DICOM Conformance Statement
ARTIS icono
VE2

SIEMENS
Healthineers

1 Conformance Statement Overview

The ARTIS icono is an Imaging Modality. It supports Storage and Transfer of images utilizing the DICOM “Storage Service Class”, the display of data and retrieval of images from DICOM Archives utilizing the DICOM “Query/Retrieve Service Class”. Workflow Management is supported by querying worklists from RIS and returning information about the procedure performed. Furthermore, the Import from and export to DICOM CD/DVD media is supported.

The ARTIS icono conforms to the DICOM Standard and supports the network services as described in Table 1: Network Services and the media services as described in Table 2 - Media Services.

Table 1: Network Services

SOP Classes	SOP Class UID	User of Service (SCU)		Provider of Service (SCP)	
Verification					
Verification	1.2.840.10008.1.1	Yes		Yes	
SOP Classes created by ARTIS icono					
		Create	**Send**	**Store**	**Display**
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Yes	Yes	Yes	Yes
X-Ray Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.67	Yes	Yes	Yes	Yes
SOP Classes managed by ARTIS icono					
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	No	Yes	Yes	No
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	No	Yes	Yes	No
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	No	Yes	Yes	No
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	No	Yes	Yes	No
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	No	Yes	Yes	No
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	No	Yes	Yes	No
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	No	Yes	Yes	No
Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1	No	Yes	Yes	No
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	No	Yes	Yes	No
X-Ray 3D Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.13.1.1	No	Yes	Yes	No
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1	No	Yes	Yes	No
Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.4	No	Yes	Yes	No
Surface Segmentation Stor-	1.2.840.10008.5.1.4.1.1.66.5	No	Yes	Yes	No

SOP Classes	SOP Class UID	User of Service (SCU)		Provider of Service (SCP)	
age					
Basic Text SR Storage	1.2.840.10008.5.1.4.1.1.88.11	No	Yes	Yes	No
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	No	Yes	Yes	No
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33	No	Yes	Yes	No
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	No	Yes	Yes	No
Transfer (Private SOP Class)					
Syngo Non-Image Storage	1.3.12.2.1107.5.9.1	Yes		Yes	
Storage Commitment					
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1	Yes		No	
Worklist Management					
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	Yes		No	
Modality Performed Procedure Step SOP Class	1.2.840.10008.3.1.2.3.3	Yes		No	
Query/Retrieve					
Patient Root Q/R Information Model - FIND	1.2.840.10008.5.1.4.1.2.1.1	No		Yes	
Patient Root Q/R - Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2	No		Yes	
Study Root Q/R - Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Yes		Yes	
Study Root Q/R - Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Yes		Yes	
Patient/Study Only Q/R - Information Model FIND	1.2.840.10008.5.1.4.1.2.2.3	No		Yes	
Patient/Study Only Q/R - Information Model MOVE	1.2.840.10008.5.1.4.1.2.3.2	No		Yes	
Print Management					
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Yes		No	
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	Yes		No	
Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Yes		No	
Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Yes		No	
Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4	Yes		No	

SOP Classes	SOP Class UID	User of Service (SCU)	Provider of Service (SCP)
Basic Color Image Box SOP Class	1.2.840.10008.5.1.1.4.1	Yes	No
Printer SOP Class	1.2.840.10008.5.1.1.16	Yes	No
Print Job SOP Class	1.2.840.10008.5.1.1.14	Yes	No
Presentation LUT SOP Class	1.2.840.10008.5.1.1.23	Yes	No

Table 2 - Media Services

Media Storage Application Profile	Write Files (FSC or FSU)	Read Files (FSR)
Compact Disk - Recordable		
STD-GEN-CD	Yes	Yes
AUG-GEN-CD	Yes	Yes
DVD		
AUG-GEN-DVD	Yes	Yes
AUG- GEN-DVD-J2K	Yes	Yes
STD-GEN-DVD	Yes	Yes
STD-GEN-DVD-J2K	Yes	Yes
USB		
AUG- GEN-USB-J2K	Yes	Yes
STD-GEN-USB-J2K	Yes	Yes

Table 3 - Implementation Identifying Information

Name	Value
Application Context Name	1.2.840.10008.3.1.1.1
Implementation Class UID	1.3.12.2.1107.5.4.5
Implementation Version Name	"SIEMENS_HEL_VE20"

2 Table of Contents

3 Introduction

3.1 Revision History

Table 4 - Revision History

Product	Product Version	Document Version	Date
ARTIS icono	VE20A	10999010-ESK-001-01	01/2019
ARTIS icono	VE20A	10999010-ESK-001-02	10/2019

3.2 Audience

This document is intended for hospital staff, health system integrators, software designers or implementers. It is assumed that the reader has a working understanding of DICOM.

3.3 Remarks

The scope of this DICOM Conformance Statement is to facilitate integration between ARTIS icono and other DICOM products. The Conformance Statement should be read and understood in conjunction with the DICOM Standard. DICOM by itself does not guarantee interoperability.

The Conformance Statement does, however, facilitate a first-level comparison for interoperability between different applications supporting compatible DICOM functionality.

This Conformance Statement is not supposed to replace validation with other DICOM equipment to ensure proper exchange of intended information. In fact, the user should be aware of the following important issues:

- The comparison of conformance statements is the first step towards assessing interconnectivity and interoperability between ARTIS icono and other DICOM conformant equipment.
- Test procedures should be defined and executed to validate the required level of interoperability with specific compatible DICOM equipment, as established by the healthcare facility.

Siemens reserves the right to modify the design and specifications contained herein without prior notice. Please contact your local Siemens representative for the most recent product information.

3.4 Definitions, Terms and Abbreviations

Definitions, terms and abbreviations used in this document are defined within the different parts of the DICOM standard.

Additional Abbreviations and terms are as follows:

AE	DICOM Application Entity
AET	Application Entity Title
ASCII	American Standard Code for Information Interchange
DCS	DICOM Conformance Statement

DICOM	Digital Imaging and Communications in Medicine
FSC	File Set Creator
FSR	File Set Reader
FSU	File Set Updater
GSDF	Grayscale Standard Display Function
IOD	DICOM Information Object Definition
ISO	International Standard Organization
n. a.	not applicable
NEMA	National Electrical Manufacturers Association
O	Optional Key Attribute
PDU	DICOM Protocol Data Unit
R	Required Key Attribute
SCU	DICOM Service Class User (DICOM client)
SCP	DICOM Service Class Provider (DICOM Server)
SOP	DICOM Service-Object Pair
SR	Structured Report
TFT	Thin Film Transistor (Display)
TID	Template ID
U	Unique Key Attribute
UID	Unique Identifier
UTF-8	Unicode Transformation Format-8
VR	Value Representation

3.5 References

NEMA PS3 / ISO 12052, Digital Imaging and Communications in Medicine (DICOM) Standard, National Electrical Manufacturers Association, Rosslyn, VA, USA (available free at http://medical.nema.org/)[1]

Integrating the Healthcare Enterprise – IHE Radiology Technical Framework - http://www.ihe.net

[1] *The DICOM Standard is under continuous maintenance, the current official version is available at http://dicom.nema.org*

4 Networking

4.1 Implementation Model

ARTIS icono supports storing DICOM images to remote nodes like workstations or Archiving Systems. Using the Storage Commitment Service, it can request safe keeping of previously stored instances from an Archiving system. Additionally, the ARTIS icono can query remote notes, retrieve and store selected instances from that node. Using the Modality Worklist service, the ARTIS icono can query a HIS/RIS for scheduled procedures. Performed procedure status and other procedure data can be returned to the HIS/RIS using the Modality Performed Procedure Step (MPPS) Service. Furthermore, printing of grayscale images is supported.

4.1.1 Application Data Flow

The following figures provide a functional overview of the ARTIS icono Application Entities (AE). Relationships are shown between user-invoked activities (in the circles at the left of the AEs) and the associated real-world activities provided by DICOM service providers (in the circles at the right of the AEs)

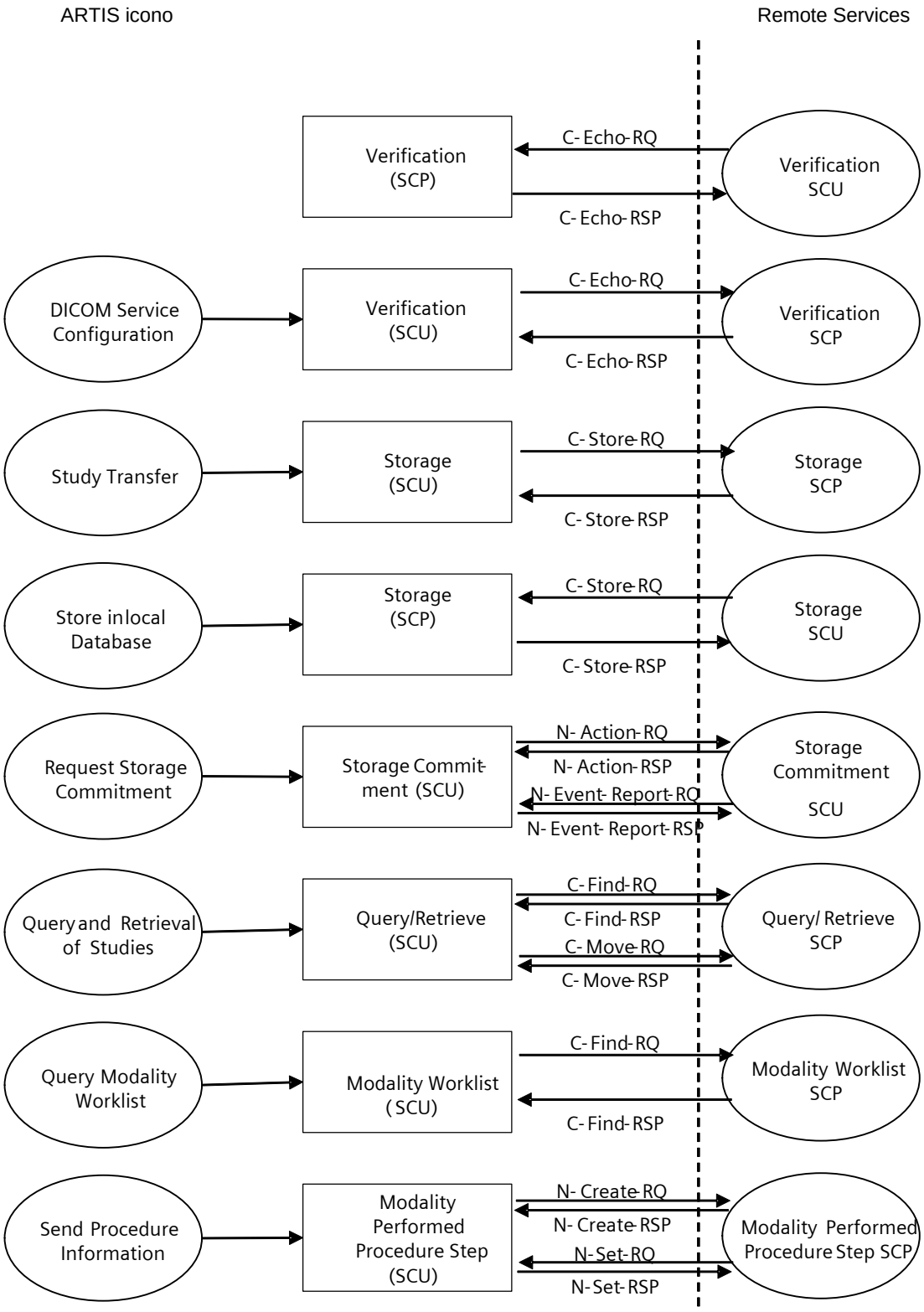

Figure 1: ARTIS icono DICOM Data Flow diagram – Acquisition Workflow

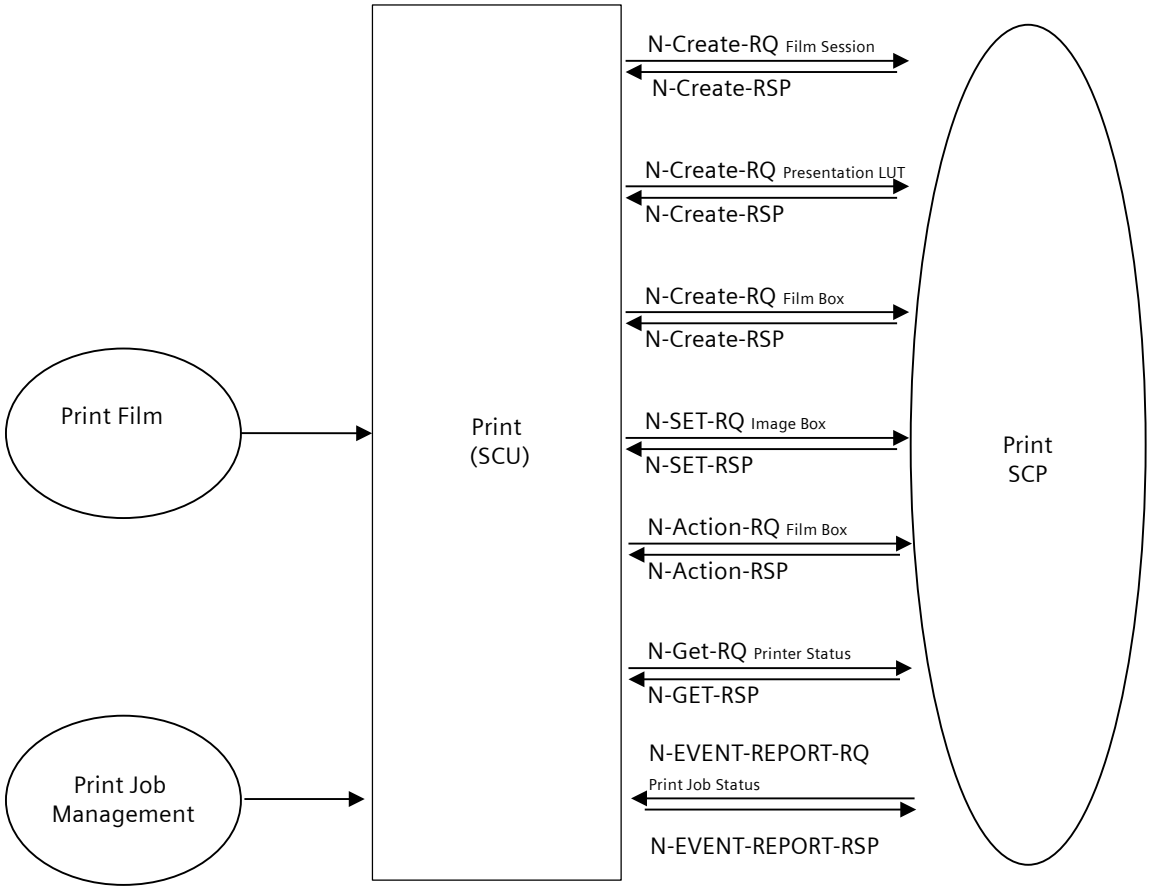

Figure 2: ARTIS icono DICOM Data Flow diagram - Printing

4.1.2 Functional Definitions of Application Entities

The SCP components of the Application Entities of the ARTIS icono operate as background server processes. They exist as soon as the system is powered up and wait for association requests. Upon accepting an association with a negotiated Presentation Context, they start to receive and process the requests described in the following sections.

The SCU components of the Application Entity are invoked upon requests from the user interface or indirect by trigger from internal processes.

4.1.2.1 Functional Definition of Verification AE

The ARTIS icono supports the Verification service as a SCP and SCU. As a SCU, Verification can be activated from the Admin Portal during system configuration by sending a C-ECHO-Request.

As a SCP of the Verification Service the ARTIS icono processes and responds to incoming verification requests using the C-ECHO-Response.

4.1.2.2 Functional Definition of Storage AE

The ARTIS icono Storage SCU is invoked either directly by the user, by an auto-archive trigger or internally by the Query/Retrieve Application Entity that is responsible for processing retrieve requests. The job consists of data describing the composite objects selected for storage and the destination Application Entity Title. An association is negotiated with the destination Application Entity and the image data is transferred using the C-STORE-Request. The transfer status is reported to the initiator of the Storage request.

The Storage SCP component of the ARTIS icono starts to receive the Composite Objects and import them into the database after accepting an association with a negotiated Presentation Context. The system can be configured in such a way, that Responses to the Storage Request are sent immediately after reception of the data, after persistent storage on the hard disc or after storage and indexing in the local database.

4.1.2.3 Functional Definition of the Storage Commitment AE

If configured, the ARTIS icono can serve as a SCU for the DICOM Storage Commitment service. Upon successful completion of a storage job, the system uses the N-ACTION-Request to request storage commitment from a remote DICOM storage commitment SCP. This can either be the same as the storage destination or a different system depending on the system configuration. Storage Commitment Requests are sent after a configurable delay after storing the objects. The ARTIS icono can receive the N-EVENT-REPORT-Request on the same or a different association.

4.1.2.4 Functional Definition of Query/Retrieve AE

The ARTIS icono supports DICOM Query/Retrieve as a SCU: The user can initiate a query to a remote node using the C-FIND-Request. After matching the specified keys, the remote Query /Retrieve SCP uses the C-FIND-Response to return the results of its search, which will be displayed to the user. Depending on user action the ARTIS icono Query/Retrieve DICOM SCU sends a C-MOVE-Request to initiate a C-STORE sub-operation on the SCP to start an image transfer from remote Storage SCU (running on Query/Retrieve SCP) to the system's Storage SCP.

The ARTIS icono supports the following query models:

- Study Root Query Model (SCU and SCP)
- Patient Root Query Model (SCP only)
- Patient/Study Only Query Model (SCP only)

Furthermore, the SCU services may issue relational queries, if supported by the remote Query/Retrieve SCP node and required by the querying Application.

The ARTIS icono DICOM Query/Retrieve SCP accepts C-FIND Request, queries the local database based on the provided matching keys and returns the matches using the C-FIND-Response. Depending on further request from the remote Query/Retrieve SCU, the ARTIS icono responds to C-MOVE-Requests by initiating a C-STORE sub-operation to send image objects to the Storage SCP of the querying system.

4.1.2.5 Functional Definition of Modality Worklist AE

The ARTIS icono Modality Worklist SCU issues DICOM Modality Worklist requests using C-FIND-Requests. The results in the C-FIND-Response are stored in internal database. The provided Patient and Procedure information is used for patient registration prior to starting an exam.

4.1.2.6 Functional Definition of Modality Performed Procedure Step SCU AE

The ARTIS icono MPPS SCU uses the N-CREATE-Request to inform an Information System that a procedure step is IN PROGRESS.

The ARTIS icono MPPS SCU uses the N-SET-Request to inform the Information System about the finalization of the Procedure Step, using either a status of COMPLETED or DISCONTINUED.

4.1.2.7 Functional Definition of Print AE

The Print SCU of the ARTIS icono is invoked by the user interface to setup film-sheet layout and whenever an image is ready to be printed on film. The Print SCU will hold and maintain all data needed to compile a complete film-sheet from the data (images, layout, configuration) received. Whenever a film-sheet is ready to print the related data is used to supply the Information to the SOP Classes of the Print Management Service Class. A queue is maintained, in order to intermediately store several film-sheets in case of resource problems on printer. The SCU will only supply and require the mandatory SOP Classes of the Print Management Service Class.

4.1.3 Sequencing of Activities

This section describes the sequencing of Real-World Activities performed by the ARTIS icono Entities using a UML sequence diagram. Real-World Activities are depicted as vertical bars and arrows show the events exchanged between them

4.1.3.1 System Configuration

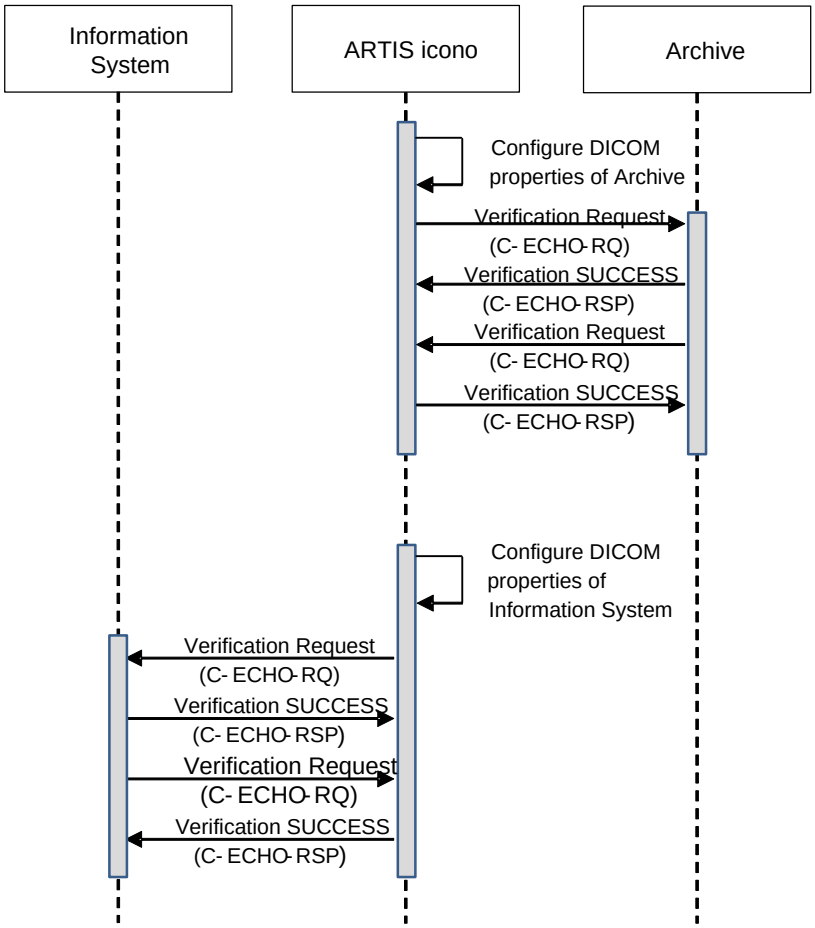

Figure 3: Sequence Diagram for Real World Activities - System Configuration

4.1.3.2 Acquisition Workflow

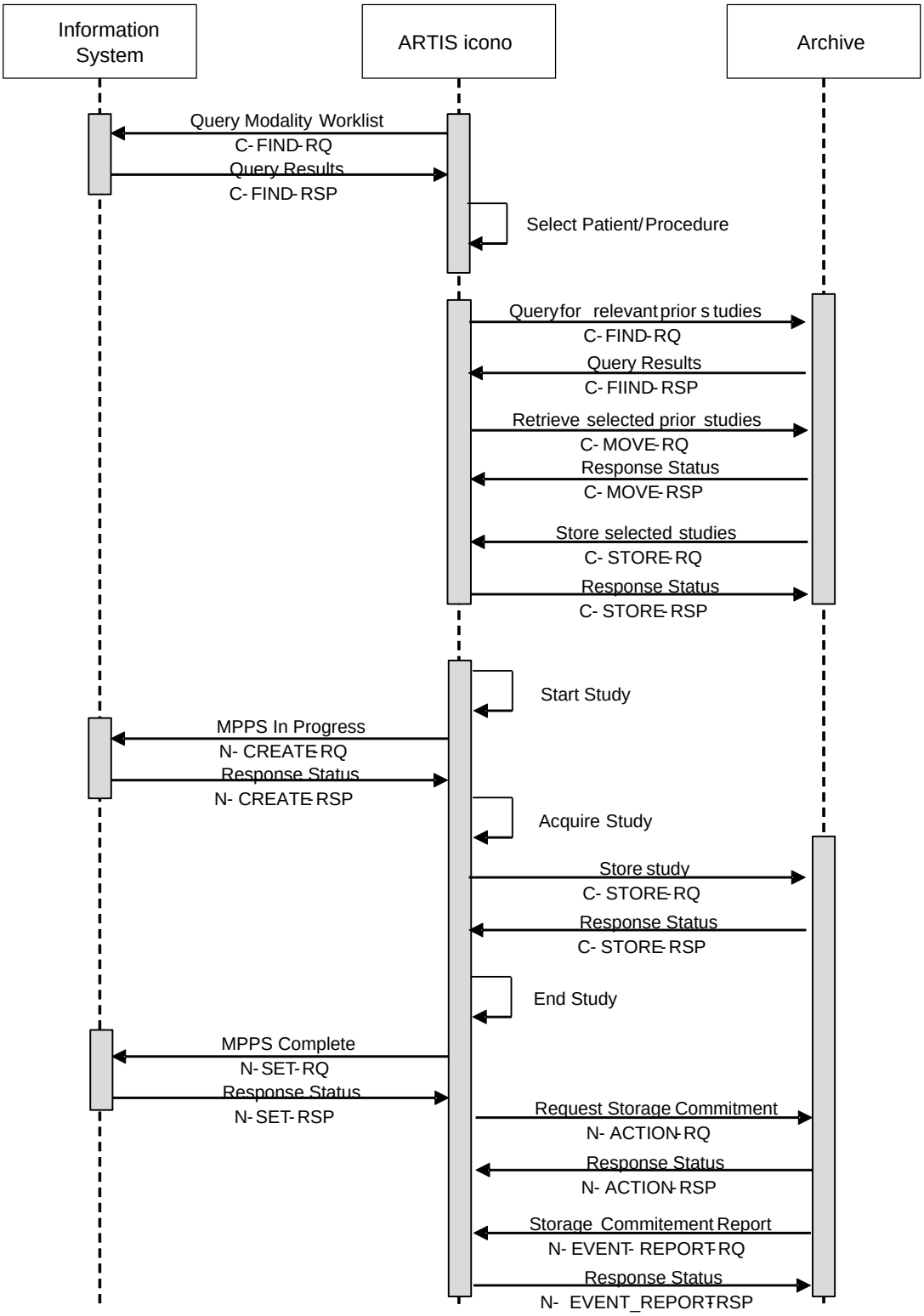

Figure 4: Sequence Diagram for Real World Activities -Acquisition workflow

4.1.3.3 Printing Workflow

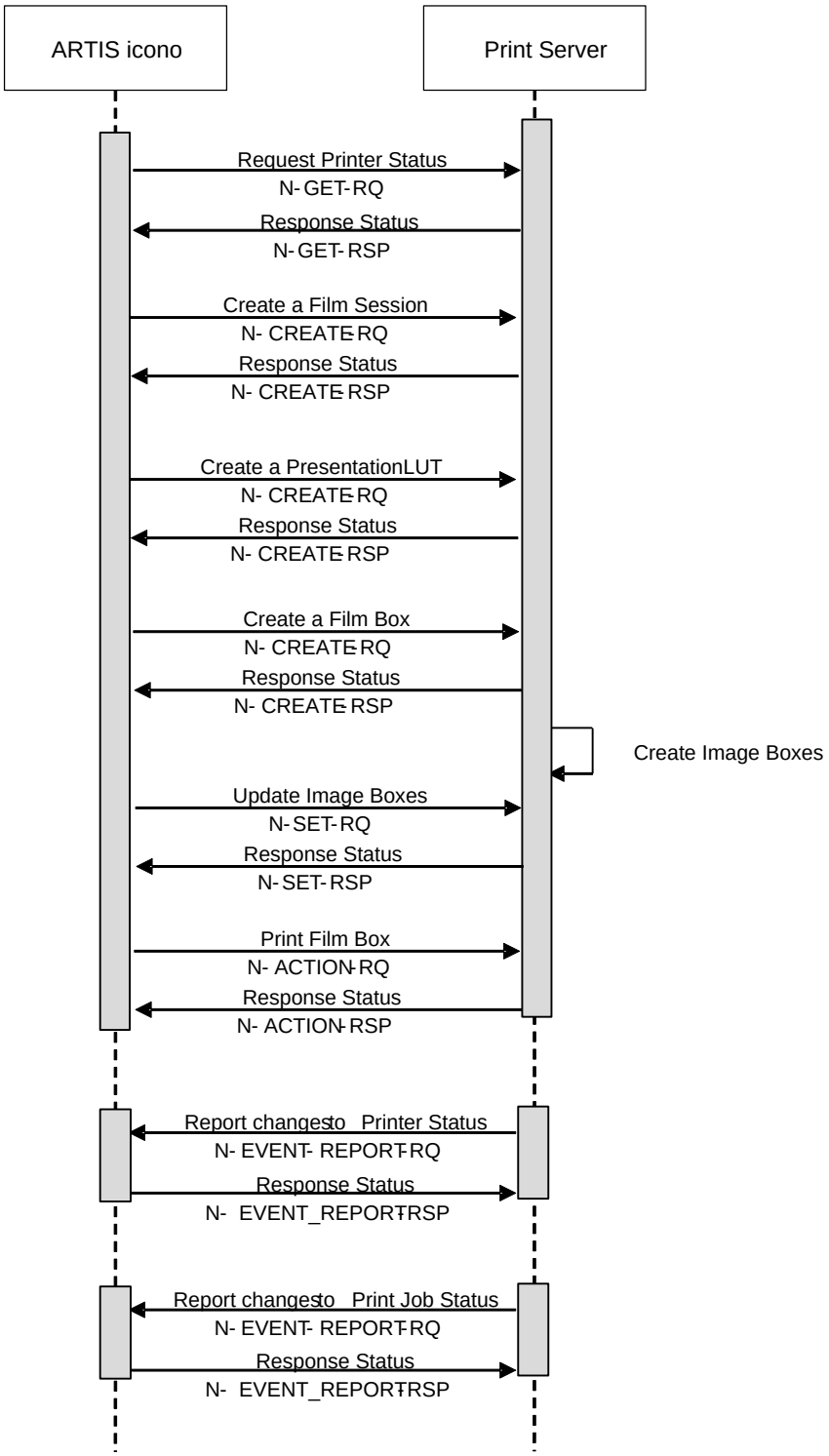

Figure 5: Sequence Diagram for Real World Activities - Printing

4.2 Application Entity Specification

This section outlines the specifications for each of the Application Entities that are part of the ARTIS icono.

4.2.1 Verification AE Specification

4.2.1.1 SOP Classes

The Verification AE of the ARTIS icono provides standard conformance to the Verification SOP Class listed in “Table 1: Network Services” section "Verification" in the “Conformance Statement Overview”.

4.2.1.2 Association Policy

The ARTIS icono Admin Portal attempts to open an association for verification request whenever the Verification function is activated.

Table 5: Association Policies

Application Context Name	1.2.840.10008.3.1.1.1
PDU size	32 kB [1]
Maximum number of simultaneous associations as an association acceptor	12[1]
Maximum number of simultaneous associations as an association initiator	unlimited

4.2.1.2.1 Asynchronous Nature

The ARTIS icono supports asynchronous communication (multiple outstanding transactions over a single association). On the SCU side the Window size proposed is infinite. On the SCP Side any size is supported.

Table 6: Asynchronous Nature as an Association Initiator

Maximum number of outstanding asynchronous transactions	10

4.2.1.2.2 Implementation Identifying Information

For Implementation Identifying Information please refer to “Table 3 - Implementation Identifying Information” in the “Conformance Statement Overview”.

[1] Default, the value is configurable

4.2.1.3 Association Initiation Policy

4.2.1.3.1 Activity – “Send Verification” Request

4.2.1.3.1.1 Description and Sequencing of Activity

The ARTIS icono serves as a SCU of the Verification Service Class. A C-ECHO-Request is initiated by the Admin Portal whenever "Verification" is requested. If an association to a remote Application Entity is successfully established, Verification with the configured AET is requested via the open association. If the C-ECHO Response from the remote Application contains a status other than "Success" this will be indicated to the user and the association is closed.

4.2.1.3.1.2 Proposed Presentation Contexts

Table 7 - Presentation Context Table "Verification" below lists the supported presentation contexts for verification requests.

Table 7 - Presentation Context Table "Verification"

Presentation Context Table – “Verification”					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

4.2.1.3.1.3 SOP Specific Conformance – Verification SCU

The ECHO-SCU provides standard conformance to the Verification Service Class.

4.2.1.4 Association Acceptance Policy

4.2.1.4.1 Activity – “Receive Verification Request”

4.2.1.4.1.1 Description and Sequencing of Activity

The ARTIS icono serves as a SCP of the Verification Service Class. If the Verification SCP accepts an association, it will respond to C-ECHO-Requests. If the Called AE Title does not match any pre-configured AE Title shared by SCP, the association will be rejected.

4.2.1.4.1.2 Accepted Presentation Contexts

The ARTIS icono DICOM application will accept Presentation Contexts as shown in the following table:

Table 8 - Presentation Context Table "Verification"

Presentation Context Table – “Verification”					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

4.2.1.4.1.3 SOP Specific Conformance – Verification SCP

The ECHO-SCP provides standard conformance to the Verification Service Class.

4.2.2 Storage AE Specification

4.2.2.1 SOP Classes

The Storage AE provides Standard Conformance to the SOP Classes listed in “Table 1: Network Services” section "SOP Classes Created by the ARTIS icono" and "SOP Classes Managed by the ARTIS icono" in the “Conformance Statement Overview”.

4.2.2.2 Association Policy

Table 9: Association Policies

Application Context Name	1.2.840.10008.3.1.1.1
PDU size	32 kB [1]
Maximum number of simultaneous associations as an association acceptor	12[1]
Maximum number of simultaneous associations as an association initiator	unlimited

The ARTIS icono contains a limitation of 512 kB for the maximum PDU size. By default, the maximum PDU size is set to 32kB.

The maximum number of simultaneous receiving associations (SCP) is configurable at run time, based on the system resources available. By default, the maximum number of associations is set to 12.

There is no inherent limit to the number of outgoing associations (SCU), other than limits imposed by the computer operating system.

4.2.2.2.1 Asynchronous Nature

The ARTIS icono supports asynchronous communication (multiple outstanding transactions over a single association). On the SCU side the Window size proposed is infinite. On the SCP Side any non-infinite maximum size will be accepted.

Table 10: Asynchronous Nature as an Association Initiator

Maximum number of outstanding asynchronous transactions	10

4.2.2.2.2 Implementation Identifying Information

For Implementation Identifying Information please refer to “Table 3 - Implementation Identifying Information” in the “Conformance Statement Overview”.

[1] Default, the value is configurable

4.2.2.3 Association Initiation Policy

4.2.2.3.1 Activity – "Send Storage Request"

4.2.2.3.1.1 Description and Sequencing of Activities

The ARTIS icono serves as a SCU of the Storage Service Class. The Storage SCU is triggered by the transfer job queue or by an external retrieve request. An association request is sent to the destination AE. Upon successful negotiation of a Presentation Context, the transfer is started. Objects will be transferred sequentially on the same open association

The ARTIS icono does not provide any automated retry mechanism.

4.2.2.3.1.2 Proposed Presentation Contexts

For all Image Objects listed in Table 1 in the "Conformance Statement Overview" the Transfer Syntaxes marked with "yes" in the Image Objects Column of the table below are supported.

For all Non-Image Objects listed in Table 1 in the "Conformance Statement Overview" the Transfer Syntaxes marked with "yes" in the Non-Image Objects Column of the table below are supported.

For a distinction between Image and Non-Image Objects please refer to the DICOM Standard PS3.3 Section A.1.4 "Overview of the Composite IOD Module Content".

Table 11: Proposed Presentation Contexts for Storage

UID value	Transfer Syntax	Image Objects	Non-Image Objects
1.2.840.10008.1.2	Implicit Value Representation Little Endian native	yes	yes
1.2.840.10008.1.2.1	Explicit Value Representation Little Endian native	yes	yes
1.2.840.10008.1.2.2	Explicit Value Representation Big Endian	yes	yes
1.2.840.10008.1.2.4.50	JPEG Baseline (Process 1) lossy compressed	yes	no
1.2.840.10008.1.2.4.51	JPEG Extended (Process 2 & 4) lossy compressed	yes	no
1.2.840.10008.1.2.4.70	JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14) lossless compressed	yes	no
1.2.840.10008.1.2.4.90	JPEG 2000 Image Compression (Lossless Only) compressed	yes	no
1.2.840.10008.1.2.4.91	JPEG 2000 Image Compression lossy compressed	yes	no
1.2.840.10008.1.2.5	RLE Lossless compressed	yes	no

Depending on the configuration, the Storage SCU will choose a compressed or uncompressed Transfer Syntax among those accepted by the SCP. The Transfer Syntax chosen is the preferred one among the compressed and uncompressed ones. The preference order is the order of occurrence in the configuration. For each node it is possible to select Transfer Syntaxes,

that can be used, and Transfer Syntaxes, that are excluded. The configuration can even be extended, based on the combination of SOP Classes and supported Transfer Syntaxes.

An instance will be JPEG lossless (Process 1 and Process 2+4) compressed only if it fulfills the following criteria:

- Image is not already compressed
- Photometric Interpretation (0028,0004) is either MONOCHROME1, MONOCHROME2, RGB, YBR_FULL or YBR_FULL_422
- Bits Allocated (0028,0100) equal to 16'D or 8'D
- Bits Stored (0028,0101) is >=8
- High Bit (0028,0102) equal to Bits Stored (0028,0101) - 1
- Pixel Representation (0028,0103) equal to 0'D

An instance will be JPEG lossy compressed only if it fulfills the following criteria:

- Image is not already compressed
- Photometric Interpretation (0028,0004) is either MONOCHROME1, MONOCHROME2 or RGB
- Bits Allocated (0028,0100) equal to 16'D or 8'D
- Bits Stored (0028,0101) equal to 12'D or 8'D
- High Bit (0028,0102) equal to Bits Stored (0028,0101) - 1
- Pixel Representation (0028,0103) equal to 0'D

An instance will be JPEG 2000 lossless compressed only if it fulfills the following criteria:

- Image is not already compressed
- Photometric Interpretation (0028,0004) is neither MONOCHROME, RGB, YBR_FULL nor YBR_FULL_422
- Bits Allocated (0028,0100) neither 16'D nor 8'D

An instance will be JPEG 2000 lossy compressed only if it fulfills the following criteria:

- Image is not already compressed
- Photometric Interpretation (0028,0004) is MONOCHROME or RGB
- Bits Stored (0028,0101) equal to 12'D or 8'D

There is no extended negotiation as an SCU.

4.2.2.3.1.3 SOP specific Conformance for SOP classes

The ARTIS icono does not add or change private attributes by default, even in case objects are compressed or the image header is updated according to IHE Patient Information Reconciliation Profile.

The behavior of ARTIS icono when encountering status codes in a C-STORE response is summarized in Table 12:

Table 12: DICOM Command Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Error	Any other DIMSE Error Status	Any none null Code	Send is continued till the end. Log message is created.
Success	Image is successfully stored	0000	If configured, Storage Commitment is requested for successfully stored instances

-

Table 13 below indicates the behavior if exceptions occur:

Table 13: DICOM Command Communication Failure Behavior

Exception	Behavior
Timeout	Log message is created (Timeout configurable; default 30s)
Association Aborted	Send is failed. Log message is created.

4.2.2.3.1.4 Correction and Rearrangement

When a Study is moved to a different:

- Procedure, the Study Instance UID is overwritten with the Study Instance UID and Accession Number of the Procedure.
- Patient, the system generates a new Study Instance UID.

The system will not update references to the changed Study Instance UIDs. Therefore. it is possible that there will be broken links between Studies after such move operations.

In case of Patient Merge and Correction no UIDs are changed, therefore it is advised to delete any corrected or rearranged objects from the PACS before attempting to archive them again, to ensure that the PACS system can store them successfully.

When the Patient Position (0018,5100) attribute is corrected, the following attributes are recalculated by the system (no UIDs are changed):

1) Image Position (0020,0032)

2) Image Orientation (0020,0037)

3) Patient Orientation (0020,0020)

4) Data Collection Center (Patient) (0018,9313) (CT only)

5) Reconstruction Target Center (Patient) (0018,9318) (CT only)

6) Positioner Primary Angle (0018,1510) (XA only)

7) Positioner Secondary Angle (0018,1511) (XA only)

Also, the value of the Slice Location (0020,1041) attribute is emptied and a new Frame of Reference UID (0020,0052) is generated for the corrected series.

When the Patient Birth Date or the Study Date is corrected, the system recalculates the Patient Age. A new item containing attributes that were removed or replaced by other values is added to the Original Attribute Sequence (0400,0561).

4.2.2.4 Association Acceptance Policy

4.2.2.4.1 Activity – "Receive Storage Request"

4.2.2.4.1.1 Description and Sequencing of Activities

The ARTIS icono serves as a SCP of the Storage Service Class. The storage SCP accepts incoming C-Store Request from any configured AE Title, receives supported objects transmitted on that association and stores them in the local database.

4.2.2.4.1.2 Accepted Presentation Contexts

For all supported Transfer Objects (see "Table 1: Network Services" section "SOP Classes Created by the ARTIS icono" and "SOP Classes Managed by the ARTIS icono" in the "Conformance Statement Overview".) the Transfer Syntaxes described in Table 11: Proposed Presentation Contexts for Storage are supported.

Generally, all Presentation Contexts are accepted as long as they contain at least one suitable Transfer Syntax. All other Presentation Contexts are rejected.

There is no Extended Negotiation as an SCP

4.2.2.4.1.3 SOP-specific Conformance Statement for Storage SOP classes

The ARTIS icono conforms to the Full Storage Class at Level 2.

In case of a successful C-STORE operation, the image has successfully been written to disk either using the Explicit Little Endian format or in the compression format received.

The Storage AE of the ARTIS icono returns the status "success" when the data is stored to disk and a minimal image header validation has been performed.

The following header attributes must be available and filled:

- SOP Class UID,
- Study Instance UID,
- Series Instance UID and
- SOP Instance UID.

Table 14 below list the status codes that the ARTIS icono can return:

Table 14: Storage C-STORE Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000	Image received correctly (success notification is done after receiving, before indexing and storing)
Failure	Out-of-resource	A700	No resource left in the Short Term Storage
Failure	Unable to Process	Cxxx	Error during instance reception
Failure	Data set does not match SOP Class	A9xx	The data set is not conforming to the SOP Class contained in the resource.

Restriction: successful operation does not guarantee storage of header data in the database.

4.2.2.4.1.4 Other SOP specific behavior

If an image is received that is already stored in the database - identified by the SOP Instance UID - the new image will be ignored. The existing instance is not superseded.

4.2.3 Storage Commitment AE Specification

4.2.3.1 SOP Classes

The Storage Commitment AE of the ARTIS icono provides standard conformance to the SOP Class listed in “Table 1: Network Services” section "Storage Commitment" in the “Conformance Statement Overview”.

4.2.3.2 Association Policy

Table 15: Association Policies

Application Context Name	1.2.840.10008.3.1.1.1
PDU size	32 kB [1]
Maximum number of simultaneous associations as an association acceptor	12[1]
Maximum number of simultaneous associations as an association initiator	unlimited

The ARTIS icono contains a limitation of 512 kB for the maximum PDU size. By default, the maximum PDU size is set to 32kB.

The maximum number of simultaneous receiving associations (SCP) is configurable at run time, based on the system resources available. By default, the maximum number of associations is set to 12.

There is no inherent limit to the number of outgoing associations (SCU), other than limits imposed by the computer operating system.

4.2.3.2.1 Asynchronous Nature

The ARTIS icono supports asynchronous communication (multiple outstanding transactions over a single association). On the SCU side the Window size proposed is infinite. On the SCP Side any non-infinite maximum size will be accepted.

Table 16: Asynchronous Nature as an Association Initiator

Maximum number of outstanding asynchronous transactions	10

4.2.3.2.2Implementation Identifying Information

For Implementation Identifying Information please refer to “Table 3 - Implementation Identifying Information” in the “Conformance Statement Overview”.

4.2.3.3 Association Initiation Policy

4.2.3.3.1 Activity “Send Initial Storage Commitment”

4.2.3.3.1.1 Description and Sequencing of Activities

[1] Default, the value is configurable

The ARTIS icono serves as a SCU of the Storage Commitment Service Class. After successful transfer of Imaging Objects to a configured Archive, the Storage Commitment SCU initiates an N-Action Request, if Storage Commitment is configured. This request will be sent on a different association than the storage request.

The Storage Commitment Request will be sent out with a delay, in order to ensure that the remote node properly indexes received instances. The delay time is configurable with a default delay of 10 minutes.

The system may issue one N-ACTION Request for a complete set (bundle) of instances or issue one N-ACTION-Request per instance. This behavior is configurable; the default value is “bundled”.

The ARTIS icono will accept the N-Event-Report-Request on the same association if sent immediately after the N-ACTION-Response. However, it will not wait for it. The association is closed after three seconds.

4.2.3.3.1.2 Proposed Presentation Contexts

The ARTIS icono DICOM application supports the presentation contexts listed in the following table for the Storage Commitment Service Class.

Table 17: Proposed Presentation Contexts for Storage Commitment

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Ext. Neg.**
Name	**UID**	**Name List**	**UID List**		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

4.2.3.3.1.3 SOP specific Conformance for SOP classes

The behavior of ARTIS icono when encountering status codes in an N-ACTION response is summarized in Table 18:

Table 18: DICOM Command Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Error	Any failure that occurs	Any none null Code	Failure reported to user; corresponding object(s) will be marked as “Archived failed”
Success	All Instances are available on the remote node	0000	Success reported to user; in case failures exist, the corresponding instances will be marked as “Archived failed”

Table 19 below indicates the behavior if exceptions occur:

Table 19: DICOM Command Communication Failure Behavior

Exception	Behavior
Timeout	Failure reported to user (Timeout configurable; default 30s); the request will be retried
Association Aborted	Failure reported to user; the request will be retried

4.2.3.4 Association Acceptance Policy

4.2.3.4.1 Activity “Receive Reply to Initial Storage Commitment”

4.2.3.4.1.1 Description and Sequencing of Activities

The ARTIS icono supports the reverse role negotiation of the Storage Commitment Service Class as the SCU. It accepts incoming N-EVENT-REPORT-Request, if they do not arrive on the same association as the N-ACTION-Request.

4.2.3.4.1.2 Accepted Presentation Contexts

The ARTIS icono DICOM application supports the presentation contexts listed in the following table for the Storage Commitment Service Class.

Table 20 - Presentation Context Table "Update Flag Information"

Presentation Context Table – “Update Flag Information”					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Implicit VR Little Endian	1.2.840.10008.1.2		

4.2.3.4.1.3 SOP-specific Conformance Statement for Storage SOP classes

The Storage Commitment SCU provides standard conformance to the Storage Commitment SOP Class.

4.2.4 Query/Retrieve AE Specification

4.2.4.1 SOP Classes

The Query/Retrieve AE provides Standard Conformance to the SOP Classes listed in “Table 1: Network Services” section "Query/Retrieve” in the “Conformance Statement Overview”.

4.2.4.2 Association Policy

Table 21: Association Policies

Application Context Name	1.2.840.10008.3.1.1.1
PDU size	32 kB [1]
Maximum number of simultaneous associations as an association acceptor	12[1]
Maximum number of simultaneous associations as an association initiator	unlimited

The ARTIS icono contains a limitation of 512 kB for the maximum PDU size. By default, the maximum PDU size is set to 32kB.

The maximum number of simultaneous receiving associations (SCP) is configurable at run time, based on the system resources available. By default, the maximum number of associations is set to 12.

There is no inherent limit to the number of outgoing associations (SCU), other than limits imposed by the computer operating system.

4.2.4.2.1 Asynchronous Nature

The ARTIS icono supports asynchronous communication (multiple outstanding transactions over a single association). On the SCU side the Window size proposed is infinite. On the SCP Side any non-infinite maximum size will be accepted.

Table 22: Asynchronous Nature as an Association Initiator

Maximum number of outstanding asynchronous transactions	10

4.2.4.2.2 Implementation Identifying Information

For Implementation Identifying Information please refer to “Table 3 - Implementation Identifying Information” in the “Conformance Statement Overview”.

4.2.4.3 Association Initiation Policy

4.2.4.3.1 Activity “Querying a Remote Node” for Instances

4.2.4.3.1.1 Description and Sequencing of Activities

The ARTIS icono serves as a SCU for the following SOP Classes

[1] Default, the value is configurable

- Study Root Q/R Information Model –FIND SOP Class

Using the attributes specified by the user as Query Keys (in accordance with the query model) the Query SCU initiates a C-FIND Request and displays the responses to the user.

4.2.4.3.1.2 Proposed Presentation Contexts

The ARTIS icono will propose Presentation Contexts as shown in the following table:

Table 23: Proposed Presentation Contexts for Query

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Ext. Neg.**
Name	**UID**	**Name List**	**UID List**		
Study Root Query/ Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	Yes
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

Table 24: Extended Negotiation as an SCU

Name	UID	Extended Negotiation
Study Root Query/ Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Relational Query will be negotiated if necessary, as defined in DICOM PS3.4

4.2.4.3.1.3 SOP Specific Conformance Statement to Query SOP classes

The ARTIS icono checks for the following status codes in the Query SCP's C-FIND-Response:

Table 25: DICOM Command Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Failure	e.g. Out of Resources; Cancellation; Identifier does not match SOP Class; Unable to process	Any none null Code	Failure reported to user
Pending	All optional keys are supported the same manner as Required Keys.	FF00	Pending state is indicated to user
	Matching Operation continues; some of the optional keys were not supported the same way as the required keys	FF01	Pending state is indicated to user
Success	Query has been performed successfully.	0000	Success reported to user

Table 26 below indicates the behavior if exceptions occur:

Table 26: DICOM Command Communication Failure Behavior

Exception	Behavior
Timeout	Failure reported to user (Timeout configurable; default 30s)
Association Aborted	Failure reported to user

The ARTIS icono supports the following query levels:

- Study
- Series

Matching Keys on Instance Level is not supported by the ARTIS icono as SCU.

The following table lists the various attributes at Study and Series level, which can be used for hierarchical queries as well as return values for display. The display capabilities are highly configurable and “yes” indicates that it is possible to configure display of the data:

Table 27: Attributes supported for instance Query - SCU

Attribute Name	Tag	Type	User input	UI
Study Level				
Patient's Name	(0010,0010)	O	enter value	yes
Patient ID	(0010,0020)	O	enter value	yes
Issuer of Patient ID	(0010,0021)	O	enter value	yes
Patient’s Birth Date	(0010,0030)	O	enter value	yes
Patient's Birth Time	(0010,0032)	O	enter value	yes
Patient’s Sex	(0010,0040)	O	enter value	yes
Accession Number	(0008,0050)	O	enter value	yes
Study ID	(0020,0010)	O	enter value	yes
Study Instance UID	(0020,000D)	U	enter value	yes
Study Date	(0008,0020)	O	enter value	yes
Study Time	(0008,0030)	O	enter value	yes
Referring Physician' s Name	(0008,0090)	O	enter value	yes
Study Description	(0008,1030)	O	enter value	yes
Number of Study related Instances	(0020,1208)	O	-	yes
Modalities in Study	(0008,0061)	O	enter value	yes
Number of Study Related Series	(0020,1206)	O	-	yes
Series Level				
Modality	(0008,0060)	O	enter value	yes
Series Date	(0008,0021)	O	enter value	yes
Series Time	(0008,0031)	O	enter value	yes
Number of Series related Instances	(0020,1209)	O	-	yes

Attribute Name	Tag	Type	User input	UI
Series Number	(0020,0011)	O	enter value	yes
Series Description	(0008,103E)	O	enter value	yes
Request Attributes Sequence \ Requested Procedure ID	(0040,0275) \ (0040,1001)	O	enter value	yes
Request Attributes Sequence \ Scheduled Procedure Step ID	(0040,0275) \ (0040,0009)	O	enter value	yes
Performed Procedure Step Start Date	(0040,0244)	O	enter value	yes
Performed Procedure Step Start Time	(0040,0245)	O	enter value	yes
Series Instance UID	(0020,000E)	U	-	yes

4.2.4.3.1 Activity “Retrieve Instances from a remote node”

4.2.4.3.1.1 Description and Sequencing of Activities

The ARTIS icono serves as a SCU for the following SOP Classes

- Patient Root Q/R Information Model - MOVE SOP Class
- Study Root Q/R Information Model – MOVE SOP Class
- Patient/Study only Q/R Information Model – MOVE SOP Class.

The C-MOVE-Request is used to retrieve the selected imaging objects. The Retrieve AE supports the query model Study Root.

4.2.4.3.1.2 Proposed Presentation Contexts

The ARTIS icono proposes Presentation Contexts shown in the following table:

Table 28: Proposed Presentation Contexts for Retrieve and Activity “MOVE SCU”

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Study Root Query/Retrieve Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	No
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

4.2.4.3.1.3 SOP Specific Conformance Statement for Move SCU Classes

The presentation context is negotiated at association establishment time. When the C-MOVE-Request is processed, the Move Destination attribute (receiver of images) is ignored. However the Move Destination AE must conform to the DICOM conventions (value representation AE).

The behavior of ARTIS icono when encountering status codes in a C-MOVE response is summarized in Table 29

Table 29: DICOM Command Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Error	e.g. Out of Resources; Cancellation; Identifier does not match SOP Class; Unable to process; Move destination unknown	Any none null Code	Failure reported to user
Pending	Move Operation continues	FF00	Operation continues in background
Success	Move has been performed successfully.	0000	Success reported to user

Table 30 below indicates the behavior if exceptions occur:

Table 30: DICOM Command Communication Failure Behavior

Exception	Behavior
Timeout	Failure reported to user (Timeout configurable; default 30s)
Association Aborted	Failure reported to user

4.2.4.4 Association Acceptance Policy

The ARTIS icono does not provide SCP functionality.

4.2.5 Modality Worklist AE Specication

4.2.5.1 SOP Classes

The Modality Worklist AE provides Standard Conformance to the SOP Classes listed in “Table 1: Network Services” section “Worklist Management" in the “Conformance Statement Overview”.

4.2.5.2 Association Policy

Table 31: Association Policies

Application Context Name	1.2.840.10008.3.1.1.1
PDU size	32 kB [1]
Maximum number of simultaneous associations as an association acceptor	12[1]
Maximum number of simultaneous associations as an association initiator	unlimited

The ARTIS icono contains a limitation of 512 kB for the maximum PDU size. By default, the maximum PDU size is set to 32kB.

[1] Default, the value is configurable

The maximum number of simultaneous receiving associations (SCP) is configurable at run time, based on the system resources available. By default, the maximum number of associations is set to 12.

There is no inherent limit to the number of outgoing associations (SCU), other than limits imposed by the computer operating system.

4.2.5.2.1 Asynchronous Nature

The ARTIS icono supports asynchronous communication (multiple outstanding transactions over a single association). On the SCU side the Window size proposed is infinite. On the SCP Side any non-infinite maximum size will be accepted.

Table 32: Asynchronous Nature as an Association Initiator

Maximum number of outstanding asynchronous transactions	10

4.2.5.2.2 Implementation Identifying Information

For Implementation Identifying Information please refer to “Table 3 - Implementation Identifying Information” in the “Conformance Statement Overview”.

4.2.5.3 Association Initiation Policy

4.2.5.3.1 Activity “Querying a Remote Node” for Modality Worklist

4.2.5.3.1.1 Description and Sequencing of Activities

The ARTIS icono serves as a SCU of the Modality Worklist service. It performs worklist queries by issuing a C-FIND request at regular intervals. In addition, a worklist request can be triggered manually.

4.2.5.3.1.2 Proposed Presentation Contexts

The ARTIS icono will propose Presentation Contexts as shown in the following table:

Table 33: Proposed Presentation Contexts for Worklist

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Ext. Neg.**
Name	**UID**	**Name List**	**UID List**		
Modality Worklist-FIND	1.2.840.10008.5.1.4.31	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	No
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

4.2.5.3.1.3 SOP Specific Conformance for SOP Classes

Search Key Attributes of the Worklist C-FIND

The ARTIS icono Modality Worklist SCU supports “broad worklist queries” with all required search keys. The following tables describe the “broad query” search keys that the SCU supports. The list is configurable in ‘DICOM Modality Worklist Query’.

Table 34: Broad Query search keys

Attribute Name	Tag	Matching Key Type	Query Value
Scheduled Procedure Step			
Scheduled Procedure Step Sequence	(0040,0100)	R	
>Modality	(0008,0060)	R	"*" or <configured Modality>
>Scheduled Station AE Title	(0040,0001)	R	<own AET> or "*"[2]
>Scheduled Procedure Step Start Date	(0040,0002)	R	Range from UI[3]
>Scheduled Procedure Step Description	(0040,0007)	O	
>Scheduled Station Name	(0040,0010)	O	
>Scheduled Procedure Step Location	(0040,0011)	O	
>Scheduled Procedure Step Status	(0040,0020)	O	
>Scheduled Performing Physician's Name	(0040,0006)	O	
>Scheduled Protocol Code Sequence	(0040,0008)	O	
>>Code Value	(0008,0100)	O	
Requested Procedure Description	(0032,1060)	O	
Requested Procedure Priority	(0040,1003)	O	
Patient Transport Arrangements	(0040,1004)	O	
Requested Procedure Comments	(0040,1400)	O	
Requested Procedure Code Sequence	(0032,1064)	O	
>Code Value	(0008,0100)	O	
Requesting Physician	(0032,1032)	O	
Referring Physicians Name	(0008,0090)	O	
Current Patient Location	(0038,0300)	O	
Pregnancy Status	(0010, 21C0)	O	
Medical Alerts	(0010,2000)	O	
Allergies	(0010,2110)	O	

[2] This depends on user configuration (Administration Portal->Technical Configuration->DICOM Nodes->Local DICOM Node->Worklist) if the "own AET" is provided or not.

[3] A time window can be configured by defining how many days to look into the past and into the future (Administration Portal->Technical Configuration->DICOM Nodes->Local DICOM Node->Worklist)

Return Key Attributes of the Modality Worklist C-FIND

The ARTIS icono Modality Worklist SCU supports worklist queries with return key attributes of all types. The following tables describe the return keys that the SCU supports.

An "x" in the **UI** column indicates that the attribute may be visualized when browsing the Worklist results with the Browser. The Browser display is additionally influenced by the related Browser configuration.

Table 35: Modality Worklist C-Find Return keys

Attribute Name	Tag	Return Key Type	UI	Notes
SOP Common				
Specific Character Set	(0008,0005)	1C	-	
Scheduled Procedure Step				
Scheduled Procedure Step Sequence	(0040,0100)	1		
>Modality	(0008,0060)	1	x	
>Scheduled Station AE Title	(0040,0001)	1		"Scheduled Station AE Title" is taken as default for "Performed Station AE Title"
>Scheduled Procedure Step Start Date	(0040,0002)	1	-	
>Scheduled Procedure Step Start Time	(0040,0003)	1	-	
>Scheduled Procedure Step End Date	(0040,0004)	3	-	
>Scheduled Procedure Step End Time	(0040,0005)	3	-	
>Scheduled Performing Physician's Name	(0040,0006)	1	x	"Scheduled Performing Physician's Name" is taken as default for "Performing Physician's Name"
>Scheduled Procedure Step Description	(0040,0007)	1C	x	"Scheduled Procedure Step Description" is taken as default for "Performed Procedure Step Description"
>Scheduled Protocol Code Sequence **	(0040,0008)	1C	-	Uses universal sequence match "Scheduled Protocol Code Sequence" is taken as default for "Performed Protocol Code Sequence"
>>Code Value	(0008,0100)	1C	-	
>>Coding Scheme Designator	(0008,0102)	1C	-	
>>Coding Scheme Version	(0008,0103)	3	-	
>>Code Meaning	(0008,0104)	3	-	
>Scheduled Procedure Step ID	(0040,0009)	1	x	"Scheduled Procedure Step ID" is taken as default for "Performed Procedure Step ID"
>Scheduled Station Name	(0040,0010)	2	x	

Attribute Name	Tag	Return Key Type	UI	Notes
>Scheduled Procedure Step Location	(0040,0011)	2	-	"Scheduled Procedure Step Location" is taken as default for "Performed Location"
>Scheduled Procedure Step Status	(0040,0020)	3	-	
>Comments on the Scheduled Procedure Step	(0040,0400)	3	-	
Requested Procedure				
Study Date	(0008,0020)	3	x	
Study Time	(0008,0030)	3	x	
Referenced Study Sequence	(0008,1110)	2	-	Uses universal sequence match
>Referenced SOP Class UID	(0008,1150)	1C	-	
>Referenced SOP Instance UID	(0008,1155)	1C	-	
Study Instance UID	(0020,000D)	1	-	
Requested Procedure Description	(0032,1060)	1C	x	
Requested Procedure Code Sequence	(0032,1064)	1C	-	Uses universal sequence match "Requested Procedure Code Sequence" is taken as default for "Procedure Code Sequence"
>Code Value	(0008,0100)	1C	-	
>Coding Scheme Designator	(0008,0102)	1C	-	
>Coding Scheme Version	(0008,0103)	3	-	
>Code Meaning	(0008,0104)	3	-	
Requested Procedure ID	(0040,1001)	1	x	"Requested Procedure ID" is taken as default for "Study ID"
Reason for the Requested Procedure	(0040,1002)	3	-	
Requested Procedure Priority	(0040,1003)	2	x	
Patient Transport Arrangements	(0040,1004)	2	-	
Confidentiality Code	(0040,1008)	3	-	
Reporting Priority	(0040,1009)	3	x	
Names of intended Recipients of Results	(0040,1010)	3	-	
Requested Procedure Comments	(0040,1400)	3	-	
Imaging Service Request				
Accession Number	(0008,0050)	2	x	
Referring Physician's Name	(0008,0090)	2	x	
Requesting Physician	(0032,1032)	2	x	
Requesting Service	(0032,1033)	3	-	
Issuing Date of Imaging Service Request	(0040,2004)	3	-	

Attribute Name	Tag	Return Key Type	UI	Notes
Issuing Time of Imaging Service Request	(0040,2005)	3	-	
Placer Order Number / Imaging Service Request	(0040,2016)	3	-	Old tag (0040,2006) is retired and not used.
Filler Order Number / Imaging Service Request	(0040,2017)	3	-	Old tag (0040,2007) is retired and not used.
Order entered by …	(0040,2008)	3	-	
Order Enterer's location	(0040,2009)	3	-	
Order Callback Phone Number	(0040,2010)	3	-	
Imaging Service Request Comments	(0040,2400)	3	-	
Visit Identification				
Admission ID	(0038,0010)	2	x	
Issuer of Admission ID	(0038,0011)	3	-	
Visit Status				
Current Patient Location	(0038,0300)	2	x	
Visit Admission				
Admitting Diagnosis Description	(0008,1080)	3	x	
Admitting Date	(0038,0020)	3	-	
Patient Identification				
Patient's Name	(0010,0010)	1	x	
Patient ID	(0010,0020)	1	x	
Issuer of Patient ID	(0010,0021)	3	x	
Other Patient IDs	(0010,1000)	3	x	
Other Patient Names	(0010,1001)	3	x	
Patient's Birth Name	(0010,1005)	3	-	
Patient Demographic				
Patient's Birth Date	(0010,0030)	2	x	
Patient's Birth Time	(0010,0032)	3	x	
Patient's Sex	(0010,0040)	2	x	
Patient's Insurance Plan Code Sequence	(0010,0050)	3	-	Uses universal sequence match
>Code Value	(0008,0100)	1C	-	
>Coding Scheme Designator	(0008,0102)	1C	-	
>Coding Scheme Version	(0008,0103)	3	-	
>Code Meaning	(0008,0104)	3	-	
Patient's Age	(0010,1010)	3	-	
Patient's Size	(0010,1020)	3	x	
Patient's Weight	(0010,1030)	2	x	
Patient's Address	(0010,1040)	3	x	
Military Rank	(0010,1080)	3	x	

Attribute Name	Tag	Return Key Type	UI	Notes
Branch of Service	(0010,1081)	3	-	
Ethnic Group	(0010,2160)	3	x	
Patient Comments	(0010,4000)	3	x	
Patient Medical				
Medical Alerts	(0010,2000)	2	x	
Allergies	(0010,2110)	2	x	
Pregnancy Status	(0010,21C0)	2	x	
Smoking Status	(0010,21A0)	3	x	
Last Menstrual Date	(0010,21D0)	3	x	
Additional Patient History	(0010,21B0)	3	x	
Special Needs	(0038,0050)	2	x	

The <product> only supports a one-to-one relationship between Requested Procedure and Scheduled Procedure Steps. If multiple Schedule Procedure Steps are scheduled for a procedure, they will result in one Performed Procedure Step.

The behavior of the ARTIS icono when encountering status codes in a C-FIND response is summarized in Table 36:

Table 36: DICOM Command Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Error	e.g. Out of Resources; Cancellation; Identifier does not match SOP Class; Unable to process	Any none null Code	Failure reported to user
Pending	All optional keys are supported the same manner as Required Keys.	FF00	Pending state is indicated to user
	Matching Operation continues; some of the optional keys were not supported the same way as the required keys	FF01	Pending state is indicated to user
Success	Query has been performed successfully.	0000	Success reported to user

Table 37 below indicates the behavior if exceptions occur:

Table 37: DICOM Command Communication Failure Behavior

Exception	Behavior
Timeout	Failure reported to user (Timeout configurable; default 30s)
Association Aborted	Failure reported to user

4.2.5.4 Association Acceptance Policy

The ARTIS icono does not provide the functionality of a SCP of the Modality Worklist – Find SOP Class.

4.2.6 Modality Performed Procedure Step AE Specification

4.2.6.1 SOP Classes

The Modality Performed Procedure Step AE provides Standard Conformance to the SOP Classes listed in “Table 1: Network Services” section “Worklist Management" in the “Conformance Statement Overview”.

4.2.6.2 Association Policy

Table 38: Association Policies

Application Context Name	1.2.840.10008.3.1.1.1
PDU size	32 kB [1]
Maximum number of simultaneous associations as an association acceptor	12[1]
Maximum number of simultaneous associations as an association initiator	unlimited

The ARTIS icono contains a limitation of 512 kB for the maximum PDU size. By default, the maximum PDU size is set to 32kB.

The maximum number of simultaneous receiving associations (SCP) is configurable at run time, based on the system resources available. By default, the maximum number of associations is set to 12.

There is no inherent limit to the number of outgoing associations (SCU), other than limits imposed by the computer operating system.

4.2.6.2.1 Asynchronous Nature

The ARTIS icono supports asynchronous communication (multiple outstanding transactions over a single association). On the SCU side the Window size proposed is infinite. On the SCP Side any non-infinite maximum size will be accepted.

Table 39: Asynchronous Nature as an Association Initiator

Maximum number of outstanding asynchronous transactions	10

4.2.6.2.2 Implementation Identifying Information

For Implementation Identifying Information please refer to “Table 3 - Implementation Identifying Information” in the “Conformance Statement Overview”.

[1] Default, the value is configurable

4.2.6.3 Association Initiation Policy

4.2.6.3.1 Activity “Create Modality Performed Procedure Step”

4.2.6.3.1.1 Description and Sequencing of Activities

The ARTIS icono serves as a SCU of the Modality Performed Procedure Step SOP Class. It sends N-CREATE request to inform the Information System that a Procedure Step has been started.

4.2.6.3.1.2 Accepted Presentation Contexts

The ARTIS icono proposes Presentation Contexts as shown in the following table:

Table 40: Acceptable Presentation Contexts Activity “Create MPPS”

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Ext. Neg.**
Name	**UID**	**Name List**	**UID List**		
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

4.2.6.3.1.3 SOP specific Conformance for MPPS SOP class

The behavior of ARTIS icono when encountering status codes in an N-CREATE-RSP response is summarized in Table 41:

Table 41: MPPS N-CREATE Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Error	MPPS creation request could not be processed.	Any none null Code	MPPS is not created.
Success	MPPS creation request processed successfully.	0000	MPPS is created.

4.2.6.3.2 Activity “Update Modality Performed Procedure Step”

4.2.6.3.2.1 Description and Sequencing of Activities

When the procedure step has been finished, the ARTIS icono sends N-SET request to inform the Information System about the finalization of the procedure step (completed or discontinued).

4.2.6.3.2.2 Proposed Presentation Contexts

The ARTIS icono proposes Presentation Contexts as shown in the following table:

Table 42: Acceptable Presentation Contexts Activity "Update MPPS"

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

4.2.6.3.2.3 SOP specific Conformance for MPPS SOP class

The behavior of ARTIS icono when encountering status codes in an N-SET-RSP response is summarized in Table 43:

Table 43: MPPS N-SET Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Error	MPPS update request could not be processed.	Any none null Code	MPPS is not updated.
Success	MPPS update request could processed successfully.	0000	MPPS is updated.

4.2.6.4 Association Acceptance Policy

The ARTIS icono does not provide the functionality of a SCP of the Modality Performed Procedure Step SOP Class.

4.2.7 Print AE Specification

4.2.7.1 SOP Classes

The Print AE provides Standard Conformance to the SOP Classes listed in "Table 1: Network Services" section "Print Management" in the "Conformance Statement Overview".

4.2.7.2 Association Policy

Table 44: Association Policies

Application Context Name	1.2.840.10008.3.1.1.1
PDU size	32 kB [1]
Maximum number of simultaneous associations as an association acceptor	12[1]

[1] Default, the value is configurable

Maximum number of simultaneous associations as an association initiator	unlimited

The ARTIS icono contains a limitation of 512 kB for the maximum PDU size. By default, the maximum PDU size is set to 32kB.

The maximum number of simultaneous receiving associations (SCP) is configurable at run time, based on the system resources available. By default, the maximum number of associations is set to 12.

There is no inherent limit to the number of outgoing associations (SCU), other than limits imposed by the computer operating system.

4.2.7.2.1 Asynchronous Nature

The ARTIS icono supports asynchronous communication (multiple outstanding transactions over a single association). On the SCU side the Window size proposed is infinite. On the SCP Side any non-infinite maximum size will be accepted.

Table 45: Asynchronous Nature as an Association Initiator

Maximum number of outstanding asynchronous transactions	10

4.2.7.3 Association Initiation Policy

4.2.7.3.1 Activity Print Film

4.2.7.3.1.1 Description and Sequencing of Activities

Whenever a film-sheet is prepared by the user, it is forwarded to the Printer Job queue. As soon as the associated Printer device is available the job is activated and an association is established.

After he film sheet is internally processed, converted to a Standard/1,1 layout and the page image is sent to the printer, the status is controlled by awaiting any N-EVENT-REPORT message throughout the transfer until the last image or film-sheet is sent.

If the response from the remote application contains a status other than Success or Warning the printing is stopped and the job status is set to Aborted.

4.2.7.3.1.2 Proposed Presentation Context

The ARTIS icono proposes Presentation Contexts as shown in the following table:

Table 46: Presentation Contexts for the Activity "Print Film"

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Ext. Neg.**
Name	**UID**	**Name List**	**UID List**		
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Film Sesssion SOP Class	1.2.840.10008.5.1.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Color Image Box SOP SOP Class	1.2.840.10008.5.1.1.4.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Printer SOP Class	1.2.840.10008.5.1.1.16	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Print Job SOP Class	1.2.840.10008.5.1.1.14	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Presentation LUT SOP Class	1.2.840.10008.5.1.1.23	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

4.2.7.3.1.3 SOP Specific Conformance

The ARTIS icono Print SCU conforms to the DICOM Basic Grayscale Print Management Meta SOP Class and the Basic Color Print Management Meta SOP Class.

The application uses a configuration platform to define the properties of the connected DICOM SCP, e.g.:

- supported film sizes of the connected DICOM SCP
- supported film formats of the DICOM SCP

The printing is only suspended in the case of a failure return status of the SCP.

Basic Film Session SOP Class

The Basic Film Session information object definition describes all the user-defined parameters, which are common for all the films of a film session. The Basic Film Session refers to one or more Basic Film Boxes that are printed on one hardcopy printer.

The ARTIS icono Print Management SCU supports the following DIMSE Service elements for the Basic Film Session SOP Class as SCU:

- N-CREATE
- N-DELETE

The Basic Film Session SOP Class N-CREATE-RQ (SCU) uses the attributes listed in the table below:

Table 47: Attributes for the N-CREATE-RQ of the Basic Film Session

Attribute Name	Tag	Usage SCU	Supported Values
Number of Copies	(2000,0010)	U	1
Medium Type	(2000,0030)	U	BLUE FILM
			CLEAR FILM
			PAPER
			MAMMO BLUE FILM
			MAMMO CLEAR FILM

The number of Copies sent to the DICOM Printer is always 1, a number higher than 1 is not supported in this version.

The Affected SOP Instance UID received with N-CREATE-RSP message will be kept internally and used for later requests (e.g. N-DELETE-RQ) on the Basic Film Session.

The Basic Film Session SOP class interprets the status codes (from N-CREATE-RSP messages) listed in the table below:

Table 48: N-CREATE-RSP Status Handling Behavior for the Basic Film Session

Service Status	Further Meaning	Error Codes	Behavior
Warning	Memory Allocation not supported	B600	Print job continues, warning is logged
Success	Film session successfully created	0000	Print job continues

The N-DELETE-RQ on the Basic Film Session SOP Class is used to remove the complete Basic Film Session SOP Instance hierarchy.

Basic Film Box SOP Class

The Basic Film Box information object definition describes all user-defined parameters of one film of the film session including presentation parameters, which are common for all images on a given film sheet.

The Basic Film Box refers to one or more Image Boxes.

The ARTIS icono Print Management SCU supports the following DIMSE Service elements for the Basic Film Box SOP Class as SCU:

- N-CREATE
- N-ACTION
- N-DELETE

The Basic Film Box SOP Class N-CREATE-RQ message uses the attributes listed below. The actual values for each attribute depend on DICOM printer configuration within the ARTIS icono DICOM Print Management SCU:

Table 49: Attributes for the N-CREATE-RQ of the Basic Film Session

Attribute Name	Tag	Usage SCU	Supported Values
Image Display Format	(2010,0010)	M	STANDARD\C,R
Referenced Film Session Sequence	(2010,0500)	M	
> Referenced SOP Class UID	(0008,1150)	M	1.2.840.10008.5.1.1.1
> Referenced SOP Instance UID	(0008,1155)	M	
Film Orientation	(2010,0040)	M	PORTRAIT, LANDSCAPE
Film Size ID	(2010,0050)	M	8INX10IN, 10INX12IN, 10INX14IN, 11INX14IN,, 14INX14IN, 14INX17IN, 24CMX24CM, 24CMX30CM
Magnification Type	(2010,0060)	M	BILINEAR, CUBIC, NONE, REPLICATE
Border Density	(2010,0100)	U	BLACK, WHITE
Max Density	(2010,0130)	U	0 < Value
Min Density	(2010,0120)	U	0 < Value < 50
Required if Presentation LUT is present			
Reflective Ambient Light	(2010,0160)	U	0 < Value
Illumination	(2010,015E)	U	0 < Value
Referenced Presentation LUT Sequence	(2050,0500)	U	

For Page Mode printing, the Image Display format used is Standard\1,1.

The N-CREATE-RSP message from the Print SCP includes the Referenced Image Box Sequence with SOP Class/Instance UID pairs which will be kept internally to be further used for the subsequent Basic Image Box SOP Class N-SET-RQ messages.

When all Image Boxes (including parameters) for the film-sheet have been set, the ARTIS icono print manager will issue an N-ACTION-RQ message with the SOP Instance UID of the Basic Film Box and the Action Type ID of 1.

The affected SOP Instance UID received with N-CREATE-RSP message will be kept internally and used for later requests (e.g. N-DELETE-RQ) on the Basic Film Box.

The Basic Film Box SOP class interprets the status codes listed in the tables below:

Table 50: N-CREATE-RSP Status Handling Behavior for Basic Film Box

Service Status	Meaning	Error Codes	Behavior
Failure	There is an existing Film Box that has not been printed and N-ACTION at the Film Session level is not supported. A new Film Box will not be created when a previous Film Box has not been printed	C616	Print job is marked as failed and the reason is logged
Warning	Requested Min Density or Max Density outside of printer's operating range. The printer will use its respective minimum or maximum density value instead	B605	Print job continues and warning is logged
Success	Film Box successfully created	0000	Print job continues

Table 51: N-ACTION-RSP Status Handling Behavior for Basic Film Box

Service Status	Meaning	Error Codes	Behavior
Failure	Unable to create print job, print queue is full	C602	Print job is marked as failed and the reason is logged
	Image size is larger than images box size	C603	Print job is marked as failed and the reason is logged
	Combined Print Image size is larger than the Image Box size	C613	Print job is marked as failed and the reason is logged
Warning	Film box does not contain image box (empty page)	B603	Print job continues and warning is logged
	Image size is larger than image box size, the image has been demagnified	B604	Print job continues and warning is logged
	Image size is larger than the Image Box size. The Image has been cropped to fit.	B609	Print job continues and warning is logged
	Image size or Combined Print Image size is larger than the Image Box size. Image or Combined Print Image has been decimated to fit.	B60A	Print job continues and warning is logged
Success	Film accepted for printing	0000	Print job continues

Basic Grayscale Image Box SOP Class

The Basic Grayscale Image Box information object definition is the presentation of an image and image related data in the image area of a film. The Basic Image Box information describes the presentation parameters and image pixel data, which apply to a single image of a sheet of film.

The Grayscale Image Box SOP Class uses only the N-SET-RQ with the attributes listed in the table below:

Table 52: Attributes for N-SET-RQ of Basic Grayscale Image Box

Attribute Name	Tag	Usage SCU	Supported Values
Image Position	(2020,0010)	M	1
Basic Grayscale Image Sequence	(2020,0110)	M	
> Samples per Pixel	(0028,0002)	M	1
> Photometric Interpretation	(0028,0004)	M	MONOCHROME2
> Rows	(0028,0010)	M	
> Columns	(0028,0011)	M	
> Pixel Aspect Ratio	(0028,0034)	M	
> Bits Allocated	(0028,0100)	M	8,16
> Bits Stored	(0028,0101)	M	8,12
> High Bit	(0028,0102)	M	7,11
> Pixel Representation	(0028,0103)	M	0
> Pixel Data	(7FE0,0010)	M	

The Basic Grayscale Image Box SOP class interprets the status codes as listed below:

Table 53: N-SET-RSP Status Handling Behavior for the Basic Grayscale Image Box SOP Class

Service Status	Further Meaning	Error Codes	Behavior
Failure	Image contains more pixel than printer can print in Image Box	C603	Print job is marked as failed and the reason is logged
	Insufficient memory in printer to store the image	C605	Print job is marked as failed and the reason is logged
	Combined Print Image size is larger than the Image Box size	C613	Print job is marked as failed and the reason is logged
Warning	Image size is larger than image box size, the image has been de-magnified.	B604	Print job continues and the reason is logged
	Requested MinDensity or MaxDensity outside of Printer's operating range	B605	Print job continues and the reason is logged
	Image size is larger than the Image Box size. The Image has been cropped to fit.	B609	Print job continues and warning is logged
	Image size or Combined Print Image size is larger than the Image Box size. Image or Combined Print Image has been decimated to fit.	B60A	Print job continues and warning is logged
Success	Image successfully stored in Image Box	0000	Print job continues

Basic Color Image Box SOP Class

The Basic Color Image Box information object definition is the presentation of an image and image related data in the image area of a film. The Basic Image Box information describes the presentation parameters and image pixel data, which apply to a single image of a sheet of film.

The Color Image Box SOP Class uses only the N-SET-RQ with the attributes listed below:

Table 54: Attributes for N-SET-RQ of Basic Color Image Box

Attribute Name	Tag	Usage SCU	Supported Values
Image Position	(2020,0010)	M	1
BASIC Color Image Sequence	(2020,0111)	M	
> Samples per Pixel	(0028,0002)	M	3
> Photometric Interpretation	(0028,0004)	M	RGB
> Planar Configuration	(0028,0006)	M	0
> Rows	(0028,0010)	M	
> Columns	(0028,0011)	M	
> Pixel Aspect Ratio	(0028,0034)	M	
> Bits Allocated	(0028,0100)	M	8
> Bits Stored	(0028,0101)	M	8
> High Bit	(0028,0102)	M	7
> Pixel Representation	(0028,0103)	M	0
> Pixel Data	(7FE0,0010)	M	

The Color Image Box SOP class interprets the status codes listed below:

Table 55: N-SET-RSP Status Handling Behavior for the Color Grayscale Image Box

Service Status	Meaning	Error Codes	Behavior
Failure	Image contains more pixel than printer can print in Image Box	C603	Print job is marked as failed and the reason is logged
	Insufficient memory in printer to store the image	C605	Print job is marked as failed and the reason is logged
	Combined Print Image size is larger than the Image Box size	C613	Print job is marked as failed and the reason is logged
Warning	Image size larger than image box size	B604	Print job continues and the reason is logged
	Image size is larger than the Image Box size. The Image has been cropped to fit.	B609	Print job continues and warning is logged
	Image size or Combined Print Image size is larger than the Image Box size. Image or Combined Print Image has been decimated to fit.	B60A	Print job continues and warning is logged
Success	Image successfully stored in Image Box	0000	Print job continues

Presentation LUT SOP Class

The objective of the Presentation LUT is to realize image hardcopy printing tailored for specific modalities, applications and user preferences.

The output of the Presentation LUT is Presentation Values (P-Values). P-Values are approximately related to human perceptual response. They are intended to facilitate common input for hardcopy. P-Values are intended to be independent of the specific class or characteristics of the hardcopy device.

The ARTIS icono Print Management SCU supports the following DIMSE Service elements for the Basic Film Session SOP Class as SCU:

- N-CREATE
- N-DELETE

The Presentation LUT SOP Class uses only the N-CREATE-RQ with the attributes listed below:

Table 56: Attributes for N-CREATE-RQ of Presentation LUT SOP Class

Attribute Name	Tag	Usage SCU	Supported Values
Presentation LUT Shape	(2050,0020)	U	IDENTITY

The affected SOP Instance UID received with N-CREATE-RSP message will be kept internally and is used for later requests on the Basic Film Box (N-CREATE-RQ) and on the Presentation LUT (N-DELETE-RQ).

The Presentation LUT SOP class interprets the status codes listed below:

Table 57: N-CREATE-RSP Status Handling Behavior for the Presentation LUT SOP Class

Service Status	Further Meaning	Error Codes	Behavior
Warning	Requested MinDensity or MaxDensity outside of HCD's operating range. HCD will use its respective minimum or maximum density value instead.	B605	Print job continues and the reason is logged
Success	Presentation LUT successfully created	0000	Print job continues

Printer SOP Class

The Printer SOP Class provides the possibility to monitor the status of the hardcopy printer in a synchronous and in an asynchronous way.

When used synchronously the ARTIS icono Print SCU uses the N-GET-RQ to request information about the printer status. It uses the attributes listed in the table below.

Table 58: Attributes afor N-GET-RQ of the Printer SOP Class

Attribute Name	Tag	Usage SCP	Supported Values
Printer Status	(2110,0010)	M	NORMAL, FAILURE, WARNING
Printer Status Info	(2110,0020)	M	

The command communication failure behavior listed below applies to all SOP classes used for the “Print Film” activity:

Table 59: DICOM Command Communication Failure Behavior

Exception	Behavior
Timeout	Failure reported to user (Timeout configurable; default 30s)
Association Aborted	Failure reported to user

4.2.7.4 Association Acceptance Policy

4.2.7.4.1 Activity Print Film

4.2.7.4.1.1 Description and Sequencing of Activities

The ARTIS icono supports the reverse role negotiation of the Printer SOP Class. Receiving the N-EVENT-REPORT-RQ from a printer the ARTIS icono is asynchronously informed about changes of the printer status.

4.2.7.4.1.2 Accepted Presentation Context

The ARTIS icono accepts Presentation Contexts as shown in the following table:

Table 60: Presentation Contexts for the Activity “Print Film”

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Printer SOP Class	1.2.840.10008.5.1.1.16	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

4.2.7.4.1.3 SOP Specific Conformance

The arguments of the N-EVENT-REPORT-RQ are defined in the table below:

Table 61: Attributes for the N-EVENT-REPORT-RQ of the Printer SOP Class

Event-type Name	Event	Attributes	Tag	Usage SCU
Normal	1	-	-	-
Warning	2	Printer Status Info	(2110,0020)	U
Failure	3	Printer Status Info	(2110,0020)	U

4.2.7.4.2 Activity Print Management

4.2.7.4.2.1 Description and Sequencing of Activities

The ARTIS icono supports the reverse role negotiation of the Print Job SOP Class. Receiving the N-EVENT-REPORT-RQ from a printer the ARTIS icono is asynchronously informed about the status of a print job for monitoring its progress.
Accepted Presentation Context

4.2.7.4.2.2 Accepted Presentation Context

The ARTIS icono accepts Presentation Contexts as shown in the following table:

Table 62: Presentation Contexts for the Activity "Print Management"

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Ext. Neg.**
Name	**UID**	**Name List**	**UID List**		
Print Job SOP Class	1.2.840.10008.5.1.1.14	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

4.2.7.4.2.3 SOP Specific Conformance

Attributes that can be handled by the Print AE of the product are listed in the table below.

Table 63: Attributes for the N-EVENT-REPORT-RQ of the Print Job SOP Class

Event-type Name	Event	Attributes	Tag	Usage SCU
Pending	1	Execution Status Info	(2100,0030)	U
		Print Job ID	(2100,0010)	-- (Print Queue Management SOP Class not supported)
		Film Session Label	(2000,0050)	U
		Printer Name	(2110,0030)	U
Printing	2	Execution Status Info	(2100,0030)	U
		Print Job ID	(2100,0010)	-- (Print Queue Management SOP Class not supported)
		Film Session Label	(2000,0050)	U
		Printer Name	(2110,0030)	U
Done	3	Execution Status Info	(2100,0030)	U
		Print Job ID	(2100,0010)	-- (Print Queue Management SOP Class not

Event-type Name	Event	Attributes	Tag	Usage SCU
				supported)
		Film Session Label	(2000,0050)	U
		Printer Name	(2110,0030)	U
Failure	4	Execution Status Info	(2100,0030)	U
		Print Job ID	(2100,0010)	-- (Print Queue Management SOP Class not supported)
		Film Session Label	(2000,0050)	U
		Printer Name	(2110,0030)	U

4.3 Network Interfaces

4.3.1 Physical Network Interface

The ARTIS icono provides DICOM 3.0 TCP/IP network communication support as defined in Part 8 of the DICOM Standard. The network communication is independent from the physical medium over which TCP/IP executes; it inherits this from the Windows OS system upon which it executes.

4.3.2 Additional Protocols

none

4.3.3 IPv4 and IPv6 Support

IPv4 and IPv6 are supported. Regarding IPv6 please note, that the complete networking infrastructure in the hospital (fire-walls, DNS-Servers, …) must support IPv6 in order to get a functioning communication.

4.4 Configuration

4.4.1 AE Title/Presentation Address Mapping

AE Titles shall be unique within the hospital. A common way to achieve that is to use the hostname as part of the AE Titles. The string can be up to 16 characters and must not contain any extended characters. Only 7-bit ASCII characters (excluding Control Characters) are allowed according to the DICOM Standard.

4.4.1.1 Local AE Titles

The ARTIS icono allows to configure AETitles, Ports and Services in any wished way. Default delivery is that all services are using the same AE title and only one port number. In case the connected systems cannot handle this default, the customer service engineer is able to configure for each service its own AE title and Port number.

Parameter	Configurable	Default Value
Default AE title	Yes	hostname in uppercase characters; limited to 16 characters
Default Port	Yes	104

4.4.1.2 Remote AE Title/Presentation Address Mapping

4.4.1.2.1 Remote Association Initiators

All relevant remote applications that may setup DICOM associations towards ARTIS icono need to be configured in ARTIS icono, before the association can be established. This behavior is configurable, but it is recommended, not to change this behavior.

The mapping of external AE Titles to TCP/IP addresses and ports is configurable and initially set at the time of installation by Installation Personnel. Changes can later on also be performed by the local system administrator. The Application Entity Titles and supported transfer syntaxes need to be known for configuration.

To enable a fast and efficient configuration possibility Siemens will deliver templates for known configuration examples, so that the behavior (usage of one AE title, default port numbers, supported services) is determined already through the template.

Remote Application Entities can be configured without restarting the process.

4.4.1.2.2 Remote Association Acceptors

For remote applications that shall be able to accept DICOM associations from ARTIS icono, the following information needs to be available:

- Application Entity Title
- Host Name / IP address on which the remote application service runs
- Port number on which the remote application accepts association requests.

The remote system will be indicated in the UI of ARTIS icono with a logical name, that is also entered when configuring the node in the administration UI.

To enable a fast and efficient configuration possibility Siemens will deliver templates for known configuration examples, so that the behavior (usage of one AE title, default port numbers, supported services) is determined already through the template.

Remote Application Entities can be configured without restarting the process.

4.4.2 Parameters

The next table lists configuration parameters, which are true for all Application Entities.

Table 64: Parameter List

Parameter	Configurable	Default Value
max PDU size	Yes	32768 Bytes
time-out for accepting/rejecting an association request	Yes	30 s
time-out for responding to an association open/close request	Yes	30 s
time-out for accepting a message over network	Yes	30 s
time-out for waiting for data between TCP/IP-packets	Yes	5 s
time-outs for waiting for a Service Request/Response message from the remote node (Storage SCP/SCU)	Yes	30 s
time-outs for waiting for a Service Request/Response message from the remote node (Query/Retrieve SCP/SCU)	Yes	30 s
time-out for waiting for a C-MOVE-RSP	No	1200 s
number of image collection before saving to database	Yes	20
max matches query limit	Yes	100
max number of parallel receiving associations	Yes	12

5 Media Interchange

5.1 Implementation Model

5.1.1 Application Data Flow Diagram

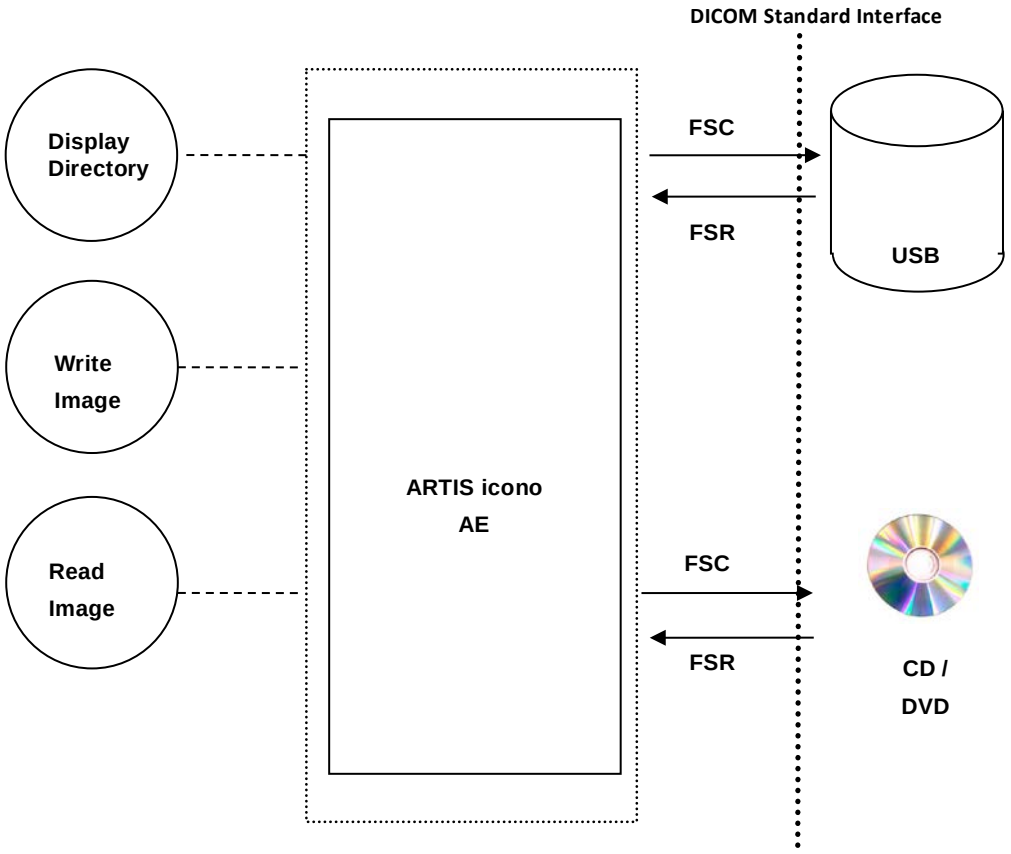

Figure 6: Media Interchange Application Data Flow Diagram

The ARTIS icono provides the functionality to Import or Export DICOM Instances from and to the File System. During export, a DICOMDIR may also be generated (user selection). A complete ISO Image ready-to-burn can also be generated. All SOP Classes defined in Table 1 are supported for the Import/Export functionality.

5.1.2 Functional definitions of AEs

The ARTIS icono application is capable of

- creating a new File-set in the File System (Export to ...)
- importing SOP Instances from the medium onto local storage
- writing the File-sets DICOMDIR information into the file system and joining it to an ISO image.

5.1.3 Sequencing of Real-World Activities

Whenever data is written to an external media, ARTIS icono creates a DICOMDIR from the selected data and creates an ISO image of the selected data on the local hard disk. Depending on the selected data and options (selected media size, with or without compression) either General Purpose CD profile or DVD-J2K profile are used.

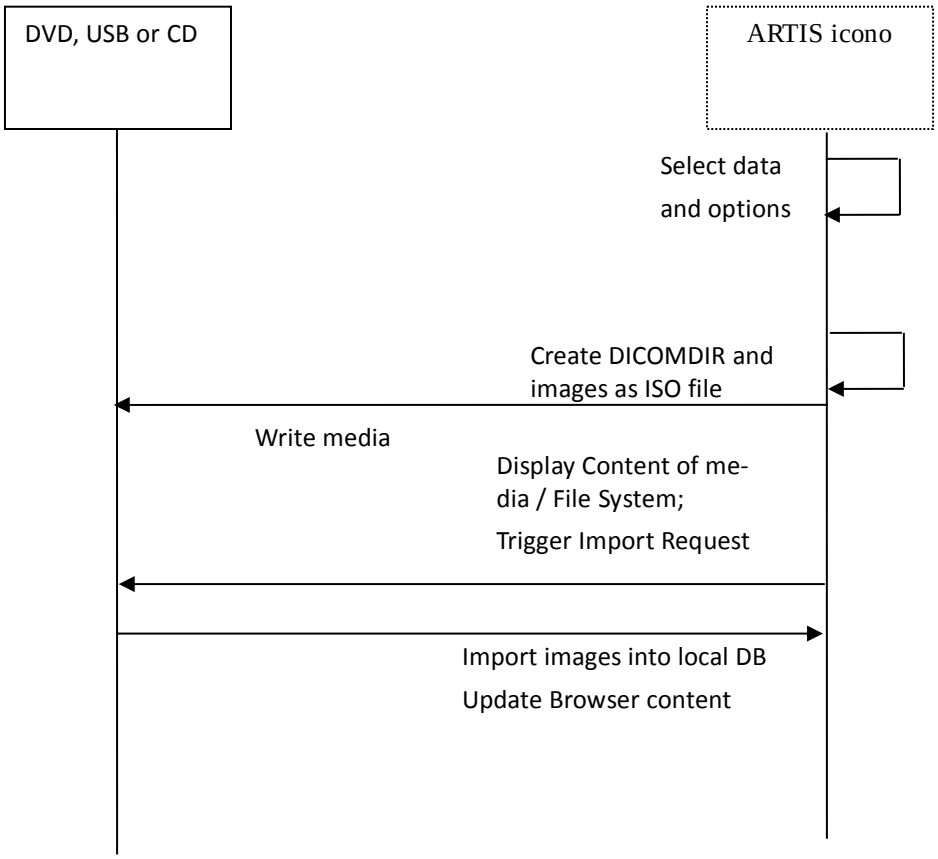

Figure 7: Sequence diagram – Media creation

5.1.4 File Meta Information for Implementation Class and Version

This section describes the values assigned to the File Meta Information attributes (see part PS 3.10) that pertain to the Implementation Class and Version. The implementation Class UID and the Implementation Version name in the File Meta Header are the same as the values specified for networking.

Table 65: Implementation Class/Version Name - Media Interchange

File Meta Information Version	0001
Implementation Class UID	1.3.12.2.1107.5.4.5
Implementation Version Name	“ SIEMENS_HEL_VE20"

5.2 AE SPECIFICATIONS

5.2.1 Media Storage AE – Specification

The ARTIS icono provides conformance to the following Application Profiles as an FSC as well as an FSR. The FSU role is only supported only on a non-optical storage device (e.g. USB stick).

In addition, augmented conformance is provided to store extra data attributes important for the full feature support of the *syngo®*-based products. Details are listed below:

Table 66: Media - Application Profiles and Real-World Activities

Application Profiles Supported	Real-World Activity	Role	Service Class Option
AUG-GEN-CD	Browse Directory Information Import into Application Export to local Archive Media	FSR , FSC , FSU	Interchange
AUG-GEN-DVD			
AUG- GEN-DVD-J2K			
AUG- GEN-USB-J2K			
STD-GEN-CD	Browse Directory Information Import into Application Export to local Archive Media	FSR , FSC , FSU	Interchange
STD-GEN-DVD			
STD-GEN-DVD-J2K			
STD-GEN-USB-J2K			

5.2.1.1 Real-World Activities

5.2.1.1.1 Activity “Browse Directory Information”

The ARTIS icono acts as FSR using the interchange option when requested to read the media directory.

The ARTIS icono will read the DICOMDIR and insert those directory entries that are valid for the application profiles supported, into a local database. The database then is used for browsing media contents.

Note: The "Icon Image Sequence" is also supported in DICOMDIR. But only those Icon Images with "Bits Allocated" (0028,0100) equal to 8 and size of 64x64 or 128x128 pixels are imported into database and are visible in the Browser.

5.2.1.1.2 Real World Activity "Import into Application"

The ARTIS icono application acts as FSR using the interchange option when requested to read SOP Instances from the medium into the application.

The SOP Instance selected from the media directory will be copied into the running Application. Only SOP Instances, that are valid for the application profile supported and supported by ARTIS icono, can be retrieved from media.

5.2.1.1.3 Real-World Activity "Export to local Archive Media"

The ARTIS icono application acts as FSU (for media with existing DICOM file-set) or FSC (media not initialized) using the interchange option when requested to copy SOP Instances from the local storage to local Archive Medium. The activity as FSU is only possible as long as the local burning SW of ARTIS icono has not already processed the generated ISO file.

The ARTIS icono application will receive a list of SOP Instances to be copied to the local archive medium. Depending on the profile selected (Standard: uncompressed, with DICOMDIR; Patient: compressed with DICOMDIR) the SOP Instances will be taken and an ISO file is being generated that includes the DICOMDIR and the corresponding objects.

It is then up to ARTIS icono local configuration (if equipped with a local media burner) to burn the ISO file to the appropriate media.

5.2.1.2 SOP Classes and Transfer Syntaxes

These Application Profiles are based on the Media Storage Service Class with the Interchange Option. The ARTIS icono provides Standard Conformance to the SOP Classes listed in "Table 1: Network Services" section "SOP Classes Created by the ARTIS icono" and "SOP Classes Managed by the ARTIS icono" in the "Conformance Statement Overview".

Using the Application Profiles supporting compression (AUG- GEN-DVD-J2K, AUG- GEN-USB-J2K, STD-GEN-DVD-J2K, STD-GEN-USB-J2K) the following Transfer Syntaxes are supported:

Table 67: Transfer Syntaxes for STD-GEN-DVD-J2K and STD-GEN-USB-J2K

UID value	Transfer Syntax	Image Objects	Non-Image Objects
1.2.840.10008.1.2.1	Explicit Value Representation Little Endian native	yes	yes
1.2.840.10008.1.2.4.50	JPEG Baseline (Process 1) lossy compressed	yes	no
1.2.840.10008.1.2.4.51	JPEG Extended (Process 2 & 4) lossy compressed	yes	no
1.2.840.10008.1.2.4.70	JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14) lossless compressed	yes	no
1.2.840.10008.1.2.4.90	JPEG 2000 Image Compression (Lossless Only) compressed	yes	no

UID value	Transfer Syntax	Image Objects	Non-Image Objects
1.2.840.10008.1.2.4.91	JPEG 2000 Image Compression lossy compressed	yes	no
1.2.840.10008.1.2.5	RLE Lossless compressed	yes	no

Using the Application Profiles that do not support compression (AUG- GEN-DVD, AUG- GEN-USB, STD-GEN-DVD, STD-GEN-USB) only Explicit Value Representation Little Endian (1.2.840.10008.1.2.1) is supported.

5.3 AUGMENTED AND PRIVATE APPLICATION PROFILES

5.3.1 Augmented Application Profiles

The standard application profiles are augmented with private object Siemens CSA Non-Image.

Table 68: Private SOP Classes and Transfer Syntaxes for Augmented Media Profiles

Information Object Definition	SOP Class UID	Transfer Syntax UID	FSC	FSR
CSA Non-Image Storage	1.3.12.2.1107.5.9.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	O	M

The Siemens non-image is typically used for raw data and 3D private data.

5.4 MEDIA CONFIGURATION

none

6 Support of Extended Character Sets

The ARTIS icono DICOM application supports the following character sets as defined in the four tables below:

Table 69: Single-Byte Character Sets without Code Extension

Character Set Description	Defined Term	ISO registration number	Character Set
Default repertoire	none	ISO_IR 6	ISO 646:
Latin alphabet No. 1	ISO_IR 100	ISO_IR 100	Supplementary set
		ISO_IR 6	ISO 646:
Latin alphabet No. 2	ISO_IR 101	ISO_IR 101	Supplementary set
		ISO_IR 6	ISO 646
Latin alphabet No. 3	ISO_IR 109	ISO_IR 109	Supplementary set
		ISO_IR 6	ISO 646
Latin alphabet No. 4	ISO_IR 110	ISO_IR 110	Supplementary set
		ISO_IR 6	ISO 646
Cyrillic	ISO_IR 144	ISO_IR 144	Supplementary set
		ISO_IR 6	ISO 646
Arabic	ISO_IR 127	ISO_IR 127	Supplementary set
		ISO_IR 6	ISO 646
Greek	ISO_IR 126	ISO_IR 126	Supplementary set
		ISO_IR 6	ISO 646
Hebrew	ISO_IR 138	ISO_IR 138	Supplementary set
		ISO_IR 6	ISO 646
Latin alphabet No. 5	ISO_IR 148	ISO_IR 148	Supplementary set
		ISO_IR 6	ISO 646
Japanese	ISO_IR 13	ISO_IR 13	JIS X 0201: Katakana
		ISO_IR 14	JIS X 0201: Romaji
Thai	ISO_IR166	ISO_IR166	TIS 620-253 (1990)
		ISO_IR 6	ISO 646

Table 70: Single-Byte Characters Sets with Code Extension

Character Set Description	Defined Term	Standard for Code Extension	ESC sequence	ISO registration number	Character Set
Default repertoire	ISO 2022 IR 6	ISO 2022	ESC 02/08 04/02	ISO-IR 6	ISO 646
Latin alphabet No.1	ISO 2022 IR 100	ISO 2022	ESC 02/13 04/01	ISO-IR 100	Supplementary set

		ISO 2022	ESC 02/08 04/02	ISO-IR 6	ISO 646
Latin alphabet No.2	ISO 2022 IR 101	ISO 2022	ESC 02/13 04/02	ISO-IR 101	Supplementary set
		ISO 2022	ESC 02/08 04/02	ISO-IR 6	ISO 646
Latin alphabet No.3	ISO 2022 IR 109	ISO 2022	ESC 02/13 04/03	ISO-IR 109	Supplementary set
		ISO 2022	ESC 02/08 04/02	ISO-IR 6	ISO 646
Latin alphabet No.4	ISO 2022 IR 110	ISO 2022	ESC 02/13 04/04	ISO-IR 110	Supplementary set
		ISO 2022	ESC 02/08 04/02	ISO-IR 6	ISO 646

Multi-Byte Character Sets without Code Extension

Table 71: Multi-Byte Character Sets without Code Extension

Character Set Description	Defined Term	ISO registration number	Character Set
Unicode	ISO_IR 192	ISO 10646	Unicode in UTF-8
Chinese	GB18030	GB18030	GB 18030-2000 (China Association for Standardization)

Table 72: Multi-Byte Character Sets with Code Extension

Character Set Description	Defined Term	Standard for Code Extension	ESC sequence	ISO registration number	Character Set
Japanese	ISO 2022 IR 159	ISO 2022	ESC 02/04 02/08 04/04	ISO-IR 159	JIS X 0212: Supplementary Kanji set
Korean	ISO 2022 IR 149	ISO 2022	ESC 02/04 02/09 04/03	ISO-IR 149	KS X 1001: Hangul and Hanja

All Special Character Sets (SCS) listed above are supported for incoming Data. When creating new Instances, the system will use the default SCS (or SCS List) configured on the machine.

When there is a mismatch between the given character set in attribute (0008,0005) and the characters in an IOD received by the system, then the following measures are taken to make the characters DICOM conform:

- Convert each illegal character to a '?'.

There are three categories of character sets which have to be differentiated because of their different encoding formats:

- Conventional ISO character sets: ISO_IR 6, ISO 2022 IR 6, ISO_IR 100, etc.
  → encoded in ISO 2022
- ISO_IR 192 → encoded in UTF-8
- GB18030 → encoded in GB18030

It is not possible to recognize the following mismatches automatically on receiving or importing:

- An attribute value is encoded in ISO_IR 192 ←→ (0008,0005) contains a conventional ISO character set as primary character set
- An attribute value is encoded in GB18030 ←→ (0008,0005) contains a conventional ISO character set as primary character set
- An attribute value is encoded in ISO 2022 ←→ (0008,0005) contains ISO_IR 192
- An attribute value is encoded in ISO 2022 ←→ (0008,0005) contains GB18030

An IOD that contains one of the above-mentioned inconsistencies is not DICOM conform. As these kinds of inconsistencies cannot be recognized by the system, the IOD will not be rejected but the character data might be corrupted.

The ARTIS icono supports Kanji characters in the byte zones after 74 (79, 7A, 7B and 7C).

7 Attribute confidentiality profiles

7.1 De-identification

The ARTIS icono application can de-identify attributes, when exporting to Media. Three different levels of de-identification are supported:

- Full de-identification
- Reduced de-identification
- Service de-identification

The user needs to select the appropriate de-identification level during export.

For full and reduced de-identification private attributes are not included in anonymized studies. For service de-identification all private attributes are included in anonymized Studies.

In the following table for attributes marked with:

- 'Yes' - data are anonymized
- 'No' - data are kept

Table 73: Application Level Confidentiality Profile attributes (standard tags)

DICOM Tag	Attribute Name	Full	Reduced	Service
(0002,0003)	Media Storage SOP Instance UID	Yes	No	No
(0004,1511)	Referenced SOP Instance UID in File	Yes	No	No
(0008,0014)	Instance Creator UID	Yes	No	No
(0008,0015)	Instance Coercion DateTime	Yes	No	No
(0008,0018)	SOP Instance UID	Yes	No	Yes
(0008,0020)	Study Date	Yes	No	No
(0008,0021)	Series Date	Yes	No	No
(0008,0022)	Acquisition Date	Yes	No	No
(0008,0023)	Content Date	Yes	No	No
(0008,0024)	Overlay Date	Yes	No	No
(0008,0025)	Curve Date	Yes	No	No
(0008,002A)	Acquisition DateTime	Yes	No	No
(0008,0030)	Study Time	Yes	No	No
(0008,0031)	Series Time	Yes	No	No
(0008,0032)	Acquisition Time	Yes	No	No
(0008,0033)	Content Time	Yes	No	No
(0008,0034)	Overlay Time	Yes	No	No
(0008,0035)	Curve Time	Yes	No	No
(0008,0050)	Accession Number	Yes	Yes	No

DICOM Tag	Attribute Name	Full	Reduced	Service
(0008,0058)	Failed SOP Instance UID List	Yes	No	No
(0008,0080)	Institution Name	Yes	Yes	No
(0008,0081)	Institution Address	Yes	Yes	No
(0008,0082)	Institution Code Sequence	Yes	Yes	No
(0008,0090)	Referring Physician's Name	Yes	Yes	Yes
(0008,0092)	Referring Physician's Address	Yes	Yes	Yes
(0008,0094)	Referring Physician's Telephone Numbers	Yes	Yes	Yes
(0008,0096)	Referring Physician's Identification Sequence	Yes	Yes	No
(0008,010D)	Context Group Extension Creator UID	Yes	No	No
(0008,0201)	Time zone Offset From UTC	Yes	No	No
(0008,1010)	Station Name	Yes	Yes	Yes
(0008,1030)	Study Description	Yes	Yes	No
(0008,103E)	Series Description	Yes	Yes	No
(0008,1040)	Institutional Department Name	Yes	Yes	No
(0008,1048)	Physician(s) of Record	Yes	Yes	Yes
(0008,1049)	Physician(s) of Record Identification Sequence	Yes	Yes	No
(0008,1050)	Performing Physicians' Name	Yes	Yes	Yes
(0008,1052)	Performing Physicians' Identification Sequence	Yes	Yes	No
(0008,1060)	Name of Physician(s) Reading Study	Yes	Yes	Yes
(0008,1062)	Physician Reading Study Identification Sequence	Yes	Yes	No
(0008,1070)	Operators' Name	Yes	Yes	Yes
(0008,1072)	Operators' Identification Sequence	Yes	Yes	No
(0008,1080)	Admitting Diagnoses Description	Yes	Yes	No
(0008,1084)	Admitting Diagnoses Code Sequence	Yes	Yes	No
(0008,1110)	Referenced Study Sequence	Yes	No	No
(0008,1111)	Referenced Performed Procedure Step Sequence	Yes	No	No
(0008,1120)	Referenced Patient Sequence	Yes	Yes	No
(0008,1140)	Referenced Image Sequence	Yes	No	No
(0008,1155)	Referenced SOP Instance UID	Yes	No	No
(0008,1195)	Transaction UID	Yes	No	No
(0008,2111)	Derivation Description	Yes	No	No
(0008,2112)	Source Image Sequence	Yes	No	No
(0008,3010)	Irradiation Event UID	Yes	No	No
(0008,4000)	Identifying Comments	Yes	Yes	No
(0008,9123)	Creator Version UID	Yes	No	No
(0010,0010)	Patient's Name	Yes	Yes	Yes
(0010,0020)	Patient ID	Yes	Yes	Yes
(0010,0021)	Issuer of Patient ID	Yes	Yes	No
(0010,0030)	Patient's Birth Date	Yes	Yes	Yes

DICOM Tag	Attribute Name	Full	Reduced	Service
(0010,0032)	Patient's Birth Time	Yes	Yes	No
(0010,0040)	Patient's Sex	Yes	No	No
(0010,0050)	Patient's Insurance Plan Code Sequence	Yes	Yes	Yes
(0010,0101)	Patient's Primary Language Code Sequence	Yes	Yes	Yes
(0010,0102)	Patient's Primary Language Modifier Code Sequence	Yes	Yes	Yes
(0010,1000)	Other Patient IDs	Yes	Yes	Yes
(0010,1001)	Other Patient Names	Yes	Yes	Yes
(0010,1002)	Other Patient IDs Sequence	Yes	Yes	Yes
(0010,1005)	Patient's Birth Name	Yes	Yes	Yes
(0010,1010)	Patient's Age	Yes	No	No
(0010,1020)	Patient's Size	Yes	No	No
(0010,1030)	Patient's Weight	Yes	No	No
(0010,1040)	Patient Address	Yes	Yes	Yes
(0010,1050)	Insurance Plan Identification	Yes	Yes	No
(0010,1060)	Patient's Mother's Birth Name	Yes	Yes	Yes
(0010,1080)	Military Rank	Yes	Yes	No
(0010,1081)	Branch of Service	Yes	Yes	No
(0010,1090)	Medical Record Locator	Yes	Yes	No
(0010,1100)	Referenced Patient Photo Sequence	Yes	Yes	No
(0010,2000)	Medical Alerts	Yes	Yes	No
(0010,2110)	Allergies	Yes	Yes	No
(0010,2150)	Country of Residence	Yes	Yes	No
(0010,2152)	Region of Residence	Yes	Yes	No
(0010,2154)	Patient's Telephone Number	Yes	Yes	Yes
(0010,2160)	Ethnic Group	Yes	No	No
(0010,2180)	Occupation	Yes	Yes	No
(0010,21A0)	Smoking Status	Yes	No	No
(0010,21B0)	Additional Patient's History	Yes	Yes	Yes
(0010,21C0)	Pregnancy Status	Yes	No	No
(0010,21D0)	Last Menstrual Date	Yes	No	No
(0010,21F0)	Patient's Religious Preference	Yes	Yes	No
(0010,2203)	Patient Sex Neutered	Yes	No	No
(0010,2297)	Responsible Person	Yes	Yes	No
(0010,2299)	Responsible Organization	Yes	Yes	No
(0010,4000)	Patient Comments	Yes	Yes	Yes
(0018,0010)	Contrast Bolus Agent	Yes	Yes	No
(0018,1000)	Device Serial Number	Yes	Yes	No
(0018,1002)	Device UID	Yes	No	No

DICOM Tag	Attribute Name	Full	Reduced	Service
(0018,1004)	Plate ID	Yes	Yes	No
(0018,1005)	Generator ID	Yes	Yes	No
(0018,1007)	Cassette ID	Yes	Yes	No
(0018,1008)	Gantry ID	Yes	Yes	No
(0018,1030)	Protocol Name	Yes	Yes	No
(0018,1400)	Acquisition Device Processing Description	Yes	Yes	No
(0018,2042)	Target UID	Yes	No	No
(0018,4000)	Acquisition Comments	Yes	Yes	No
(0018,700A)	Detector ID	Yes	Yes	No
(0018,9424)	Acquisition Protocol Description	Yes	Yes	No
(0018,9516)	Start Acquisition DateTime	Yes	No	No
(0018,9517)	End Acquisition DateTime	Yes	No	No
(0018,A003)	Contribution Description	Yes	Yes	No
(0020,000D)	Study Instance UID	Yes	No	Yes
(0020,000E)	Series Instance UID	Yes	No	Yes
(0020,0010)	Study ID	Yes	Yes	No
(0020,0052)	Frame of Reference UID	Yes	No	No
(0020,0200)	Synchronization Frame of Reference UID	Yes	No	No
(0020,3401)	Modifying Device ID	Yes	Yes	No
(0020,3404)	Modifying Device Manufacturer	Yes	Yes	No
(0020,3406)	Modified Image Description	Yes	Yes	No
(0020,4000)	Image Comments	Yes	Yes	No
(0020,9158)	Frame Comments	Yes	Yes	No
(0020,9161)	Concatenation UID	Yes	No	No
(0020,9164)	Dimension Organization UID	Yes	No	No
(0028,1199)	Palette Color Lookup Table UID	Yes	No	No
(0028,1214)	Large Palette Color Lookup Table UID	Yes	No	No
(0028,4000)	Image Presentation Comments	Yes	Yes	No
(0032,0012)	Study ID Issuer	Yes	Yes	No
(0032,1020)	Scheduled Study Location	Yes	Yes	No
(0032,1021)	Scheduled Study Location AE Title	Yes	Yes	No
(0032,1030)	Reason for Study	Yes	Yes	No
(0032,1032)	Requesting Physician	Yes	Yes	No
(0032,1033)	Requesting Service	Yes	Yes	No
(0032,1060)	Requested Procedure Description	Yes	Yes	No
(0032,1070)	Requested Contrast Agent	Yes	Yes	No
(0032,4000)	Study Comments	Yes	Yes	No
(0038,0004)	Referenced Patient Alias Sequence	Yes	Yes	No
(0038,0010)	Admission ID	Yes	Yes	No

DICOM Tag	Attribute Name	Full	Reduced	Service
(0038,0011)	Issuer of Admission ID	Yes	Yes	No
(0038,001E)	Scheduled Patient Institution Residence	Yes	Yes	No
(0038,0020)	Admitting Date	Yes	No	No
(0038,0021)	Admitting Time	Yes	No	No
(0038,0040)	Discharge Diagnosis Description	Yes	Yes	No
(0038,0050)	Special Needs	Yes	Yes	No
(0038,0060)	Service Episode ID	Yes	Yes	No
(0038,0061)	Issuer of Service Episode ID	Yes	Yes	No
(0038,0062)	Service Episode Description	Yes	Yes	No
(0038,0300)	Current Patient Location	Yes	Yes	No
(0038,0400)	Patient's Institution Residence	Yes	Yes	No
(0038,0500)	Patient State	Yes	Yes	No
(0038,4000)	Visit Comments	Yes	Yes	No
(0040,0001)	Scheduled Station AE Title	Yes	Yes	No
(0040,0002)	Scheduled Procedure Step Start Date	Yes	No	No
(0040,0003)	Scheduled Procedure Step Start Time	Yes	No	No
(0040,0004)	Scheduled Procedure Step End Date	Yes	No	No
(0040,0005)	Scheduled Procedure Step End Time	Yes	No	No
(0040,0006)	Scheduled Performing Physician Name	Yes	Yes	No
(0040,0007)	Scheduled Procedure Step Description	Yes	Yes	No
(0040,000B)	Scheduled Performing Physician Identification Sequence	Yes	Yes	No
(0040,0010)	Scheduled Station Name	Yes	Yes	No
(0040,0011)	Scheduled Procedure Step Location	Yes	Yes	No
(0040,0012)	Pre-Medication	Yes	Yes	No
(0040,0241)	Performed Station AE Title	Yes	Yes	No
(0040,0242)	Performed Station Name	Yes	Yes	No
(0040,0243)	Performed Location	Yes	Yes	No
(0040,0244)	Performed Procedure Step Start Date	Yes	No	No
(0040,0245)	Performed Procedure Step Start Time	Yes	No	No
(0040,0250)	Performed Procedure Step End Date	Yes	No	No
(0040,0251)	Performed Procedure Step End Time	Yes	No	No
(0040,0253)	Performed Procedure Step ID	Yes	Yes	No
(0040,0254)	Performed Procedure Step Description	Yes	Yes	No
(0040,0275)	Request Attributes Sequence	Yes	Yes	No
(0040,0280)	Comments on Performed Procedure Step	Yes	Yes	No
(0040,0555)	Acquisition Context Sequence	Yes	Yes	No
(0040,1001)	Requested Procedure ID	Yes	Yes	No
(0040,1004)	Patient Transport Arrangements	Yes	Yes	No

DICOM Tag	Attribute Name	Full	Reduced	Service
(0040,1005)	Requested Procedure Location	Yes	Yes	No
(0040,1010)	Names of Intended Recipient of Results	Yes	Yes	No
(0040,1011)	Intended Recipients of Results Identification Sequence	Yes	Yes	No
(0040,1101)	Person Identification Code Sequence	Yes	Yes	No
(0040,1102)	Person Address	Yes	Yes	No
(0040,1103)	Person Telephone Numbers	Yes	Yes	No
(0040,1400)	Requested Procedure Comments	Yes	Yes	No
(0040,2001)	Reason for Imaging Service Request	Yes	Yes	No
(0040,2008)	Order Entered By	Yes	Yes	No
(0040,2009)	Order Enterer Location	Yes	Yes	No
(0040,2010)	Order Callback Phone Number	Yes	Yes	No
(0040,2016)	Placer Order Number of Imaging Service Request	Yes	Yes	No
(0040,2017)	Filler Order Number of Imaging Service Request	Yes	Yes	No
(0040,2400)	Imaging Service Request Comments	Yes	Yes	No
(0040,3001)	Confidentiality Constraint on Patient Data Description	Yes	Yes	No
(0040,4005)	Scheduled Procedure Step Start DateTime	Yes	No	No
(0040,4010)	Scheduled Procedure Step Modification DateTime	Yes	No	No
(0040,4011)	Expected Completion Date Time	Yes	No	No
(0040,4023)	Referenced General Purpose Scheduled Procedure Step Transaction UID	Yes	No	No
(0040,4025)	Scheduled Station Name Code Sequence	Yes	Yes	No
(0040,4027)	Scheduled Station Geographic Location Code Sequence	Yes	Yes	No
(0040,4028)	Performed Station Name Code Sequence	Yes	Yes	No
(0040,4030)	Performed Station Geographic Location Code Sequence	Yes	Yes	No
(0040,4034)	Scheduled Human Performers Sequence	Yes	Yes	No
(0040,4035)	Actual Human Performers Sequence	Yes	Yes	No
(0040,4036)	Human Performers Organization	Yes	Yes	No
(0040,4037)	Human Performers Name	Yes	Yes	No
(0040,4050)	Performed Procedure Step Start DateTime	Yes	No	No
(0040,4051)	Performed Procedure Step End DateTime	Yes	No	No
(0040,4052)	Procedure Step Cancellation DateTime	Yes	No	No
(0040,A027)	Verifying Organization	Yes	Yes	No
(0040,A073)	Verifying Observer Sequence	Yes	Yes	No
(0040,A075)	Verifying Observer Name	Yes	Yes	No
(0040,A078)	Author Observer Sequence	Yes	Yes	No
(0040,A07A)	Participant Sequence	Yes	Yes	No

DICOM Tag	Attribute Name	Full	Reduced	Service
(0040,A07C)	Custodial Organization Sequence	Yes	Yes	No
(0040,A088)	Verifying Observer Identification Code Sequence	Yes	Yes	No
(0040,A123)	Person Name	Yes	Yes	No
(0040,A124)	UID	Yes	Yes	No
(0040,A171)	Observation UID	Yes	No	No
(0040,A172)	Referenced Observation UID (Trial)	Yes	No	No
(0040,A192)	Observation Date (Trial)	Yes	No	No
(0040,A193)	Observation Time (Trial)	Yes	No	No
(0040,A307)	Current Observer (Trial)	Yes	Yes	No
(0040,A352)	Verbal Source (Trial)	Yes	Yes	No
(0040,A353)	Address (Trial)	Yes	Yes	No
(0040,A354)	Telephone Number (Trial)	Yes	Yes	No
(0040,A358)	Verbal Source Identifier Code Sequence (Trial)	Yes	Yes	No
(0040,A402)	Observation Subject UID (Trial)	Yes	No	No
(0040,A730)	Content Sequence	Yes	Yes	No
(0040,DB0C)	Template Extension Organization UID	Yes	No	No
(0040,DB0D)	Template Extension Creator UID	Yes	No	No
(0070,0001)	Graphic Annotation Sequence	Yes	Yes	No
(0070,0084)	Content Creator's Name	Yes	Yes	No
(0070,0086)	Content Creator's Identification Code Sequence	Yes	Yes	No
(0070,031A)	Fiducial UID	Yes	No	No
(0088,0140)	Storage Media Fileset UID	Yes	No	No
(0088,0200)	Icon Image Sequence	Yes	Yes	No
(0088,0904)	Topic Title	Yes	Yes	No
(0088,0906)	Topic Subject	Yes	Yes	No
(0088,0910)	Topic Author	Yes	Yes	No
(0088,0912)	Topic Keywords	Yes	Yes	No
(0400,0100)	Digital Signature UID	Yes	Yes	No
(0400,0402)	Referenced Digital Signature Sequence	Yes	Yes	No
(0400,0403)	Referenced SOP Instance MAC Sequence	Yes	Yes	No
(0400,0404)	MAC	Yes	Yes	No
(0400,0550)	Modified Attributes Sequence	Yes	Yes	No
(0400,0561)	Original Attributes Sequence	Yes	Yes	No
(2030,0020)	Text String	Yes	Yes	No
(3006,0024)	Referenced Frame of Reference UID	Yes	No	No
(3006,00C2)	Related Frame of Reference UID	Yes	No	No
(3008,0105)	Source Serial Number	No	No	No
(300A,0013)	Dose Reference UID	Yes	No	No
(300E,0008)	Reviewer Name	Yes	Yes	No

DICOM Tag	Attribute Name	Full	Reduced	Service
(4000,0010)	Arbitrary	Yes	Yes	No
(4000,4000)	Text Comments	Yes	Yes	No
(4008,0042)	Results ID Issuer	Yes	Yes	No
(4008,0102)	Interpretation Recorder	Yes	Yes	No
(4008,010A)	Interpretation Transcriber	Yes	Yes	No
(4008,010B)	Interpretation Text	Yes	Yes	No
(4008,010C)	Interpretation Author	Yes	Yes	No
(4008,0111)	Interpretation Approver Sequence	Yes	Yes	No
(4008,0114)	Physician Approving Interpretation	Yes	Yes	No
(4008,0115)	Interpretation Diagnosis Description	Yes	Yes	No
(4008,0118)	Results Distribution List Sequence	Yes	Yes	No
(4008,0119)	Distribution Name	Yes	Yes	No
(4008,011A)	Distribution Address	Yes	Yes	No
(4008,0202)	Interpretation ID Issuer	Yes	Yes	No
(4008,0300)	Impressions	Yes	Yes	No
(4008,4000)	Results Comments	Yes	Yes	No
(50xx,xxxx)	Curve Data	Yes	Yes	No
(60xx,0100)	Overlay Bits Allocated	Yes	Yes	No
(60xx,0102)	Overlay Bit Position	Yes	Yes	No
(60xx,3000)	Overlay Data	Yes	Yes	No
(60xx,4000)	Overlay Comments	Yes	Yes	No
(FFFA,FFFA)	Digital Signatures Sequence	Yes	Yes	Yes
(FFFC,FFFC)	Data Set Trailing Padding	Yes	Yes	Yes

8 Security

8.1 Security Profiles

Time Synchronization Profiles: The ARTIS icono acts as an NTP Client in the Maintain Time Transaction.

8.2 Association Level Security

It is possible to configure whether the SCP will only answer to known AETs or to any AET.

8.3 Application Level Security

- For configuration and Maintenance, Service Technician must login with a separate password.

9 Annexes

9.1 IOD Contents

9.1.1 Created SOP Instances

9.1.1.1 X-Ray Angiographic Image Standard Extended SOP Class

The ARTIS icono system will create images during acquisition and with post processing applications. Those will be encoded as XA Standard Extended SOP Class. Images created during post processing will be marked as derived. Please see the following table for a complete overview of supplied Type 1/2/3 Standard and additional Private Attributes:

The Standard DICOM Modules will be used to encode ECG data.

9.1.1.1.1 "Acquired Image" or derived XA image

Table 74 - XA acquired or derived image

Attribute Name	Tag	Value
Specific Character Set	(0008,0005)	From Configuration / RIS
Image Type	(0008,0008)	*See "9.5.1.8 SOP Common Module - Image Type Extensions"*
SOP Class UID	(0008,0016)	1.2.840.10008.5.1.4.1.1.12.1
SOP Instance UID	(0008,0018)	
Study Date	(0008,0020)	<yyyymmdd>
Series Date	(0008,0021)	<yyyymmdd>
Acquisition Date	(0008,0022)	Date of Original Acquisition (X-Ray event)
Content Date	(0008,0023)	<yyyymmdd> (Date of pixel data creation) Note: in Resize or Ready Process mode pixel data is created at date of transfer
Study Time	(0008,0030)	<hhmmss>
Series Time	(0008,0031)	<hhmmss>
Acquisition Time	(0008,0032)	Time of Original Acquisition (X-Ray event) Note: For Store Monitor images this is the specific time of the frame acquisition
Content Time	(0008,0033)	<hhmmss> (Time of pixel data creation) Note: in Resize or Ready Process mode pixel data is created at date of transfer
Accession Number	(0008,0050)	From RIS or "Accession No." input
Modality	(0008,0060)	XA
Manufacturer	(0008,0070)	Siemens

Attribute Name	Tag	Value
Institution Name	(0008,0080)	From Configuration
Institution Address	(0008,0081)	From Configuration
Referring Physician's Name	(0008,0090)	From RIS or input
Station Name	(0008,1010)	From Configuration
Study Description	(0008,1030)	From RIS or “Study” input
Procedure Code Sequence	(0008,1032)	From RIS
>Code Value	(0008,0100)	From RIS
>Coding Scheme Designator	(0008,0102)	From RIS
>Code Meaning	(0008,0104)	From RIS
Series Description	(0008,103E)	User input (Label), “Organ Program” name or type of object, e.g.: Radiation Dose Information
Performing Physician's Name	(0008,1050)	From RIS or input
Operator's Name	(0008,1070)	“Operator 1”\”Operator 2” input
Admitting Diagnosis Description	(0008,1080)	From RIS or input
Manufacturer's Model Name	(0008,1090)	AXIOM-Artis
Referenced Performed Procedure Step Sequence	(0008,1111)	
>Referenced SOP Class UID	(0008,1150)	
>Referenced SOP Instance UID	(0008,1155)	
Referenced Image Sequence	(0008,1140)	For biplane images
>Referenced SOP Class UID	(0008,1150)	
>Referenced SOP Instance UID	(0008,1155)	
Derivation Description	(0008,2111)	Notes about transformation steps
Start Trim	(0008,2142)	<1st frame to display>
Stop Trim	(0008,2143)	<last frame to display>
Recommended Display Frame Rate	(0008,2144)	(in f/s)
Irradiation Event UID	(0008,3010)	
Patient's Name	(0010,0010)	From RIS or input
Patient ID	(0010,0020)	From RIS or input
Issuer Of Patient ID	(0010,0021)	From RIS
Patient's Birth Date	(0010,0030)	From RIS or input
Patient's Birth Time	(0010,0032)	From RIS

Attribute Name	Tag	Value
Patient's Sex	(0010,0040)	From RIS or input
Other Patient IDs	(0010,1000)	From RIS
Other Patient Names	(0010,1001)	From RIS
Patient's Birth Name	(0010,1005)	From RIS
Patient's Age	(0010,1010)	Calculated from “Date of Birth” input
Patient's Size	(0010,1020)	From RIS or input (in meters)
Patient‘s Weight	(0010,1030)	From RIS or input (in kilograms)
Patient’s Address	(0010,1040)	From RIS or input
Military Rank	(0010,1080)	From RIS
Branch Of Service	(0010,1081)	From RIS
Medical Alerts	(0010,2000)	From RIS
Allergies	(0010,2110)	From RIS
Ethnic Group	(0010,2160)	From RIS
Smoking Status	(0010,21A0)	From RIS
Pregnancy Status	(0010,21C0)	From RIS
Last Menstrual Date	(0010,21D0)	From RIS
Patient Comment	(0010,4000)	From RIS or “Patient Comment” input
Contrast/Bolus Agent	(0018,0010)	From organ program settings
Cine Rate	(0018,0040)	<acquired frame rate>
KVP	(0018,0060)	<peak KV used> (KV)
Device Serial Number	(0018,1000)	<modality serial number>
Software Version	(0018,1020)	
Protocol Name	(0018,1030)	“Organ Program” input
Contrast Bolus Ingredient	(0018,1048)	From organ program settings
Frame Time	(0018,1063)	(msec/frame) for special objects
Frame Time Vector	(0018,1065)	<number of Frame values>(msec)
Distance Source to Detector	(0018,1110)	Source Image Receptor Distance (SID) (mm)
Distance Source to Patient	(0018,1111)	Source Object Distance (SOD) (mm) From auto calibration or manual calibration
Estimated Radiographic Magnification Factor	(0018,1114)	<Ratio of SID/SOD>

Attribute Name	Tag	Value
Exposure Time	(0018,1150)	<duration of x-Ray exposure>(msec)
X-Ray Tube Current	(0018,1151)	(mA)
Exposure in µAs	(0018,1153)	Average per frame value * number of frames
Average Pulse Width	(0018,1154)	(msec)
Radiation Setting	(0018,1155)	SC | GR
Radiation Mode	(0018,115A)	PULSED
Image and Fluoroscopy Area Dose Product	(0018,115E)	(dGy*cm*cm)
Intensifier Size	(0018,1162)	<(zoomed) diameter> (mm)
Imager Pixel Spacing	(0018,1164)	(mm)
Grid	(0018,1166)	FOCUSED | NONE
Focal Spots	(0018,1190)	(mm)
Positioner Motion	(0018,1500)	STATIC | DYNAMIC
Positioner Primary Angle	(0018,1510)	(degrees); 0 with DYNAMIC
Positioner Secondary Angle	(0018,1511)	(degrees); 0 with DYNAMIC
Positioner Primary Angle Increment	(0018,1520)	Only with DYNAMIC (absolute values)
Positioner Secondary Angle Increment	(0018,1521)	Only with DYNAMIC (absolute values)
Shutter Shape	(0018,1600)	RECTANGULAR
Shutter Left Vertical Edge	(0018,1602)	<column number left edge>
Shutter Right Vertical Edge	(0018,1604)	<column number right edge>
Shutter Upper Horizontal Edge	(0018,1606)	<row number upper edge>
Shutter Lower Horizontal Edge	(0018,1608)	<row number lower edge>
Collimator Shape	(0018,1700)	RECTANGULAR
Collimator Left Vertical Edge	(0018,1702)	<column number left edge>
Collimator Right Vertical Edge	(0018,1704)	<column number right edge>
Collimator Upper Horizontal Edge	(0018,1706)	<row number upper edge>
Collimator Lower Horizontal Edge	(0018,1708)	<row number lower edge>
Patient Position	(0018,5100)	Mandatory “Patient Position” input
Detector Description	(0018,7006)	
Detector ID	(0018,700A)	
Detector Binning	(0018,701A)	1\1, 2\2, 3\3 or 4\4

Attribute Name	Tag	Value
Detector Element Spacing	(0018,7022)	
Exposure Time in µs	(0018,8150)	
X-Ray Tube Current in µA	(0018,8151)	
Private Creator	(0019,00xx)	SIEMENS SMS-AX VIEW 1.0
Attributes according to "9.5.1.2 Angio Viewing Module"		
Study Instance UID	(0020,000D)	From RIS or system generated
Series Instance UID	(0020,000E)	
Study ID	(0020,0010)	From RIS Requested Procedure ID or system created
Series Number	(0020,0011)	
Acquisition Number	(0020,0012)	
Instance Number	(0020,0013)	
Patient Orientation	(0020,0020)	calculated from "Patient Position" input and from Gantry coordinate data.
Laterality	(0020,0060)	input via L or R marker annotation, else absent
Images in Acquisition	(0020,1002)	
Image Comments	(0020,4000)	Not encoded or "SM" or "REF"
Private Creator	(0021,00xx)	SIEMENS SMS-AX ACQ 1.0
Attributes according to "9.5.1.3 Angio Acquisition Data Module"		
Private Creator	(0023,00xx)	SIEMENS SMS-AX QUANT 1.0
Attributes according to "9.5.1.4 Angio Quantification Module" if image was calibrated		
Private Creator	(0025,00xx)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0
Attributes according to "9.5.1.5 Original Image Info Module"		
Samples per Pixel	(0028,0002)	1
Photometric Interpretation	(0028,0004)	MONOCHROME2
Number of Frames	(0028,0008)	
Frame Increment Pointer	(0028,0009)	(0018,1063) or (0018,1065)
Rows	(0028,0010)	Up to 2584
Columns	(0028,0011)	Up to 2584
Pixel Spacing	(0028,0030)	
Bits Allocated	(0028,0100)	8 | 16

Attribute Name	Tag	Value
Bits Stored	(0028,0101)	8 | 12 | 16
High Bit	(0028,0102)	7 | 11 | 15
Pixel Representation	(0028,0103)	0
Pixel Spacing Calibration Type	(0028,0A02)	GEOMETRY after acquisition, may change after manual calibration
Pixel Spacing Calibration Description	(0028,0A04)	Description of used calibration method
Burned in Annotation	(0028,0301)	Set to “YES” for reports saved as XA image (Exam Protocol)
Pixel Intensity Relationship	(0028,1040)	LIN | LOG | DISP
Window Center	(0028,1050)	<NAT value>
Window Width	(0028,1051)	<NAT value>
VOI LUT Function	(0028,1056)	LINEAR | SIGMOID not set means linear windowing
Recommended Viewing Mode	(0028,1090)	SUB | NAT
Lossy Image Compression	(0028,2110)	
Modality LUT Sequence	(0028,3000)	(if [0028,1040] = LOG)
>LUT Descriptor	(0028,3002)	<num of LUT entries>, <first pixel val mapped>, <Entry bits alloc>
>Modality LUT Type	(0028,3004)	US
>LUT data	(0028,3006)	<array of data, accord. descriptor>
Representative Frame Number	(0028,6010)	<e.g. frame number of Icon Image>
Mask Subtraction Sequence	(0028,6100)	
>Mask Operation	(0028,6101)	AVG_SUB
>Mask Frame Numbers	(0028,6110)	
Private Creator	(0029,00xx)	CARDIO-D.R. 1.0
Attributes according to "9.5.1.1 Edge Enhancement Module"		
Private Creator	(0029,00xx)	SIEMENS AX OOG
Attributes according to "9.5.1.6 OOG Overlay Module*"*		
Study ID Issuer	(0032,0012)	internal study identifier
Requesting Physician	(0032,1032)	From RIS
Study Comments	(0032,4000)	Patient Registration input
Admission ID	(0038,0010)	From RIS

Attribute Name	Tag	Value
Special Needs	(0038,0050)	From RIS
Current Patient Location	(0038,0300)	From RIS
Performed Procedure Step Start Date	(0040,0244)	
Performed Procedure Step Start Time	(0040,0245)	
Performed Procedure Step ID	(0040,0253)	
Performed Procedure Step Description	(0040,0254)	
Request Attributes Sequence	(0040,0275)	
>Requested Procedure Description	(0032,1060)	From RIS
>Scheduled Procedure Step Description	(0040,0007)	From RIS
>Scheduled Procedure Step ID	(0040,0009)	From RIS
>Requested Procedure ID	(0040,1001)	From RIS or “Request ID” input
Image Horizontal Flip	(0070,0041)	N
Image Horizontal Flip	(0070,0042)	0
Entrance Dose in mGy	(0040,8302)	<accumulated reference air kerma for this event>(mGy)
Curve Dimensions	(5000,0005)	2
Number of Points	(5000,0010)	<number of data points>
Type of Data	(5000,0020)	ECG
Axis Units	(5000,0030)	DPPS\NONE (DPPS = data points per second)
Data Value Presentation	(5000,0103)	0000h
Curve Data Descriptor	(5000,0110)	0\1
Coordinate Start Value	(5000,0112)	0
Coordinate Step Value	(5000,0114)	<sampling rate>
Curve Data	(5000,3000)	
Overlay Rows	(60xx,0010)	
Overlay Columns	(60xx,0011)	
Number of Frames in Overlay	(60xx,0015)	<number>
Overlay Description	(60xx,0022)	
Overlay Type	(60xx,0040)	G
Overlay Origin	(60xx,0050)	1\1

Attribute Name	Tag	Value
Image Frame Origin	(60xx,0051)	1
Overlay Bits Allocated	(60xx,0100)	1 or 16
Overlay Bit Position	(60xx,0102)	12 or 0 (if Overlay encoded in [60xx,3000])
Overlay Data	(60xx,3000)	<contains Overlay>
Private Creator	(7FDF,00xx)	SIEMENS SYNGO DATA PADDING
Attributes according to "9.5.1.7 Data Padding Module*"*		
Pixel Data	(7FE0,0010)	

9.1.1.1.2 Exam Protocol as XA Image

The ARTIS icono will generate an X-Ray Radiation Dose SR object to store all dose and acquisition relevant information for all irradiation events. An excerpt of this information is displayed to the user as "Exam Protocol". This displayed Exam Protocol can be converted to an XA multi-frame image. The pixel data contain the protocol data as an image.

All patient level, study level and equipment information is taken from the acquired images of the related procedure.

Acquisition specific information (e.g. KVP, mA) and further information is set either to default values (type 1), set to zero length (type 2) or not set at all.

The overlay graphic and curve module are not used with Exam Protocol as XA image.

9.1.1.2 SR Document SOP Class

The ARTIS icono will create an X-Ray Radiation Dose SR for each Study performed on the system. Please refer to next sections to learn about the SR implementation and the definition of the underlying SR template.

9.1.1.2.1 X-Ray Radiation Dose SR SOP Class

The ARTIS icono will create X-Ray Radiation Dose SRs implementing TID 10001 *Projection X-Ray Radiation Dose*

For every single irradiation event an entry is made into the SR.
The scope of accumulation is "Performed Procedure Step". Updating of a SR will not change the SOP Instance UID.

All patient level, study level and equipment information is taken from the acquired images of the related procedure.

Attribute mapping from Modality Worklist to X-Ray Radiation Dose SR is equal to the mapping into acquired images.

For details on the contents of the Accumulated X-Ray Dose Container (TID 10002), please see table below (one container per plane).

Table 75 - Details on Accumulated X-Ray Dose Data

Concept Name	Comments on Concept Value
Dose Area Product Total	The accumulated dose area product (measured with dose chamber near collimator) applied during fluoro and acquisition performed in this plane [Gym^2].

Concept Name	Comments on Concept Value
Dose (RP) Total	Calculated accumulated dose at the RP applied during fluoro and acquisition performed in this plane [Gy]. (Not corrected for backscatter)
Fluoro Dose Area Product Total	The accumulated dose area product applied during fluoro performed in this plane [Gym^2].
Fluoro Dose (RP) Total	Calculated accumulated dose at the RP applied during fluoro performed in this plane [Gy].
Total Fluoro Time	Total time of fluoro performed in this plane [s]. (pedal time)
Acquisition Dose Area Product Total	The accumulated dose area product applied during acquisition performed in this plane [Gym^2].
Acquisition Dose (RP) Total	Calculated accumulated dose at the RP applied during acquisition performed in this plane [Gy].
Total Acquisition Time	Total time of acquisition performed in this plane [s]. (pedal time)
Reference Point Definition	The Interventional Reference Point (IRP) for the system is always "15cm from Isocenter toward Source"

For details on the contents of the Irradiation Event Container (TID 10003), please see table below (one container per irradiation event).

Table 76 - Details on Dose SR Irradiation Event Data

Concept Name	Comments on Concept Value
Acquisition Plane	"Plane A", "Plane B" or "Single Plane" (for single-plane system)
DateTime Started	Start of X-Ray
Irradiation Event Type	"Fluoroscopy" - irradiation applied by Fluoro pedal "Stationary Acquisition" - irradiation applied by Acquisition pedal, no system-controlled movement "Stepping Acquisition" - irradiation applied by Acquisition pedal, system-controlled stepping movement "Rotational Acquisition" - irradiation applied by Acquisition pedal, system-controlled rotational movement
Acquisition Protocol	Name of the organ program used to parameterize this irradiation event
Patient Table Relationship	"headfirst" or "feet-first"
Patient Orientation	"recumbent"
Patient Orientation Modifier	"supine", "prone", "right lateral decubitus" or "left lateral decubitus"
Reference Point Definition	The Interventional Reference Point (IRP) for the system is always "15cm from Isocenter toward Source"

Concept Name	Comments on Concept Value
Irradiation Event UID	UID identifying this event.
Dose Area Product	The dose area product (measured with dose chamber near collimator) applied by this irradiation event in [Gym^2].
Patient Equivalent Thickness	Equivalent water value of the patient/object [mm]
Dose (RP)	Calculated dose at the RP in [Gy]. (Not corrected for backscatter)
Positioner Primary Angle	Patient-based angle of the primary plane in [deg]. For “Rotational Acquisition” this is the start position of the movement.
Positioner Secondary Angle	Patient-based angle of the secondary plane in [deg]. For “Rotational Acquisition” this is the start position of the movement.
Positioner Primary End Angle	Only with “Rotational Acquisition” - this is the primary plane end position of the movement.
Positioner Secondary End Angle	Only with “Rotational Acquisition” - this is the secondary plane end position of the movement.
Table Head Tilt Angle	Angle of the head-feet axis of the table relative to the horizontal plane. Positive values indicate that the head of the table is upwards [deg].
Table Horizontal Rotation Angle	Rotation of the table in the horizontal plane (clockwise when looking from above the table) [deg].
Table Cradle Tilt Angle	Angle of the left-right axis of the table relative to the horizontal plane. Positive values indicate that the left of the table is upwards [deg].
Collimated Field Area	Collimated field area at detector plane in [m^2].
Collimated Field Height	Collimated field height at detector plane in [mm].
Collimated Field Width	Collimated field width at detector plane in [mm].
X-Ray Filters	A CONTAINER with the subsequent items marked with a “>”
>X-Ray Filter Type	Either “No Filter” or “Flat filter” is set.
>X-Ray Filter Material	If filter is used, a value of “Copper or Copper Compound” is set.
>X-Ray Filter Thickness Minimum	Minimal thickness of the applied filter in [mm].
>X-Ray Filter Thickness Maximum	Maximal thickness of the applied filter in [mm]. ARTIS icono uses uniform filter thickness, so this value always matches the minimal thickness value.
Fluoro Mode	Only with “Fluoroscopy” - ARTIS icono uses “Pulsed” Fluoroscopy only
Pulse Rate	The used pulse rate for this irradiation event in [pulse/s].
Number of Pulses	The number of X-Ray pulses generated during performance of this irradiation event.

Concept Name	Comments on Concept Value
KVP	The mean-value for the voltage applied by this irradiation event in [kV].
X-Ray Tube Current	The mean-value for the tube current applied by this irradiation event in [mA].
Exposure Time	Time calculated according to the term “Number of Pulses” x “Average Pulse Width”. It is the ”X-Ray on” time and not the “pedal time” for this irradiation event [ms].
Pulse Width	The mean-value for the pulse width for each X-Ray pulse applied by this irradiation event in [ms].
Irradiation Duration	Clock time from the start of loading time of the first pulse until the loading time trailing edge of the final pulse in the same irradiation event [s]
Exposure	Cumulative x-ray exposure value calculated according to the term “X-Ray Tube Current” x “Exposure Time” in [µAs]
Focal Spot Size	Size of the focal spot in [mm] that was used during the performance of this irradiation event.
Distance Source to Detector	The Source Image Distance (SID) as it is valid at the end of the irradiation event in [mm].
Distance Source to Isocenter	The value of the Source to Isocenter distance in [mm].
Table Longitudinal Position	Table Longitudinal Position wrt isocenter. Table motion towards LAO is positive assuming that the patient is positioned supine and its head is in normal position [mm]. Value at start of irradiation event in case of table movement.
Table Lateral Position	Table Lateral Position wrt isocenter. Table motion towards CRA is positive assuming that the patient is positioned supine and its head is in normal position [mm]. Value at start of irradiation event in case of table movement.
Table Height Position	Table Height Position wrt isocenter. Table motion downwards is positive [mm]. Value at start of irradiation event in case of table movement.
Table Longitudinal End Position	Table Longitudinal Position at end of irradiation event [mm]. Only set when table was moved during the event.
Table Lateral End Position	Table Lateral Position at end of irradiation event [mm]. Only set when table was moved during the event.
Table Height End Position	Table Height Position at end of irradiation event [mm]. Only set when table was moved during the event.
Reference Point Definition	The Interventional Reference Point (IRP) for the system is always “15cm from Isocenter toward Source”
Target Region	Fixed value of “Entire body” is used.

Concept Name	Comments on Concept Value
Comment	Contains additional information items from the Exam Report in XML like structure. There are separate contents for “Fluoroscopy” or “Acquisition”. For details see paragraph below this table.
Device Role in Procedure	The value of “Irradiating Device” is always set. The subsequent items marked with a “>” give additional details.
>Device Name	Logical name of the device taken from site configuration. Is also used as Station Name (0008,1010) in DICOM Image Header.
>Device Manufacturer	The value of “Siemens” is always set. Is also used as Manufacturer (0008,0070) in DICOM Image Header.
>Device Model Name	The value of “AXIOM-Artis” is always set. Is also used as Manufacturer’s Model Name (0008,1090) in DICOM Image Header.
>Device Serial Number	Serial number of the device taken from site configuration. Is also used as Device Serial Number (0018,1000) in DICOM Image Header.
Acquired Image	SOP Instance UID of the acquired image as link to that image. Always present for “Stationary Acquisition” and ”Rotational Acquisition”. Only present for “Fluoroscopy” if the ‘Store Fluoro Scene’ feature was used to permanently store the Fluoro result.

In case of “Fluoroscopy” the following XML structure is provided in the “Comment” Concept Value (the values are sample values and will be individually set for each event):

```
<FluoroData>
<SceneCounter SRData="1"/>
<ExtendedAcqMode SRData=""/>
<PeriDynaStepCount SRData=" "/>
<SceneName SRData="FL xLow"/>
<AngulationStep SRData=" "/>
<WaterValue SRData="0.000000"/>
<CurrentTimeProduct SRData="36.720005"/>
<TubeFocalSpot SRData="small"/>
<iiDiameter SRData="220"/>
<Time SRData="20-Sep-10 17:31:57"/>
<IsPuck SRData="False"/>
<SceneTime SRData="4"/>
<FrameRate SRData="7.500000"/>
<NumOfFrames SRData="30"/>
<MaxSkinEntranceDose SRData="0mGy"/>
<Zoom SRData="220" />
<PatientPosition SRData="HFS" />
</FluoroData>
```

In case of “Stationary Acquisition” or “Rotational Acquisition” the following XML structure is provided in the “Comment” Concept Value (the values are sample values and will be individually set for each event):

```
<AcquisitionData>
<SceneCounter SRData="1"/>
<AcqMode SRData="CARD"/>
```

<ExtendedAcqMode SRData=""/>
<PeriDynaStepCount SRData=" "/>
<SceneName SRData="Coro "/>
<AcqType SRData="FIXED"/>
<AngulationStep SRData=" "/>
<WaterValue SRData="1639"/>
<CurrentTimeProduct SRData="561.586121"/>
<TubeFocalSpot SRData="large"/>
<iiDiameter SRData="220"/>
<Time SRData="20-Sep-10 17:32:02"/>
<IsPuck SRData="False"/>
<SceneTime SRData="9"/>
<FrameRate SRData="10.000000"/>
<NumOfFrames SRData="88"/>
<MaxSkinEntranceDose SRData="0mGy"/>
<Zoom SRData="220" />
</AcquisitionData>

9.1.2 Usage of attributes from received IODs

Please refer to the “SOP-specific conformance…” sections in the DICOM networking part of this DCS for more details on attribute specific handling.

9.1.3 Attribute mapping

The ARTIS icono implements an actor Acquisition Modality according to the IHE Scheduled Workflow (SWF) profile.

9.1.4 Coerced/Modified fields

The ARTIS icono DICOM Application is not performing data coercion.

9.2 Data Dictionary of Private Attributes

The following table lists all private attributes created by ARTIS icono which may be included in the generated instances.

Table 77: Private Data Element Dictionary

Tag	Private Owner Code	Name	VR	VM
(0019,xx00)	SIEMENS SMS-AX VIEW 1.0	Review Mode	US	1
(0019,xx01)	SIEMENS SMS-AX VIEW 1.0	Anatomical Background Percent	US	1
(0019,xx02)	SIEMENS SMS-AX VIEW 1.0	Number of Phases	US	1
(0019,xx03)	SIEMENS SMS-AX VIEW 1.0	Apply Anatomical Background	US	1
(0019,xx04)	SIEMENS SMS-AX VIEW 1.0	Pixel Shift Array	SS	4-4n
(0019,xx05)	SIEMENS SMS-AX VIEW 1.0	Brightness	US	1
(0019,xx06)	SIEMENS SMS-AX VIEW 1.0	Contrast	US	1
(0019,xx07)	SIEMENS SMS-AX VIEW 1.0	Enabled Shutters	US	1

Tag	Private Owner Code	Name	VR	VM
(0019,xx08)	SIEMENS SMS-AX VIEW 1.0	Native Edge Enh. Percent Gain	US	1
(0019,xx09)	SIEMENS SMS-AX VIEW 1.0	Native Edge Enh. LUT Index	SS	1
(0019,xx0A)	SIEMENS SMS-AX VIEW 1.0	Native Edge Enh. Kernel Size	SS	1
(0019,xx0B)	SIEMENS SMS-AX VIEW 1.0	Subtr. Edge Enh. Percent Gain	US	1
(0019,xx0C)	SIEMENS SMS-AX VIEW 1.0	Subtr. Edge Enh. LUT Index	SS	1
(0019,xx0D)	SIEMENS SMS-AX VIEW 1.0	Subtr. Edge Enh. Kernel Size	SS	1
(0019,xx0E)	SIEMENS SMS-AX VIEW 1.0	Fade Percent	US	1
(0019,xx0F)	SIEMENS SMS-AX VIEW 1.0	Flipped before Laterality Applied	US	1
(0019,xx10)	SIEMENS SMS-AX VIEW 1.0	Apply Fade	US	1
(0019,xx12)	SIEMENS SMS-AX VIEW 1.0	Zoom	US	1
(0019,xx13)	SIEMENS SMS-AX VIEW 1.0	Pan X	SS	1
(0019,xx14)	SIEMENS SMS-AX VIEW 1.0	Pan Y	SS	1
(0019,xx15)	SIEMENS SMS-AX VIEW 1.0	Native Edge Enh. Adv Percent Gain	SS	1
(0019,xx16)	SIEMENS SMS-AX VIEW 1.0	Subtr. Edge Enh. Adv Percent Gain	SS	1
(0019,xx17)	SIEMENS SMS-AX VIEW 1.0	Invert Flag	US	1
(0019,xx1B)	SIEMENS SMS-AX VIEW 1.0	Full Resolution Flag	US	1
(0019,xx1C)	SIEMENS SMS-AX VIEW 1.0	Auto Window Center	DS	1
(0019,xx1D)	SIEMENS SMS-AX VIEW 1.0	Auto Window Width	DS	1
(0019,xx1E)	SIEMENS SMS-AX VIEW 1.0	Auto Window Correct Value	IS	2
(0019,xx1F)	SIEMENS SMS-AX VIEW 1.0	Sigmoid Window Parameter	DS	1
(0019,xx20)	SIEMENS SMS-AX VIEW 1.0	Roadmap Catheter Contrast	DS	1
(0019,xx21)	SIEMENS SMS-AX VIEW 1.0	Roadmap Vessel Contrast	DS	1
(0019,xx23)	SIEMENS SMS-AX VIEW 1.0	CLEARstent ROI Origin	US	2
(0019,xx24)	SIEMENS SMS-AX VIEW 1.0	CLEARstent ROI Size	US	2
(0019,xx25)	SIEMENS SMS-AX VIEW 1.0	VFR Info	US	2-2n
(0019,xx30)	SIEMENS SMS-AX VIEW 1.0	Frame # Roadmap - Min Amplification	US	1
(0019,xx31)	SIEMENS SMS-AX VIEW 1.0	Frame # Roadmap - Vessel Map	US	1
(0019,xx32)	SIEMENS SMS-AX VIEW 1.0	Roadmap Device Presentation	US	1
(0019,xx33)	SIEMENS SMS-AX VIEW 1.0	Roadmap Vessel Presentation	US	1
(0019,xx35)	SIEMENS SMS-AX VIEW 1.0	Interpolation Parameter	US	1

Tag	Private Owner Code	Name	VR	VM
(0019,xx41)	SIEMENS SMS-AX VIEW 1.0	Pixel Shift Values	FL	6-6n
(0019,xx42)	SIEMENS SMS-AX VIEW 1.0	Pixel Shift Indicator	US	1
(0019,xx43)	SIEMENS SMS-AX VIEW 1.0	Applied Pixel Shift Values	FL	6-6n
(0019,xx44)	SIEMENS SMS-AX VIEW 1.0	Pixel Shift Validity	US	2-2n
(0019,xx51)	SIEMENS SMS-AX VIEW 1.0	UIPnat Processing Mode	US	1
(0019,xx52)	SIEMENS SMS-AX VIEW 1.0	UIPnat DDO Kernel Size	US	1
(0019,xx53)	SIEMENS SMS-AX VIEW 1.0	UIPnat DDO Gain	US	1
(0019,xx54)	SIEMENS SMS-AX VIEW 1.0	UIPnat Constrast	US	1
(0019,xx55)	SIEMENS SMS-AX VIEW 1.0	UIPnat Dynamic	US	1
(0019,xx56)	SIEMENS SMS-AX VIEW 1.0	UIPnat Adaptive Flavor	US	1
(0019,xx57)	SIEMENS SMS-AX VIEW 1.0	UIPnat Peak Reduction	US	1
(0019,xx58)	SIEMENS SMS-AX VIEW 1.0	UIPnat Brightness Control	US	1
(0019,xx59)	SIEMENS SMS-AX VIEW 1.0	UIPnat Brightness Value	US	1
(0019,xx61)	SIEMENS SMS-AX VIEW 1.0	Visibility Overlay	US	1
(0021,xx00)	SIEMENS SMS-AX ACQ 1.0	Acquisition Type	US	1
(0021,xx01)	SIEMENS SMS-AX ACQ 1.0	Acquisition Mode	US	1
(0021,xx02)	SIEMENS SMS-AX ACQ 1.0	Footswitch Index	US	1
(0021,xx03)	SIEMENS SMS-AX ACQ 1.0	Acquisition Room	US	1
(0021,xx04)	SIEMENS SMS-AX ACQ 1.0	Current Time Product	SL	1
(0021,xx05)	SIEMENS SMS-AX ACQ 1.0	Dose	SL	1
(0021,xx08)	SIEMENS SMS-AX ACQ 1.0	Skin Dose Rate	SL	1
(0021,xx0A)	SIEMENS SMS-AX ACQ 1.0	Copper Filter	UL	1
(0021,xx0B)	SIEMENS SMS-AX ACQ 1.0	Measuring Field	US	1
(0021,xx0E)	SIEMENS SMS-AX ACQ 1.0	Total Steps	SS	1
(0021,xx0F)	SIEMENS SMS-AX ACQ 1.0	Dyna X-Ray Info	SL	4-4n
(0021,xx10)	SIEMENS SMS-AX ACQ 1.0	Modality LUT Input Gamma	ÚS	1
(0021,xx11)	SIEMENS SMS-AX ACQ 1.0	Modality LUT Output Gamma	US	1
(0021,xx12)	SIEMENS SMS-AX ACQ 1.0	SH_STPAR	OB	1
(0021,xx14)	SIEMENS SMS-AX ACQ 1.0	Dyna Angulation Step	SS	1
(0021,xx15)	SIEMENS SMS-AX ACQ 1.0	DDO Value	US	1

Tag	Private Owner Code	Name	VR	VM
(0021,xx16)	SIEMENS SMS-AX ACQ 1.0	DR Single Flag	US	1
(0021,xx17)	SIEMENS SMS-AX ACQ 1.0	Source to Isocenter	SL	1
(0021,xx19)	SIEMENS SMS-AX ACQ 1.0	ECG Index Array	SL	1-n
(0021,xx1B)	SIEMENS SMS-AX ACQ 1.0	SH_ZOOM	OB	1
(0021,xx1C)	SIEMENS SMS-AX ACQ 1.0	SH_COLPAR	OB	1
(0021,xx1D)	SIEMENS SMS-AX ACQ 1.0	K-Factor	US	1
(0021,xx1E)	SIEMENS SMS-AX ACQ 1.0	EVE	US	1
(0021,xx1F)	SIEMENS SMS-AX ACQ 1.0	Total Scene Time	SL	1
(0021,xx20)	SIEMENS SMS-AX ACQ 1.0	Restore Flag	US	1
(0021,xx21)	SIEMENS SMS-AX ACQ 1.0	Stand Movement Flag	US	1
(0021,xx22)	SIEMENS SMS-AX ACQ 1.0	FD Rows	US	1
(0021,xx23)	SIEMENS SMS-AX ACQ 1.0	FD Columns	US	1
(0021,xx24)	SIEMENS SMS-AX ACQ 1.0	Table Movement Flag	US	1
(0021,xx28)	SIEMENS SMS-AX ACQ 1.0	Gamma LUT Sequence	SQ	1
(0021,xx29)	SIEMENS SMS-AX ACQ 1.0	Scene Time in s	DS	1
(0021,xx2A)	SIEMENS SMS-AX ACQ 1.0	3D Cardiac Phase Center	IS	1
(0021,xx2B)	SIEMENS SMS-AX ACQ 1.0	3D Cardiac Phase Width	IS	1
(0021,xx30)	SIEMENS SMS-AX ACQ 1.0	Organ Program Info	OB	1
(0021,xx31)	SIEMENS SMS-AX ACQ 1.0	Source Image Distance	SS	1-n
(0021,xx32)	SIEMENS SMS-AX ACQ 1.0	Original Pixel Spacing	DS	2
(0021,xx3B)	SIEMENS SMS-AX ACQ 1.0	mAs Modulation	IS	1
(0021,xx3C)	SIEMENS SMS-AX ACQ 1.0	3D R-Peak Reference Time	DT	1-n
(0021,xx3D)	SIEMENS SMS-AX ACQ 1.0	ECG Frame Time Vector	SL	1-n
(0021,xx3E)	SIEMENS SMS-AX ACQ 1.0	ECG Start Time of Run	SL	1
(0021,xx40)	SIEMENS SMS-AX ACQ 1.0	Gamma LUT Descriptor	US	3
(0021,xx41)	SIEMENS SMS-AX ACQ 1.0	Gamma LUT Type	LO	1
(0021,xx42)	SIEMENS SMS-AX ACQ 1.0	Gamma LUT Data	US	1-n
(0021,xx43)	SIEMENS SMS-AX ACQ 1.0	Global Gain	US	1
(0021,xx44)	SIEMENS SMS-AX ACQ 1.0	Global Offset	US	1
(0021,xx45)	SIEMENS SMS-AX ACQ 1.0	Dipp Mode	US	1

Tag	Private Owner Code	Name	VR	VM
(0021,xx46)	SIEMENS SMS-AX ACQ 1.0	Artis System Type	US	1
(0021,xx47)	SIEMENS SMS-AX ACQ 1.0	Artis Table Type	US	1
(0021,xx48)	SIEMENS SMS-AX ACQ 1.0	Artis Table Top Type	US	1
(0021,xx49)	SIEMENS SMS-AX ACQ 1.0	Water Value	SS	1
(0021,xx4A)	SIEMENS SMS-AX ACQ 1.0	CNR Flag	US	1
(0021,xx4B)	SIEMENS SMS-AX ACQ 1.0	CNR / Dose Requested	FL	1
(0021,xx4C)	SIEMENS SMS-AX ACQ 1.0	CNR / Dose Achieved	FL	1
(0021,xx50)	SIEMENS SMS-AX ACQ 1.0	X-ray Tube Type	LO	1
(0021,xx51)	SIEMENS SMS-AX ACQ 1.0	3D Positioner Primary Start Angle	DS	1
(0021,xx52)	SIEMENS SMS-AX ACQ 1.0	3D Positioner Secondary Start Angle	DS	1
(0021,xx53)	SIEMENS SMS-AX ACQ 1.0	Stand Position	SS	3
(0021,xx54)	SIEMENS SMS-AX ACQ 1.0	Rotation Angle	SS	1
(0021,xx55)	SIEMENS SMS-AX ACQ 1.0	Image Rotation	US	1
(0021,xx56)	SIEMENS SMS-AX ACQ 1.0	Table Coordinates	SS	3
(0021,xx57)	SIEMENS SMS-AX ACQ 1.0	Isocenter Table Position	SS	3
(0021,xx58)	SIEMENS SMS-AX ACQ 1.0	Table Object Distance	DS	1
(0021,xx59)	SIEMENS SMS-AX ACQ 1.0	C-Arm Coordinate System	FL	1-n
(0021,xx5A)	SIEMENS SMS-AX ACQ 1.0	Robot Axes	FL	1-n
(0021,xx5B)	SIEMENS SMS-AX ACQ 1.0	Table Coordinate System	FL	12
(0021,xx5C)	SIEMENS SMS-AX ACQ 1.0	Patient Coordinate System	FL	12
(0021,xx5D)	SIEMENS SMS-AX ACQ 1.0	Angulation	SL	1-n
(0021,xx5E)	SIEMENS SMS-AX ACQ 1.0	Orbital	SL	1-n
(0021,xx5F)	SIEMENS SMS-AX ACQ 1.0	3D Start Position ID	US	1
(0021,xx60)	SIEMENS SMS-AX ACQ 1.0	3D Rotation Time	SL	1
(0021,xx61)	SIEMENS SMS-AX ACQ 1.0	Large Volume Overlap	SS	1
(0021,xx62)	SIEMENS SMS-AX ACQ 1.0	Reconstruction Preset	US	1
(0021,xx63)	SIEMENS SMS-AX ACQ 1.0	3D Start Angle	SS	1
(0021,xx64)	SIEMENS SMS-AX ACQ 1.0	3D Planned Angle	SL	1
(0021,xx65)	SIEMENS SMS-AX ACQ 1.0	3D Rotation Plane Alpha	SL	1
(0021,xx66)	SIEMENS SMS-AX ACQ 1.0	3D Rotation Plane Beta	SL	1

Tag	Private Owner Code	Name	VR	VM
(0021,xx67)	SIEMENS SMS-AX ACQ 1.0	3D First Image Angle	SL	1
(0021,xx68)	SIEMENS SMS-AX ACQ 1.0	3D Trigger Angle	SS	1-n
(0021,xx69)	SIEMENS SMS-AX ACQ 1.0	Amplitude	SS	1
(0021,xx71)	SIEMENS SMS-AX ACQ 1.0	Detector Rotation	DS	1-n
(0021,xx72)	SIEMENS SMS-AX ACQ 1.0	Physical Detector Rotation	SL	1-n
(0021,xx81)	SIEMENS SMS-AX ACQ 1.0	Table Head Tilt	SS	1
(0021,xx82)	SIEMENS SMS-AX ACQ 1.0	Table Rotation	SS	1
(0021,xx83)	SIEMENS SMS-AX ACQ 1.0	Table Cradle Tilt	SS	1
(0021,xx84)	SIEMENS SMS-AX ACQ 1.0	Artis System Family	LO	1
(0021,xx85)	SIEMENS SMS-AX ACQ 1.0	Orientation Stand Table	SS	1
(0021,xx86)	SIEMENS SMS-AX ACQ 1.0	Image Rotation DIPP	US	1
(0021,xx87)	SIEMENS SMS-AX ACQ 1.0	System Tilt	SS	1
(0021,xxA3)	SIEMENS SMS-AX ACQ 1.0	3D Cardiac Trigger Sequence	SQ	1
(0021,xxA4)	SIEMENS SMS-AX ACQ 1.0	3D Frame Reference Date Time	DT	1
(0021,xxA5)	SIEMENS SMS-AX ACQ 1.0	3D Cardiac Trigger Delay Time	FD	1
(0021,xxA6)	SIEMENS SMS-AX ACQ 1.0	3D R-R Interval Time Measured	FD	1
(0021,xxB0)	SIEMENS SMS-AX ACQ 1.0	Emergency Patient Flag	US	1
(0023,xx08)	SIEMENS SMS-AX QUANT 1.0	Calibration TOD Value	IS	1
(0025,xx00)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	View Native	US	1
(0025,xx01)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Original Series Number	US	1
(0025,xx02)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Original Image Number	US	1
(0025,xx03)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Win Center	US	1
(0025,xx04)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Win Width	US	1
(0025,xx05)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Win Brightness	US	1
(0025,xx06)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Win Contrast	US	1
(0025,xx07)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Original Frame Number	US	1

Tag	Private Owner Code	Name	VR	VM
(0025,xx08)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Original Mask Frame Number	US	1
(0025,xx09)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Opac	US	1
(0025,xx0A)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Original Number of Frames	US	1
(0025,xx0B)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Original Scene Duration	DS	1
(0025,xx0C)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Image Object ID	LO	1
(0025,xx0D)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Original Scene VFR Info	SS	1-n
(0025,xx0E)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Original Frame ECG Position	SS	1
(0025,xx10)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Zoom Flag	SS	1
(0025,xx11)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Flexible Pixel Shift	US	1
(0025,xx12)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Number of Mask Frames	US	1
(0025,xx13)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Number of Fill Frames	US	1
(0025,xx14)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Series Number	IS	1
(0025,xx15)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Image Number	IS	1
(0025,xx16)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Ready Processing Status	IS	1
(0025,xx22)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Start Trim	US	1
(0029,xx00)	CARDIO-D.R. 1.0	Standard Edge Enhancement Sequence	SQ	1
(0029,xx01)	CARDIO-D.R. 1.0	Convolution Kernel Size	US	2
(0029,xx02)	CARDIO-D.R. 1.0	Convolution Kernel Coefficients	US	1-n
(0029,xx03)	CARDIO-D.R. 1.0	Edge Enhancement Gain	FL	1
(0029,xx08)	SIEMENS AX OOG	OOG Type	CS	1
(0029,xx09)	SIEMENS AX OOG	OOG Version	LO	1

(0029,xx0A)	SIEMENS AX OOG	Overlay Data	OB	1
(0029,xx0B)	SIEMENS AX OOG	Overlay Type	CS	1
(0029,xx0C)	SIEMENS AX OOG	Bitmap Coordinate	SL	4
(0029,xx0D)	SIEMENS AX OOG	Bitmap Data	OB	1
(0029,xx10)	SIEMENS AX OOG	OOG Overlay Sequence	SQ	1
(7FDF,xxFC)	SIEMENS SYNGO DATA PADDING	Pixel Data Leading Padding	OB	1

Note: Please be informed that some of the Private Owner Codes contain double-spaces in the name definitions. The following term (only double-spaces marked) are defined:
SIEMENS SMS-AX<spc><spc>VIEW 1.0
SIEMENS SMS-AX<spc><spc>ACQ 1.0
SIEMENS SMS-AX<spc><spc>QUANT 1.0
SIEMENS SMS-AX<spc><spc>ORIGINAL IMAGE INFO 1.0

(All spaces not specially marked, are single spaces.)

9.2.1 Usage of Attributes from received IODs

N/A

9.2.2 Attribute mapping

The ARTIS icono implements an actor Acquisition Modality according to the IHE Scheduled Workflow (SWF) profile.

9.2.3 Coerced / Modified fields

N/A

9.3 Coded Terminology and Templates

9.3.1 Context Groups

9.3.2 Template Specifications

9.3.3 Private Code definitions

9.4 Grayscale Image Consistency

The high resolution TFT display monitor option of ARTIS icono comes with a DICOM Grayscale Standard Display Function (GSDF) compliant factory pre-setting. A typical working environment setup is assumed for ambient light.

9.5 Standard Extended / Specialized / Private SOP Classes

9.5.1 Standard Extended XA

The XA SOP Instances created by ARTIS icono are standard-extended by adding the following private module attributes.

Table 78 - Private Modules for Standard Extended XA

IE	Module	Refer-ence	Usage	Note
Image	Edge Enhancement	9.5.1.1	U	private Filter Information
	Angio Viewing	9.5.1.2	U	private Viewing information
	Angio Acquisition	9.5.1.3	U	additional private Information about image Acquisition
	Angio Quantification	9.5.1.4	U	if image is calibrated for Quant
	Original Image Info	9.5.1.5	U	if derived image
	OOG Overlay Info	9.5.1.6	U	If overlay was applied
	Data Padding	9.5.1.7	U	private data padding

U = User Option

9.5.1.1 Edge Enhancement Module

The table in this section contains private IOD attributes that describe Edge Enhancement extensions due to the Dynamic Cardio Review definition.

Table 79 - (Private) Edge Enhancement Module

Attribute Name	Tag	Owner	Type	Notes
Standard Edge En-hancement Sequence	(0029,xx00)	CARDIO-D.R. 1.0	3	Standard formula according to Dyna view Extensions. For DSA images two items are provided, one item for native and a second for DSA viewing
>Convolution Kernel Size	(0029,xx01)	CARDIO-D.R. 1.0	1C	x-/y-size value pair. Each value shall be greater or equal to 3. Required if sequence is pre-sent

Attribute Name	Tag	Owner	Type	Notes
>Convolution Kernel Coefficients	(0029,xx02)	CARDIO-D.R. 1.0	1C	Row-by-row list of the kernel Coefficients. Required if sequence is present
>Edge Enhancement Gain	(0029,xx03)	CARDIO-D.R. 1.0	1C	Applied Filter gain Factor. Required if sequence is present

9.5.1.2 Angio Viewing Module

The table in this section contains private IOD attributes that describe extensions for storing angio viewing information.

Table 80 - (Private) Angio Viewing Module Attributes

Attribute Name	Tag	Owner	Type	Notes
Review Mode	(0019,xx00)	SIEMENS SMS-AX VIEW 1.0	3	Special Modes for Angio Review. Defined Terms are 1 = REV_MAXFILL, 2 = REV_LOOP, 3 = REV_SCROLL, 4 = REV_STEREO_LOOP
Anatomical Background Percent	(0019,xx01)	SIEMENS SMS-AX VIEW 1.0	3	Percentage of Mix between Subtracted Image Result and Native Mask. Range is from 0 to 100.
Number of Phases	(0019,xx02)	SIEMENS SMS-AX VIEW 1.0	3	1-4 (1 or # of "Variable Frame Rate" acq phases)
Apply Anatomical Background	(0019,xx03)	SIEMENS SMS-AX VIEW 1.0	3	
Pixel Shift Array	(0019,xx04)	SIEMENS SMS-AX VIEW 1.0	3	4 * Number of Frames (0028,0008)
Brightness	(0019,xx05)	SIEMENS SMS-AX VIEW 1.0	3	SUB windowing
Contrast	(0019,xx06)	SIEMENS SMS-AX VIEW 1.0	3	SUB windowing
Enabled Shutter	(0019,xx07)	SIEMENS SMS-AX VIEW 1.0	3	Visualize shutter
Native Edge Enhancement Percent Gain	(0019,xx08)	SIEMENS SMS-AX VIEW 1.0	3	Percent gain for native display of images.

Attribute Name	Tag	Owner	Type	Notes
Native Edge Enhancement LUT Index	(0019,xx09)	SIEMENS SMS-AX VIEW 1.0	3	
Native Edge Enhancement Kernel Size	(0019,xx0A)	SIEMENS SMS-AX VIEW 1.0	3	
Subtracted Edge Enhancement Percent Gain	(0019,xx0B)	SIEMENS SMS-AX VIEW 1.0	3	Percent gain for subtracted display of images.
Subtracted Edge Enhancement LUT Index	(0019,xx0C)	SIEMENS SMS-AX VIEW 1.0	3	
Subtracted Edge Enhancement Kernel Size	(0019,xx0D)	SIEMENS SMS-AX VIEW 1.0	3	
Fade Percent	(0019,xx0E)	SIEMENS SMS-AX VIEW 1.0	3	
Flipped before Laterality Applied	(0019,xx0F)	SIEMENS SMS-AX VIEW 1.0	3	
Apply Fade	(0019,xx10)	SIEMENS SMS-AX VIEW 1.0	3	
Zoom	(0019,xx12)	SIEMENS SMS-AX VIEW 1.0	3	
Pan X	(0019,xx13)	SIEMENS SMS-AX VIEW 1.0	3	
Pan Y	(0019,xx14)	SIEMENS SMS-AX VIEW 1.0	3	
Native Edge Enhancement Adverse Percent Gain	(0019,xx15)	SIEMENS SMS-AX VIEW 1.0	3	
Subtracted Edge Enhancement Adverse Percent Gain	(0019,xx16)	SIEMENS SMS-AX VIEW 1.0	3	
Invert Flag	(0019,xx17)	SIEMENS SMS-AX VIEW 1.0	3	
Acquisition Size	(0019,xx1B)	SIEMENS SMS-AX VIEW 1.0	3	
Auto Window Center	(0019,xx1C)	SIEMENS SMS-AX VIEW 1.0	3	
Auto Window Width	(0019,xx1D)	SIEMENS SMS-AX VIEW 1.0	3	
Auto Window Correct Value	(0019,xx1E)	SIEMENS SMS-AX VIEW 1.0	3	

Attribute Name	Tag	Owner	Type	Notes
Sigmoid Window Parameter	(0019,xx1F)	SIEMENS SMS-AX VIEW 1.0	3	
Roadmap Catheter Contrast	(0019,xx20)	SIEMENS SMS-AX VIEW 1.0	3	
Roadmap Vessel Contrast	(0019,xx21)	SIEMENS SMS-AX VIEW 1.0	3	
CLEARstent ROI Origin	(0019,xx23)	SIEMENS SMS-AX VIEW 1.0	3	
CLEARstent ROI Size	(0019,xx24)	SIEMENS SMS-AX VIEW 1.0	3	
VFR Info	(0019,xx25)	SIEMENS SMS-AX VIEW 1.0	3	
Frame Number Roadmap - Min Amplification	(0019,xx30)	SIEMENS SMS-AX VIEW 1.0	3	
Frame Number Roadmap - Vessel Map	(0019,xx31)	SIEMENS SMS-AX VIEW 1.0	3	
Roadmap Device Presentation	(0019,xx32)	SIEMENS SMS-AX VIEW 1.0	3	
Roadmap Vessel Presentation	(0019,xx33)	SIEMENS SMS-AX VIEW 1.0	3	
Interpolation Parameter	(0019,xx35)	SIEMENS SMS-AX VIEW 1.0	3	
Pixel Shift Values	(0019,xx41)	SIEMENS SMS-AX VIEW 1.0	3	
Pixel Shift Indicator	(0019,xx42)	SIEMENS SMS-AX VIEW 1.0	3	
Applied Pixel Shift Values	(0019,xx43)	SIEMENS SMS-AX VIEW 1.0	3	
Pixel Shift Validity	(0019,xx44)	SIEMENS SMS-AX VIEW 1.0	3	
UIPnat Processing Mode	(0019,xx51)	SIEMENS SMS-AX VIEW 1.0	3	Processing for native view
UIPnat DDO Kernel Size	(0019,xx52)	SIEMENS SMS-AX VIEW 1.0	3	Processing for native view
UIPnat DDO Gain	(0019,xx53)	SIEMENS SMS-AX VIEW 1.0	3	Processing for native view
UIPnat Contrast	(0019,xx54)	SIEMENS SMS-AX VIEW 1.0	3	Processing for native view

Attribute Name	Tag	Owner	Type	Notes
UIPnat Dynamic	(0019,xx55)	SIEMENS SMS-AX VIEW 1.0	3	Processing for native view
UIPnat Adaptive Flavor	(0019,xx56)	SIEMENS SMS-AX VIEW 1.0	3	Processing for native view
UIPnat Peak Reduction	(0019,xx57)	SIEMENS SMS-AX VIEW 1.0	3	Processing for native view
UIPnat Brightness Control	(0019,xx58)	SIEMENS SMS-AX VIEW 1.0	3	Processing for native view
UIPnat Brightness Value	(0019,xx59)	SIEMENS SMS-AX VIEW 1.0	3	Processing for native view
Visibility Overlay Flag	(0019,xx61)	SIEMENS SMS-AX VIEW 1.0	3	Overlay shall be hidden (0) or displayed (1)

9.5.1.3 Angio Acquisition Data Module

The table in this section contains private IOD attributes that describe extensions for storing specific Angio Acquisition data.

Table 81 - (Private) Angio Acquisition Data Attributes

Attribute Name	Tag	Owner	Type	Notes
Acquisition Type	(0021,xx00)	SIEMENS SMS-AX ACQ 1.0	3	Technical Type of Acquisition performed to get image result. Defined Terms are 1 = fixed frame rate, 2 = variable frame rate (manually triggered), 3 = variable frame rate (time triggered), 4 = peri manual to head, 10 = dynavision manual inject., 11 = dynavision automatic, 13 = continuous fluoro, 14 = pulsed fluoro, 15 = ECG triggered fluoro

Attribute Name	Tag	Owner	Type	Notes
Acquisition Mode	(0021,xx01)	SIEMENS SMS-AX ACQ 1.0	3	Technical Mode of Acquisition performed to get image result. Defined Terms are: 0 = no mode specified, 1 = Digital Radiography, 2 = DSA, 3 = Peri-DSA, 4 = DR stepping, 5 = DR Dynavision (nat), 6 = Dynavision (sub), 7 = Card, 8 = Service mode (internal), 9 = 3D Mode 10 = Service mode (internal), 11 = Vessel Phase Roadmap, 19 = Bypass Fluoro, 20 = Roadmap Fluoro, 21 = Normal Fluoro
Foot Switch Index	(0021,xx02)	SIEMENS SMS-AX ACQ 1.0	3	
Acquisition Room	(0021,xx03)	SIEMENS SMS-AX ACQ 1.0	3	0 = Exam Room, 1 = Control Room
Current Time Product	(0021,xx04)	SIEMENS SMS-AX ACQ 1.0	3	(µAs)
Dose	(0021,xx05)	SIEMENS SMS-AX ACQ 1.0	3	(nGy/pulse)
Referenced Air Kerma Rate	(0021,xx08)	SIEMENS SMS-AX ACQ 1.0	3	(0.01 mGy / min)
Copper Filter	(0021,xx0A)	SIEMENS SMS-AX ACQ 1.0	3	(0.1 mm)
Measuring Field	(0021,xx0B)	SIEMENS SMS-AX ACQ 1.0	3	
Total Steps	(0021,xx0E)	SIEMENS SMS-AX ACQ 1.0	3	Number of multi-frame images which make up a Peri or DR-Step acquisition

Attribute Name	Tag	Owner	Type	Notes
Dyna X-Ray Info	(0021,xx0F)	SIEMENS SMS-AX ACQ 1.0	3	Per frame info (4 * number of frames). (V, µA value, µs, µAs) Only with rotational images
Gamma Input	(0021,xx10)	SIEMENS SMS-AX ACQ 1.0	3	
Gamma Output	(0021,xx11)	SIEMENS SMS-AX ACQ 1.0	3	
SH_STPAR	(0021,xx12)	SIEMENS SMS-AX ACQ 1.0	3	Technical data-structure with Gantry information.
Dyna Angulation Step	(0021,xx14)	SIEMENS SMS-AX ACQ 1.0	3	in 0.01deg / pulse Only with rotational images
DDO Value	(0021,xx15)	SIEMENS SMS-AX ACQ 1.0	3	
DR Single Flag	(0021,xx16)	SIEMENS SMS-AX ACQ 1.0	3	1 = DR SINGLE, else single Frame DR acquisition
Source to Isocenter	(0021,xx17)	SIEMENS SMS-AX ACQ 1.0	3	(mm)
ECG Index Array	(0021,xx19)	SIEMENS SMS-AX ACQ 1.0	3	Pointer to ECG data, one value per frame
SH_ZOOM	(0021,xx1B)	SIEMENS SMS-AX ACQ 1.0	3	Technical data-structure
SH_COLPAR	(0021,xx1C)	SIEMENS SMS-AX ACQ 1.0	3	Technical data-structure with collimator information.
K-Factor	(0021,xx1D)	SIEMENS SMS-AX ACQ 1.0	3	
EVE	(0021,xx1E)	SIEMENS SMS-AX ACQ 1.0	3	
Total Scene Time	(0021,xx1F)	SIEMENS SMS-AX ACQ 1.0	3	In sec. (rounded)
Restore Flag	(0021,xx20)	SIEMENS SMS-AX ACQ 1.0	3	
Stand Movement Flag	(0021,xx21)	SIEMENS SMS-AX ACQ 1.0	3	1 = movements during acquisi-tion
FD Rows	(0021,xx22)	SIEMENS SMS-AX ACQ 1.0	3	Acquisition matrix, rows
FD Columns	(0021,xx23)	SIEMENS SMS-AX ACQ 1.0	3	Acquisition matrix, columns

Attribute Name	Tag	Owner	Type	Notes
Table Movement Flag	(0021,xx24)	SIEMENS SMS-AX ACQ 1.0	3	1 = for movements (stand or table) during acquisition
Gamma LUT Sequence	(0021,xx28)	SIEMENS SMS-AX ACQ 1.0	3	Non-linear LUT applied to raw data (12bit –> 12bit)
>Gamma LUT Descriptor	(0021,xx40)	SIEMENS SMS-AX ACQ 1.0	3	
>Gamma LUT Type	(0021,xx41)	SIEMENS SMS-AX ACQ 1.0	3	
>Gamma LUT Data	(0021,xx42)	SIEMENS SMS-AX ACQ 1.0	3	
Scene Time in s	(0021,xx29)	SIEMENS SMS-AX ACQ 1.0	3	In sec.
3D Cardiac Phase Center	(0021,xx2A)	SIEMENS SMS-AX ACQ 1.0	3	
3D Cardiac Phase Width	(0021,xx2B)	SIEMENS SMS-AX ACQ 1.0	3	
Organ Program Info	(0021,xx30)	SIEMENS SMS-AX ACQ 1.0	3	Technical data-structure with organ program information
Source Image Distance	(0021,xx31)	SIEMENS SMS-AX ACQ 1.0	3	per frame values for rotational images in 0.1 mm in mm otherwise
Original Pixel Spacing	(0021,xx32)	SIEMENS SMS-AX ACQ 1.0	3	Pixel Spacing at acquisition time before any resizing/processing was applied. Value cannot be used for measurement.
mAs Modulation	(0021,xx3B)	SIEMENS SMS-AX ACQ 1.0	3	only for cardiac triggered 3D acquisition
3D R-Peak Reference Time	(0021,xx3C)	SIEMENS SMS-AX ACQ 1.0	3	one value per frame, only for cardiac triggered 3D acquisition
ECG Frame Time Vector	(0021,xx3D)	SIEMENS SMS-AX ACQ 1.0	3	one value per frame, only for ECG gated fluoro / acquisition
ECG Start Time of Run	(0021,xx3E)	SIEMENS SMS-AX ACQ 1.0	3	absolute time in sec (UTC), only for ECG gated fluoro / acquisition
Global Gain	(0021,xx43)	SIEMENS SMS-AX ACQ 1.0	3	
Global Offset	(0021,xx44)	SIEMENS SMS-AX ACQ 1.0	3	

Attribute Name	Tag	Owner	Type	Notes
Dipp Mode	(0021,xx45)	SIEMENS SMS-AX ACQ 1.0	3	
Artis System Type	(0021,xx46)	SIEMENS SMS-AX ACQ 1.0	3	Type of system 11 = floor, 13 = ceiling, 14 = biplane, 15 = pheno
Artis Table Type	(0021,xx47)	SIEMENS SMS-AX ACQ 1.0	3	Type of table Defined Terms are: 10 = basic, 11 = tilting, 12 = cradle
Artis Table Top Type	(0021,xx48)	SIEMENS SMS-AX ACQ 1.0	3	Type of table top Defined Terms are: 1 = card, 2 = neuro, 3 = universal, 4 = OR, 5 = other type, 11 - 12 = surgery table types
Water Value	(0021,xx49)	SIEMENS SMS-AX ACQ 1.0	3	Equivalent water value of the patient/object in 0.1 mm
CNR Flag	(0021,xx4A)	SIEMENS SMS-AX ACQ 1.0	3	0: CNR dose control not used 1: CNR dose control used
CNR / Dose Requested	(0021,xx4B)	SIEMENS SMS-AX ACQ 1.0	3	
CNR / Dose Achieved	(0021,xx4C)	SIEMENS SMS-AX ACQ 1.0	3	
X-Ray Tube Type	(0021,xx50)	SIEMENS SMS-AX ACQ 1.0	3	
3D Positioner Primary Start Angle	(0021,xx51)	SIEMENS SMS-AX ACQ 1.0	3	(deg) Only with rotational images
3D Positioner Secondary Start Angle	(0021,xx52)	SIEMENS SMS-AX ACQ 1.0	3	(deg) Only with rotational images
Stand Position	(0021,xx53)	SIEMENS SMS-AX ACQ 1.0	3	in 0.1 mm; x, y, z Only with rotational images
Rotation Angle	(0021,xx54)	SIEMENS SMS-AX ACQ 1.0	3	in 0.1 deg Only with rotational images

Attribute Name	Tag	Owner	Type	Notes
Image Rotation	(0021,xx55)	SIEMENS SMS-AX ACQ 1.0	3	Rotation in relation to default patient position 0 = not rotated, 1 = rotated in clockwise direction, 2 = rotated in counterclockwise direction, Only with rotational images
Table Coordinates	(0021,xx56)	SIEMENS SMS-AX ACQ 1.0	3	(mm); x, y, z Only with rotational images
Isocenter Table Position	(0021,xx57)	SIEMENS SMS-AX ACQ 1.0	3	in 0.1 mm; long, lat, height
Table Object Distance	(0021,xx58)	SIEMENS SMS-AX ACQ 1.0	3	Original (uncalibrated) table object distance in mm
C-Arm Coordinate System	(0021,xx59)	SIEMENS SMS-AX ACQ 1.0	3	
Robot Axes	(0021,xx5A)	SIEMENS SMS-AX ACQ 1.0	3	
Table Coordinate System	(0021,xx5B)	SIEMENS SMS-AX ACQ 1.0	3	
Patient Coordinate System	(0021,xx5C)	SIEMENS SMS-AX ACQ 1.0	3	
Angulation	(0021,xx5D)	SIEMENS SMS-AX ACQ 1.0	3	
Orbital	(0021,xx5E)	SIEMENS SMS-AX ACQ 1.0	3	
3D Start Position ID	(0021,xx5F)	SIEMENS SMS-AX ACQ 1.0	3	
3D Rotation Time	(0021,xx60)	SIEMENS SMS-AX ACQ 1.0	3	
Large Volume Overlap	(0021,xx61)	SIEMENS SMS-AX ACQ 1.0	3	in 0.1 mm Only for 3D Large Volume acquisitions
3D Reconstruction Preset	(0021,xx62)	SIEMENS SMS-AX ACQ 1.0	3	Only with rotational images
3D Start Angle	(0021,xx63)	SIEMENS SMS-AX ACQ 1.0	3	in 0.01 deg Only with rotational images
3D Planned Angle	(0021,xx64)	SIEMENS SMS-AX ACQ 1.0	3	in 0.01 deg Only with rotational images

Attribute Name	Tag	Owner	Type	Notes
3D Rotation Plane Alpha	(0021,xx65)	SIEMENS SMS-AX ACQ 1.0	3	in 0.01 deg Only with rotational images
3D Rotation Plane Beta	(0021,xx66)	SIEMENS SMS-AX ACQ 1.0	3	in 0.01 deg Only with rotational images
3D First Image Angle	(0021,xx67)	SIEMENS SMS-AX ACQ 1.0	3	in 0.01 deg Only with rotational images
3D Trigger Angle	(0021,xx68)	SIEMENS SMS-AX ACQ 1.0	3	in 0.01 deg Only with rotational images
Amplitude	(0021,xx69)	SIEMENS SMS-AX ACQ 1.0	3	in 0.1 deg Only with rotational images
Detector Rotation	(0021,xx71)	SIEMENS SMS-AX ACQ 1.0	3	In deg One value / frame for rotational images one single value otherwise
Physical Detector Rotation	(0021,xx72)	SIEMENS SMS-AX ACQ 1.0	3	In 0.01 deg One value / frame for rotational images one single value otherwise
Table Head Tilt	(0021,xx81)	SIEMENS SMS-AX ACQ 1.0	3	In 0.1 deg + means: head end up
Table Rotation	(0021,xx82)	SIEMENS SMS-AX ACQ 1.0	3	In 0.1 deg + means: counterclockwise rotation
Table Cradle Tilt	(0021,xx83)	SIEMENS SMS-AX ACQ 1.0	3	In 0.1 deg + means: right patient side up (position HFS)
Artis System Family	(0021,xx84)	SIEMENS SMS-AX ACQ 1.0	3	
Orientation Stand Table	(0021,xx85)	SIEMENS SMS-AX ACQ 1.0	3	In 0.1 deg
Image Rotation DIPP	(0021,xx86)	SIEMENS SMS-AX ACQ 1.0	3	Flip in internal pipeline 1 = flip left/right 2 = flip up/down 3 = flip left/right and up/down 4 = no flip
System Tilt	(0021,xx87)	SIEMENS SMS-AX ACQ 1.0	3	In 0.1 deg
3D Cardiac Trigger Sequence	(0021,xxA3)	SIEMENS SMS-AX ACQ 1.0	3	Only for cardiac triggered 3D acquisition
>3D Frame Reference Date Time	(0021,xxA4)	SIEMENS SMS-AX ACQ 1.0	3	

Attribute Name	Tag	Owner	Type	Notes
>3D Cardiac Trigger Delay Time	(0021,xxA5)	SIEMENS SMS-AX ACQ 1.0	3	
>3D R-R Interval Time Measured	(0021,xxA6)	SIEMENS SMS-AX ACQ 1.0	3	

9.5.1.4 Angio Quantification Module

The table in this section contains private IOD attributes that describe extensions for Calibration Results features.

Table 82 - (Private) Angio Quantification Module Attributes

Attribute Name	Tag	Owner	Type	Notes
Calibration TOD Value	(0023,xx08)	SIEMENS SMS-AX QUANT 1.0	3	Table Object Distance in cm

9.5.1.5 Original Image Info Module

The table in this section contains private IOD attributes that describe extensions for additional original image data for derived images (e.g. Store Monitor Image).

Table 83 - (Private) Original Image Info Module Attributes

Attribute Name	Tag	Owner	Type	Notes
View Native	(0025,xx00)	SIEMENS SMS-AX ORI-GINAL IMAGE INFO 1.0	3	
Original Series Number	(0025,xx01)	SIEMENS SMS-AX ORI-GINAL IMAGE INFO 1.0	3	
Original Image Number	(0025,xx02)	SIEMENS SMS-AX ORI-GINAL IMAGE INFO 1.0	3	
Win Center	(0025,xx03)	SIEMENS SMS-AX ORI-GINAL IMAGE INFO 1.0	3	
Win Width	(0025,xx04)	SIEMENS SMS-AX ORI-GINAL IMAGE INFO 1.0	3	
Win Brightness	(0025,xx05)	SIEMENS SMS-AX ORI-GINAL IMAGE INFO 1.0	3	

Attribute Name	Tag	Owner	Type	Notes
Win Contrast	(0025,xx06)	SIEMENS SMS-AX ORI-GINAL IMAGE INFO 1.0	3	
Original Frame Number	(0025,xx07)	SIEMENS SMS-AX ORI-GINAL IMAGE INFO 1.0	3	
Original Mask Frame Number	(0025,xx08)	SIEMENS SMS-AX ORI-GINAL IMAGE INFO 1.0	3	
Opac	(0025,xx09)	SIEMENS SMS-AX ORI-GINAL IMAGE INFO 1.0	3	
Original Number of Frames	(0025,xx0A)	SIEMENS SMS-AX ORI-GINAL IMAGE INFO 1.0	3	
Original Scene Duration	(0025,xx0B)	SIEMENS SMS-AX ORI-GINAL IMAGE INFO 1.0	3	
Image Object ID	(0025,xx0C)	SIEMENS SMS-AX ORI-GINAL IMAGE INFO 1.0	3	Set to "AXIM_READY_PROCESSED" when Ready Processing was applied
Original Scene VFR Info	(0025,xx0D)	SIEMENS SMS-AX ORI-GINAL IMAGE INFO 1.0	3	Number of phases, then followed by n pairs (Last Frame Number, then Frame Rate)
Original Frame ECG Position	(0025,xx0E)	SIEMENS SMS-AX ORI-GINAL IMAGE INFO 1.0	3	
Zoom Flag	(0025,xx10)	SIEMENS SMS-AX ORI-GINAL IMAGE INFO 1.0	3	
Flexible Pixel Shift	(0025,xx11)	SIEMENS SMS-AX ORI-GINAL IMAGE INFO 1.0	3	
Number of Mask Frames	(0025,xx12)	SIEMENS SMS-AX ORI-GINAL IMAGE INFO 1.0	3	
Number of Fill Frames	(0025,xx13)	SIEMENS SMS-AX ORI-GINAL IMAGE INFO 1.0	3	

Attribute Name	Tag	Owner	Type	Notes
Series Number	(0025,xx14)	SIEMENS SMS-AX ORI-GINAL IMAGE INFO 1.0	3	
Image Number	(0025,xx15)	SIEMENS SMS-AX ORI-GINAL IMAGE INFO 1.0	3	
Ready Processing Status	(0025,xx16)	SIEMENS SMS-AX ORI-GINAL IMAGE INFO 1.0	3	1 = ready processed, 2 = resized, 3 = both 4 = resize 14 to 16 bit (rotational images) 5 = acquired with 16 bit (rotational images)
Start Trim	(0025,xx22)	SIEMENS SMS-AX ORI-GINAL IMAGE INFO 1.0	3	Start Trim in original image

9.5.1.6 OOG Overlay Module

The table in this section contains private IOD attributes that describe extensions for internal handling of private overlay data.

Table 84 – (Private) OOG Overlay Module

Attribute Name	Tag	Owner	Type	Notes
OOG Type	(0029,xx08)	SIEMENS AX OOG	3	'AX OOG'
OOG Version	(0029,xx09)	SIEMENS AX OOG	3	
OOG Overlay Sequence	(0029,xx10)	SIEMENS AX OOG	3	Sequence containing the private overlay data
>Overlay Data	(0029,xx0A)	SIEMENS AX OOG	3	Overlay data stream
>Overlay Type	(0029,xx0B)	SIEMENS AX OOG	3	
>Bitmap Coordinate	(0029,xx0C)	SIEMENS AX OOG	3	Only when bitmap is present in overlay
>Bitmap Data	(0029,xx0D)	SIEMENS AX OOG	3	Only when bitmap is present in overlay

9.5.1.7 Data Padding Module

The table in this section contains private IOD attributes that describe extensions for padding data leading to pixel data.

Table 85 – (Private) Data Padding Module

Attribute Name	Tag	Owner	Type	Notes
Pixel Data Leading Padding	(7FDF,xxFC)	SIEMENS SYNGO DATA PADDING	3	Pixel Data Leading Padding

9.5.1.8 SOP Common Module - Image Type Extensions

Additional values for the image type attribute are used to designate the purpose of the SOP instance created by the ARTIS icono system. Please see the following table for details.

Table 86 - Image Type Extensions

Type of Scene/Image	Image Type
Scene and Single Image	ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE B ORIGINAL\PRIMARY\BIPLANE A ORIGINAL\PRIMARY\BIPLANE B
Scene and Single Image acquired with alternate footswitch	ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A\ALT ACQ ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE B\ALT ACQ ORIGINAL\PRIMARY\BIPLANE A\ALT ACQ ORIGINAL\PRIMARY\BIPLANE B\ALT ACQ
Reference Image	DERIVED\SECONDARY\SINGLE PLANE\SINGLE A\REFIMAGE DERIVED\SECONDARY\SINGLE PLANE\SINGLE B\REFIMAGE
CLEARstent Reference Image	DERIVED\SECONDARY\SINGLE PLANE\SINGLE A\REFIMAGE\ICSTENT REF DERIVED\SECONDARY\SINGLE PLANE\SINGLE B\REFIMAGE\ICSTENT REF
Dynamic CLEARstent Image	DERIVED\SECONDARY\SINGLE PLANE\SINGLE A\ICSTENT DYNAMIC DERIVED\SECONDARY\SINGLE PLANE\SINGLE B\ICSTENT DYNAMIC
CLEARstent Live Image	DERIVED\SECONDARY\SINGLE PLANE\SINGLE A\CLEARESTENT_LIVE DERIVED\SECONDARY\SINGLE PLANE\SINGLE B\CLEARESTENT_LIVE
Store Monitor	DERIVED\SECONDARY\SINGLE PLANE\SINGLE A\STORE MONITOR DERIVED\SECONDARY\SINGLE PLANE\SINGLE B\STORE MONITOR
Perivision	ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A\PERI\MASK\n[1] ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A\PERI\FILL\n[1]
Dynavision	ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A\DYNA\[2]

Type of Scene/Image	Image Type
3D Acquisition DR	ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A\3D ACQ\DR[2]
3D Acquisition DSA	ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A\3D ACQ\DSA[2]
3D Acquisition CARD	ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A\3D ACQ\CARD[2]
3D Acquisition multiphase	ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A\3D ACQ\CARD_NO_TRIGGER[2]
3D Acquisition Large Volume	ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A\3D ACQ\LV[2]
3D Acquisition 360°	ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A\3D ACQ\LV FAST[2]
Store Fluoro Loop	DERIVED\PRIMARY\SINGLE PLANE\SINGLE A\STORE FLUORO DERIVED\PRIMARY\SINGLE PLANE\SINGLE B\STORE FLUORO DERIVED\PRIMARY\BIPLANE A\\STORE FLUORO DERIVED\PRIMARY\BIPLANE B\\ STORE FLUORO
Store Roadmap	DERIVED\PRIMARY\SINGLE PLANE\SINGLE A\ROADMAP DERIVED\PRIMARY\SINGLE PLANE\SINGLE B\ROADMAP DERIVED\PRIMARY\BIPLANE A\\ROADMAP DERIVED\PRIMARY\BIPLANE B\\ROADMAP
Vessel Phase for Roadmap	ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A\4PHASE RDMP DSA ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE B\4PHASE RDMP DSA ORIGINAL\PRIMARY\BIPLANE A\\4PHASE RDMP DSA ORIGINAL\PRIMARY\BIPLANE B\\4PHASE RDMP DSA
Reference Image with Max Opac for Roadmap	DERIVED\SECONDARY\SINGLE PLANE\SINGLE A\REFIMAGE\ RDMP MAX OPAC DERIVED\SECONDARY\SINGLE PLANE\SINGLE B\REFIMAGE\ RDMP MAX OPAC
Exam Protocol (converted to XA Image)	ORIGINAL\PRIMARY\SINGLE PLANE\\EXAM PROTOCOL

[1] the term "n" is replaced by the related Step Number where the Image was acquired. Step Numbers start with "1".
[2] Additional values with phase info are set

9.6 Private Transfer Syntaxes

No private Transfer Syntaxes are defined for or requested by ARTIS icono DICOM application.

9.6.1 Additional DICOM Execution Status Information

Printer Status Info and Execution Status Info are defined terms and can therefore be extended or reduced by camera manufacturers. Therefore ARTIS icono shall be flexible.

If any other printer status info or execution status info is received ARTIS icono will react as shown in the following table:

Table 87: Additional Printer Status Information

Printer Status / Execution	Printer / Execution Status Info	Description	Message string visible in the Job status bar	Other action for syngo / camera symbol
WARNING	<any other>	<not defined status info>	Camera info: <status info>	<None>/Interact
FAILURE	<any other>	<not defined status info>	Camera info: <status info> Queue stopped.	Queue for this camera will be STOPPED/ Queue stopped

Annex A: Index of Tables

Annex B: Table of Figures

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Siemens Healthineers Headquarters

Siemens Healthcare GmbH

Henkestr. 127

91052 Erlangen

Germany

Phone +49 9131 84-0
siemens.com/healthineers

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