP Class - Patient Module

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|-----------------------|------------|---------------------------------------|
| Patient's Name | 0010,0010 | Received from RIS or entered by user. |
| Patient ID | 0010,0020 | Received from RIS or entered by user. |
| Patient's Birth Date | 0010,0030 | Received from RIS or entered by user. |
| Patient's Sex | 0010,0040 | Received from RIS or entered by user. |

Table 9-3: Secondary Capture Image Storage SOP Class - General Study Module

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|-----------------------|------------|-------------|
| Study Date | 0008,0020 | |
| Study Time | 0008,0030 | |

Table 9-3: Secondary Capture Image Storage SOP Class - General Study Module (Continued)

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|----------------------------|------------|--|
| Accession Number | 0008,0050 | Zero length value if not received from RIS. |
| Referring Physician's Name | 0008,0090 | Zero length value if not received from RIS. |
| Study Description | 0008,1030 | Filled with the Exam Type, limited to a maximum of 6 characters. |
| Study Instance UID | 0020,000D | Generated at creation of the Study (Component) or received from RIS. |
| Study ID | 0020,0010 | Zero length value. |

Table 9-4: Secondary Capture Image Storage SOP Class - General Series Module

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|-----------------------------|------------|--|
| Series Date | 0008,0021 | |
| Series Time | 0008,0031 | |
| Modality | 0008,0060 | Applied value(s): OT |
| Performing Physician's Name | 0008,1050 | Received from RIS, entered by user or is empty is not known. |
| Protocol Name | 0018,1030 | Filled with the Exam Type, limited to a maximum of 6 characters. |
| Series Instance UID | 0020,000E | Generated at creation of the series. |
| Series Number | 0020,0011 | |
| Laterality | 0020,0060 | Always zero length value |

Table 9-5: Secondary Capture Image Storage SOP Class - SC Equipment Module

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|--|------------|---|
| Conversion Type | 0008,0064 | Applied value(s): DV |
| Secondary Capture Device Manufacturer | 0018,1016 | Applied value(s): Philips Medical Systems |
| Secondary Capture Device Manufacturer's Model Name | 0018,1018 | Applied value(s): DSI R5.1.1 |
| Secondary Capture Device Software Version(s) | 0018,1019 | |

Table 9-6: Secondary Capture Image Storage SOP Class - General Image Module

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|-----------------------|------------|---|
| Acquisition Date | 0008,0022 | |
| Image Date | 0008,0023 | |
| Acquisition Time | 0008,0032 | |
| Image Time | 0008,0033 | |
| Acquisition Number | 0020,0012 | |
| Image Number | 0020,0013 | Applied value(s): 1 |
| Patient Orientation | 0020,0020 | Always zero length value |
| Image Comments | 0020,4000 | Contains also the DSI image annotations on normal (i.e. non zoomed) images in the format --(x,y) text --. This attribute is not present if not entered by user and if no annotations are present. |

Table 9-7: Secondary Capture Image Storage SOP Class - Image Pixel Module

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|----------------------------|------------|--|
| Samples per Pixel | 0028,0002 | Applied value(s): 1 |
| Photometric Interpretation | 0028,0004 | Applied value(s): MONOCHROME2 |
| Rows | 0028,0010 | 512 or 1024. The actual image size in 60 Hz DSI systems is smaller: 480 or 960. Applied value(s): 1024, 512 |
| Columns | 0028,0011 | Equal to the value of Rows (512 or 1024). The actual image size in 60 Hz DSI system is smaller: 480 or 960. Applied value(s): 1024, 512 |
| Bits Allocated | 0028,0100 | Applied value(s): 8 |
| Bits Stored | 0028,0101 | Applied value(s): 8 |
| High Bit | 0028,0102 | Applied value(s): 7 |
| Pixel Representation | 0028,0103 | Applied value(s): 0000H |
| Pixel Data | 7FE0,0010 | |

Table 9-8: Secondary Capture Image Storage SOP Class - SC Image Module

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|---------------------------|------------|-------------|
| Date of Secondary Capture | 0018,1012 | |
| Time of Secondary Capture | 0018,1014 | |

Table 9-9: Secondary Capture Image Storage SOP Class - SOP Common Module

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|------------------------|------------|---|
| Specific Character Set | 0008,0005 | Applied value(s): ISO_IR 100 |
| SOP Class UID | 0008,0016 | Applied value(s): 1.2.840.10008.5.1.4.1.1.7 |
| SOP Instance UID | 0008,0018 | Generated at creation of the image. |

10 Overview of the applied Modality Worklist IOD

This chapter specifies in detail the applied attributes in the C-FIND Service Element of this supported SOP Class.

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.

Table 10-1: Modality Worklist Information Model - FIND SOP Class - Patient Identification Module

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|-----------------------|------------|-------------|
| Patient's Name | 0010,0010 | Return key |
| Patient ID | 0010,0020 | Return key |

Table 10-2: Modality Worklist Information Model - FIND SOP Class - Patient Demographic Module

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|-----------------------|------------|-------------|
| Patient's Birth Date | 0010,0030 | Return key |
| Patient's Sex | 0010,0040 | Return key |

Table 10-3: Modality Worklist Information Model - FIND SOP Class - Scheduled Procedure Step Module

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|---|------------|---|
| Scheduled Procedure Step Sequence | 0040,0100 | Return key |
| > Modality | 0008,0060 | Fixed Single Value matching is applied. Applied value(s): RF |
| > Scheduled Station AE Title | 0040,0001 | Fixed Single Value matching is applied (which is the configured Application Name) |
| > Scheduled Procedure Step Start Time | 0040,0003 | Return key |
| > Scheduled Performing Physician's Name | 0040,0006 | Return key |
| > Scheduled Procedure Step Description | 0040,0007 | Used at DSI for exam type selection. |

Table 10-4: Modality Worklist Information Model - FIND SOP Class - Requested Procedure Module

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|-----------------------------------|------------|-------------|
| Study Instance UID | 0020,000D | Return key |
| Requested Procedure Code Sequence | 0032,1064 | Return key |
| > Code Value | 0008,0100 | Return key |
| > Coding Scheme Designator | 0008,0102 | Return key |
| > Code Meaning | 0008,0104 | Return key |

Table 10-5: Modality Worklist Information Model - FIND SOP Class - Imaging Service Request Module

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|----------------------------|------------|-------------|
| Accession Number | 0008,0050 | Return key |
| Referring Physician's Name | 0008,0090 | Return key |

11 Overview of the applied Study Component Management IOD

This chapter specifies in detail the applied attributes in the N-CREATE Service Element of this supported SOP Class.

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.

Table 11-1: Study Component Management SOP Class - Study Component Module

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|----------------------------|------------|-----------------|
| Referenced Series Sequence | 0008,1115 | Is always empty |
| Study ID | 0020,0010 | Is always empty |

Table 11-2: Study Component Management SOP Class - Study Component Relationship Module

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|-------------------------------|------------|--|
| Referenced Study Sequence | 0008,1110 | |
| > Referenced SOP Class UID | 0008,1150 | Applied value(s): 1.2.840.10008.3.1.2.3.1 |
| > Referenced SOP Instance UID | 0008,1155 | Value from Study Instance UID in C-FIND Response of Modality Worklist. |

Table 11-3: Study Component Management SOP Class - Study Component Acquisition Module

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|----------------------------|------------|---|
| Modality | 0008,0060 | Applied value(s): RF, RG |
| Study Description | 0008,1030 | Description of the classification of the Study (Component) performed, entered by institution. |
| Procedure Code Sequence | 0008,1032 | |
| > Code Value | 0008,0100 | DSI uses the value, if any is returned, in the C-FIND response. Applied value(s): DSI |
| > Coding Scheme Designator | 0008,0102 | DSI uses the value, if any is returned, in the C-FIND response. Applied value(s): 99DSI |

Table 11-3: Study Component Management SOP Class - Study Component Acquisition Module

| <i>Attribute Name</i> | <i>Tag</i> | <i>Note</i> |
|---------------------------|------------|--|
| > Code Meaning | 0008,0104 | DSI uses the value, if any is returned, in the C-FIND response. Applied value(s): DSI CREATED CODE |
| Study Component Status ID | 0032,1055 | Applied value(s): COMPLETED |

12 Remarks, Implementation Restrictions and Choices.

Table 1: Matching of the Data Model of the DSI 5.1 User interface to DICOM (Export/RIS)

| DSI User Interface | DICOM | Table Reference | RIS/Export |
|--------------------|-----------------------------|----------------------|----------------|
| Name | Patient's Name | Table 8-2, Table 9-2 | RIS and Export |
| Birthdate | Patients's Birth Date | Table 8-2, Table 9-2 | RIS and Export |
| S | Patient's Sex | Table 8-2, Table 9-2 | RIS and Export |
| Patient ID | Patient ID | Table 8-2, Table 9-2 | RIS and Export |
| Exam | Sched. Proc. Step. Desc | Table 10-3 | RIS |
| | Study Description | Table 8-3, Table 9-3 | Export |
| | Protocol Name | Table 8-4, Table 9-4 | Export |
| Physician Name | Referring Physician's Name | Table 10-5 | RIS |
| | Referring Physician's name | Table 8-3, Table 9-3 | Export |
| | Performing Physician's Name | Table 8-3, Table 9-3 | Export |

The following table shows the differences between the DSI 5.1 output compared with the EasyVision 4.2 output.

Table 2: List of differences between the DSI 5.1 and EasyVision Output 4.2.

| Attribute Description | Tag | | Difference w.r.t. DSI 5.1 direct DICOM output |
|---|-----------|----------------------|---|
| Performing Physician's Name | 0008,1050 | Table 8-4 | Is not identical with the DSI 5.1 output. Is exported in 0008,1060. |
| Image Comments | 0020,4000 | Table 8-6, Table 9-6 | Is not supported by the EasyVision. |
| Secondary Capture Device Manufacturer | 0018,1016 | Table 9-5 | Is not identical with the DSI 5.1 output. |
| Secondary Capture Manufacturer's Model Name | 0018,1018 | Table 9-5 | Is not identical with the DSI 5.1 output. |

Table 2: List of differences between the DSI 5.1 and EasyVision Output 4.2.

| Attribute Description | Tag | | Difference w.r.t. DSI 5.1 direct DICOM output |
|---------------------------------------|-----------|-----------|---|
| Manufacturer's Model Name | 0008,1090 | Table 8-5 | Is not identical with the DSI 5.1 output. |
| Secondary Capture Software Version(s) | 0018,1019 | Table 9-5 | Is not identical with the DSI 5.1 output. |
| Software Version(s) | 0018,1020 | Table 8-5 | Is not identical with the DSI 5.1 output. |
| Date of Secondary Capture | 0018,1012 | Table 9-8 | Is not identical with the DSI 5.1 output. |
| | | | |
| Time of Secondary Capture. | 0018,1014 | Table 9-8 | Is not identical with the DSI 5.1 output |

- The DSI 5.1, EasyVision Release 4.1 combination output does not properly export the accession number, tag number (0008,0050).