



DICOM Conformance Statement ARTIS one VA11

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1 Conformance Statement Overview

The ARTIS one is a “syngo®-based 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. Printing of viewing results is provided with Print Management Services.

The ARTIS one 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
Transfer (Image SOP Class)			
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	Yes
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Yes	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	Yes
Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.4	Yes	Yes
Transfer (Non-Image SOP Class)			
Surface Segmentation	1.2.840.10008.5.1.4.1.1.66.5	Yes	Yes
X-Ray Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.67	Yes	Yes
Comprehensive SR (priv. “Quant Report” Templ.)	1.2.840.10008.5.1.4.1.1.88.33	Yes	Yes
Transfer (Private SOP Class)			
Syngo Non-Image Storage	1.3.12.2.1107.5.9.1	Yes	Yes
Storage Commitment			
Storage Commitment Push Model	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	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	Yes	Yes
Patient Root Q/R - Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2	Yes	Yes
Study Root Q/R - Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Yes	Yes

SOP Classes	SOP Class UID	User of Service (SCU)	Provider of Service (SCP)
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	Yes	Yes
Patient/Study Only Q/R - Information Model MOVE	1.2.840.10008.5.1.4.1.2.3.2	Yes	Yes
Print Management			
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1.9	Yes	No
Presentation LUT	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		
General Purpose on CD-R and DVD	Yes (see Note1)	Yes
Basic Cardiac X-Ray on CD-R	Yes (See Note 2)	Yes
1024 X-Ray on CD-R	Yes	Yes
DVD		
1024 X-Ray on DVD	Yes	Yes
General Purpose DVD with JPEG	Yes	Yes

Note 1: with uncompressed setting

Note 2: with "resize" (512x512) active and only cine multi-frames included

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
Implementation Version Name	"SIEMENS_EAS_VA10"

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3 Introduction

3.1 Revision History

Table 4 - Revision History

Product	Product Version	Document Version	Date
ARTIS one	VA10A	10742211-ESK-001-00	12/2013
ARTIS one	VA11A	10742211-ESK-001-01	03/2022

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 one 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 one 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 Healthineers 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 Digital Imaging and Communications in Medicine (DICOM) Standard, 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 one 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 one can query remote notes, retrieve and store selected instances from that node. Using the Modality Worklist service, the ARTIS one 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 one 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)

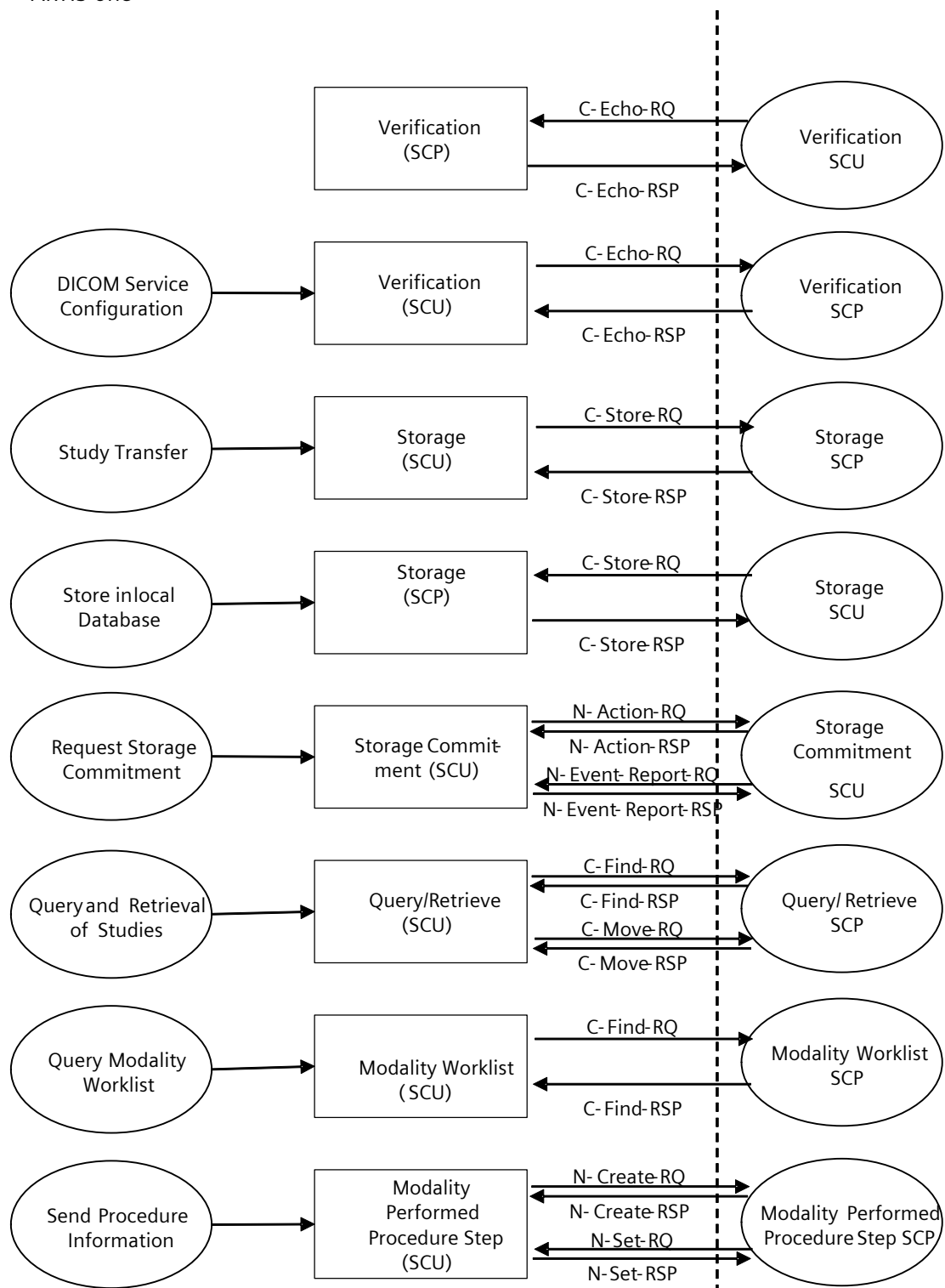


Figure 1: ARTIS one DICOM Data Flow diagram – Acquisition Workflow

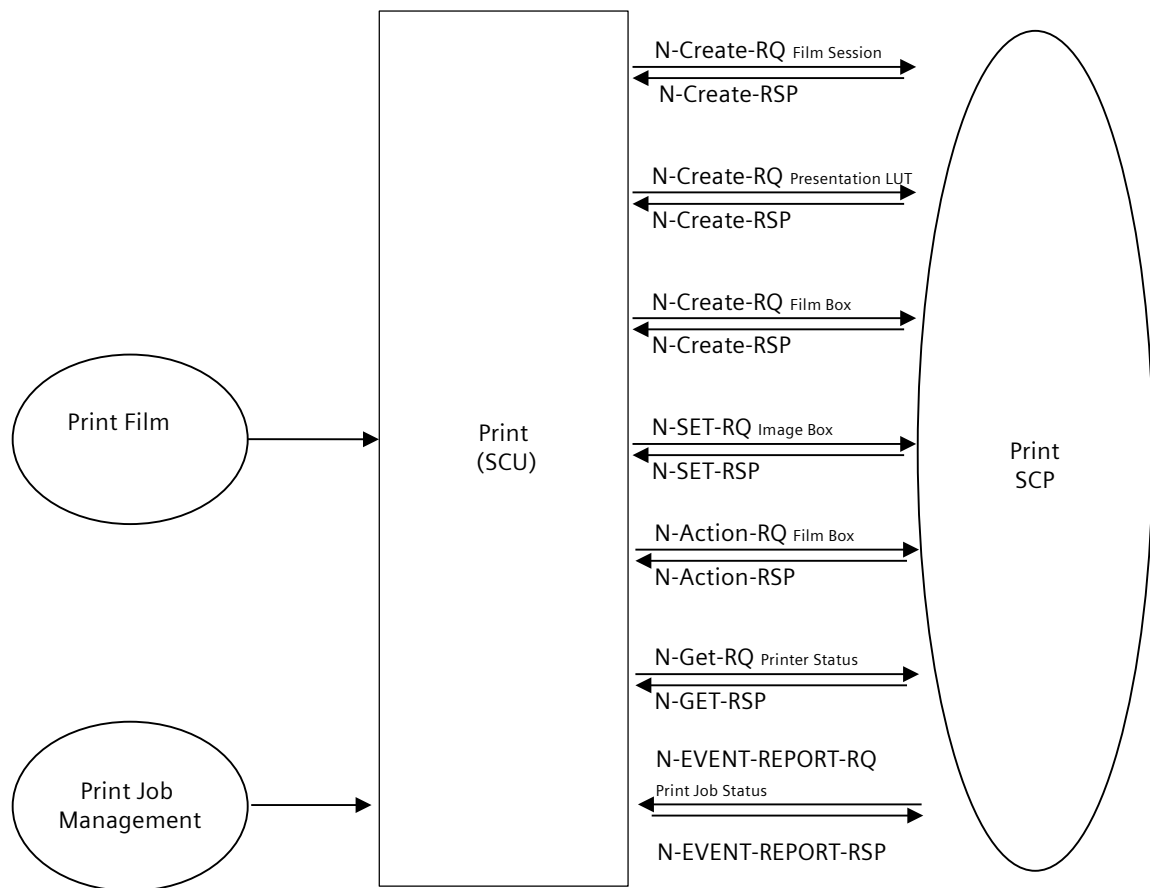


Figure 2: ARTIS one DICOM Data Flow diagram - Printing

4.1.2 Functional Definitions of Application Entities

4.1.2.1 Functional Definition of Verification-SCU AE

The ARTIS one DICOM Service Tool application opens an association when a "verification" of a remote application is requested during a configuration session. This can be done when entering new data for remote application configuration or to verify existing configuration data.

4.1.2.2 Functional Definition of Storage-SCU AE

The ARTIS one Storage SCU is invoked by the job control interface that is responsible for processing network archival tasks. The job consists of data describing the composite image objects selected for storage and the destination. An association is negotiated with the destination application entity and the image data is transferred using the C-STORE DIMSE-Service. Status of the transfer is reported to the job control interface.

With each successfully completed send job, the ARTIS one DICOM Application will populate the Storage Commitment Push Model Action Information from the SOP Instances sent. Then a Storage Commit Request is triggered, if configured. Depending on configuration, the ARTIS one DICOM application will keep the association open for responses with a configurable time-out, or closes the association and expects responses on a different association that has to be established by the remote Storage Commitment SCP.

The commitment status derived from the related trigger response will be indicated in the related Status Flags of the related entity. It is possible to create triggers ("auto rules") from this event.

The Transaction UUIDs of the pending commitment request are kept "open" (Job-status is "waiting") for a configurable time (default: 1h). If the "open time" for a pending commitment request has elapsed w/o a related response from the provider, the Transaction UUID is removed and the related entities are indicated as "commit failed".

Open Transaction UUIDs of pending commitment requests are discarded after a reboot of the system. The related entities are indicated as "commit failed".

4.1.2.3 Functional Definition of Storage-SCP AE

The Storage SCP component of the ARTIS one DICOM application is operating as background server process. The process starts when the machine is powered on and waits for Storage association requests. Upon accepting an association with a negotiated Presentation Context it starts to receive the Composite Image Objects and imports them to local database.

The Verification SCP is included in the Storage SCP.

The Storage Commitment SCP is running in background and is ready to receive requests when the system is started. Storage Commitment will be checked and returned against the SOP Classes received and kept in the local Storage of the ARTIS one. The response will either be sent "on same" (association not closed by requester) or "on separate" association (requester closed association consecutive to positive request status).

4.1.2.4 Functional Definition of Query/Retrieve-SCU AE

The ARTIS one DICOM query/retrieve SCU requests the remote query/retrieve SCP to perform a search and match to the keys specified in the request in order to display the results in the system's user interface. Depending on user action (Import) the ARTIS one query/retrieve DICOM SCU sends a C-MOVE DIMSE service 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.

4.1.2.5 Functional Definition of Query/Retrieve-SCP AE

The ARTIS one DICOM query/retrieve SCP responds to C-FIND DIMSE services from remote SCU applications. Depending on further remote request, a C-GET or a C-MOVE involves the system's DICOM query/retrieve SCP application to initiate a C-STORE association to send image objects to a remote Storage SCP.

All components of the DICOM query/retrieve SCP application are operating as background server processes. The processes start when the machine is powered on and then respond to queries based on the records stored in its database.

4.1.2.6 Functional Definition of Print SCU AE

The Print SCU 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.

4.1.2.7 Functional Definition of Worklist SCU AE

The worklist SCU ("broad query") is invoked from the patient browser user interface or by timer to request the worklist from a remote Information System (Modality Worklist Class SCP). The worklist SCP responses to the C-FIND query and scheduled imaging service requests (scheduled procedure steps) and patient demographic information will be "pulled" from the information system to the ARTIS one modality. All information retrieved will be held in the scheduling database for usage during Patient registration procedure.

Furthermore, the patient-based Query dialog from the patient browser allows to enter specific matching criteria ("narrow query") for the worklist query. With the response data the Patient Registration dialog can be populated according availability within the worklist response identifier.

4.1.2.8 Functional Definition of Modality PPS SCU AE

With registering a Patient (i.e. a Scheduled Procedure Step from Worklist), the ARTIS one DICOM application will create a MPPS Instance and communicate it to the MPPS Manager (SCP). It is configurable to set the states of all related MPPS to "Completed" when a patient is closed. Furthermore, a manual update can be performed with the MPPS user interface. From the user interface it is possible to set the state of the MPPS to "Completed" or "Discontinued". After that the DICOM application will no longer allow updates on the related MPPS Instance.

The ARTIS one will not only allow a "1:1 -relationship" of Scheduled Procedure Steps and Performed Procedure Steps, but also supports the "simple group-case" (grouping several SPS of the same Requested Procedure) , "complex group-case" (grouping several SPS from different Requested Procedures) and "append case" from the respective IHE-scenarios.

The ARTIS one will support creation of "unscheduled cases" by allowing MPPS Instances to be communicated for locally registered Patients.

4.1.3 Sequencing of Activities

4.1.3.1 Verification

Newly entered data must be saved before a "verification" of these data is possible.

4.1.3.2 Storage

Prior to sending of SOP Instances the ARTIS one Storage application is capable of invoking processing and resizing features in order to prepare image pixel contents into convenient formats for certain multi-vendor environments.

The Storage Commitment trigger is automatically derived from the successful completion of a Send Job.

4.1.3.3 Query/Retrieve

Retrieve of images is only possible if a result from a previous "Search..." operation exists and those entities can be selected for "Import".

The Query application will not “per se” request information on IMAGE level. The user can select a series and request image level information with the “Image List” function.

4.1.3.4 Workflow

The “narrow” (interactive) Worklist Query requires that sufficient matching keys or an unique matching key are/is entered before the query is issued. Only then a single response can be expected to complete the registration dialog.

An MPPS N-CREATE message is sent when a patient is registered. For procedure steps registered as “emergency” cases the MPPS N-CREATE is withheld until it is set to completed.

MPPS N-SET messages to update the information are sent after each X-Ray event.

4.2 Application Entity Specification

4.2.1 Verification SCU AE Specification

4.2.1.1 SOP Classes

For SOP Classes supported, please refer to “Table 1: Network Services” section “Verification” in the “Conformance Statement Overview”.

4.2.1.2 Association Policies

4.2.1.2.1 General

The ARTIS one DICOM Service Tool application attempts to open an association for verification request whenever the “verification” function is activated during network configuration of a remote DICOM application.

4.2.1.2.2 Number of Associations

The ARTIS one DICOM Service Tool application initiates one association at a time to request verification.

4.2.1.2.3 Asynchronous Nature

The ARTIS one DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

4.2.1.2.4 Implementation Identifying Information

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

4.2.1.3 Association Initiation Policy

4.2.1.3.1 Activity – “Verification”

4.2.1.3.1.1 Description and Sequencing of Activity

The Verification SCU C-ECHO request is initiated by Service and Configuration SW 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 in the service environment and the association is closed.

4.2.1.3.1.2 Proposed Presentation Contexts

The ARTIS one DICOM application will propose Presentation Contexts as shown in the following table:

Table 5 - 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	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

4.2.1.3.1.3 SOP Specific Conformance – Verification SCU

The Application conforms to the definition of the Verification SCU in accordance to the DICOM Standard.

4.2.1.4 Association Acceptance Policy

The Verification SCP is part of the Storage SCP.

4.2.2 Storage SCU AE Specification

4.2.2.1 SOP Classes

For SOP Classes supported, please refer to "Table 1: Network Services", sections "Transfer" and "Workflow Management".

4.2.2.2 Association Policies

4.2.2.2.1 General

The DICOM Storage application will be triggered by the transfer job queue or by an external retrieve request. An association request is sent to the destination AE and, upon successful negotiation of a Presentation Context, the transfer is started. Depending on configuration, processing or resizing can be applied to the images prior to being sent.

With a Send Job successfully completed, the DICOM application will generate the Storage Commitment Action Information which references to all Instances of the processed job. The Commit Request is sent over a single opened association. The ARTIS one will wait for Status responses of the Storage Commitment Request. If the Provider accepts the Storage Commitment with Success Status, the generated Transaction UID, together with study identification data and a timestamp, is kept. Depending on configuration, the association is closed or kept open for a configured time range. If the association is closed immediately, the response is expected on a different association which is the default setting. Multiple Storage Commitment Requests can be pending.

The default PDU size used will be 512 KB.

4.2.2.2.2 Number of Associations

The ARTIS one DICOM application initiates several associations at a time, one for each destination to which a transfer request is being processed in the active job queue list.

The number of simultaneous DICOM associations can be configured via the Service-UI. The dialog can be found in "Configuration / DICOM / General".

4.2.2.2.3 Asynchronous Nature

The ARTIS one DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

4.2.2.2.4 Implementation Identifying Information

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

4.2.2.3 Association Initiation Policy

If a job with network destination gets active in the job list or a retrieve sub-operation is processed, the ARTIS one DICOM application attempts to initiate a new association for

- DIMSE C-STORE to send images and with successful status and
- N-ACTION DIMSE for the Storage Commitment Push Model Service Class to request commitment.

4.2.2.3.1 Activity – "Send to ..."

4.2.2.3.1.1 Description and Sequencing of Activity

The C-STORE request is triggered by a job with network destination or the processing of an external C-MOVE retrieve request. If the process successfully establishes an association to a remote Application Entity, it will transfer each image one after another via the open association. Processing features and resizing of the pixel matrix can be applied as part of the transfer. If the C-STORE Response from the remote Application contains a status other than "Success" or "Warning", the association is aborted.

With success status for the previous transfer, the ARTIS one Storage application sends the commit request (N-ACTION-RQ) message and waits for acceptance of this request (N-ACTION-RSP). After receiving this, the transaction is marked as "waiting".

Depending on a configuration value, the association will then be closed or kept open. In the first case, there is another configurable timeout giving the number of hours (h) and minutes (m) (by default 1h:0m) to wait for the corresponding commit response (N-EVENT-REPORT). In the second case, this time is the (also configurable) time-out for the association being kept open. In both cases, if the commit response (N-EVENT-REPORT) does not arrive within the configured time-out, the transaction will be marked as failed.

If the commit response (N-EVENT-REPORT) received has the status of "complete - failure exists", the transaction is marked as failed, else the transaction is marked as "completed". In both cases, a status message is shown to the user.

4.2.2.3.1.2 Proposed Presentation Contexts

The ARTIS one DICOM application will propose Storage SCU Presentation Contexts as shown in the following table:

Table 6 - Presentation Context Table "Send to ..."

Presentation Context Table – "Send to ..."				
Abstract Syntax	Transfer Syntax		Role	Ext. Neg.
Description	Name List	UID List		
Any image SOP Class detailed in "Table 1: Network Services" section „Transfer (Image SOP Class)".	JPEG Lossy Extended	1.2.840.10008.1.2.4.51	SCU	None
	JPEG Lossless, Process 14 (selection value 1)	1.2.840.10008.1.2.4.70		
	JPEG Lossy Baseline (Process 1)	1.2.840.10008.1.2.4.50		
	Explicit VR Little Endian	1.2.840.10008.1.2.1		
	Explicit VR Big Endian	1.2.840.10008.1.2.2		
	Implicit VR Little Endian	1.2.840.10008.1.2		

Presentation Context Table – “Send to ...”				
Abstract Syntax	Transfer Syntax		Role	Ext. Neg.
Description	Name List	UID List		
Any non-image SOP Class detailed in “Table 1: Network Services” section „Transfer (Non-image SOP Class)“.	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None
Private SOP Class as detailed in Chapter “Table 1: Network Services” section „Transfer (Private SOP Class)“.	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None
Storage Commitment SOP Class as detailed in “Table 1: Network Services” section “Workflow Management”.	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None

4.2.2.3.1.3 SOP specific Conformance - “Send to ...”

The ARTIS one can send images in different formats. In a destination specific service level configuration, it can be configured if images are sent original, resized (512x512 8 bit, 1024x1024 12 bit) and/or processed.

For association and DIMSE level time-outs, please refer to section Configuration (4.4.2 Parameters) of this document.

4.2.2.3.1.3.1 *Optional Attributes*

Please refer to the related Image Object definition tables in the Annex (section “Created SOP Instances”) for a list of all DICOM IOD attributes of type 2 and 3, which are encoded by the ARTIS one applications.

4.2.2.3.1.3.2 *Specialized Information Object Definitions*

The DICOM images sent by ARTIS one DICOM application conform to the DICOM IOD definitions (Standard extended IODs). But they will contain additional private elements, which have to be discarded by a DICOM system when modifying the image.

The DICOM nodes are responsible for data consistency when modifying images. All unknown private attributes have to be removed upon modification!

4.2.2.3.1.3.3 *Data Dictionary of applied private IOD Attributes*

Please refer to “Standard Extended/Specialized/Private SOP Classes” in the Annex for a list of possible private IOD attributes.

4.2.2.3.1.4 SOP specific Conformance - Request Commitment

Storage Commitment is supported for all the SOP Classes detailed in Chapter “Table 1: Network Services” section “Workflow Management”.

The Referenced Study Component Sequence is not supported.

Storage Media File-Set ID and UID Attributes will not be supported in the commitment request (N-ACTION primitive) invoked by the Storage Commitment SCU.

4.2.2.4 Association Acceptance Policy

4.2.2.4.1 Activity – Update Flag Information

4.2.2.4.1.1 Description and Sequencing of Activity

After sending a Storage Commitment Request the ARTIS one either waits on the same association or, being configured to receive response on a separate association, closes the association and waits for an association request from the Storage Commitment SCP that wants to send the results.

Any incoming Notification will be checked for validity, that is, if the related Transaction UID is still part of the Pending Request Queue.

If the Notification is valid the related Instances are marked with the reported status. The over-all Commit Status of the higher Information Entities in the ARTIS one database is derived from propagation of the States of all sub-ordinate Image entities included in a study.

The Status Flags directly affected by Storage Commitment results and indicated in the different entities of the Patient Browser list can be one of

- “AC” or “SC” - Successful Commitment, "A" means archived to configured Archive destination, whereas "S" means sent to any other destination.
- “Af” or “Sf” - Commitment failed.
- “A?” or “S?” - Commitment request is sent, response is pending.

In case of failure the user has to repeat the transfer of images to the Archive destination. Another Storage Commitment will be performed after sending is completed successfully.

4.2.2.4.1.2 Accepted Presentation Context

The ARTIS one DICOM application will accept Storage Commitment Presentation Contexts as shown in the following table:

Table 7 - Presentation Context Table "Update Flag Information"

Presentation Context Table – “Update Flag Information”				
Abstract Syntax	Transfer Syntax		Role	Ext. Neg.
Description	Name List	UID List		
1.2.840.10008.1.20.1 Storage Commitment Push Model	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		

4.2.2.4.1.3 SOP specific Conformance

If the Commitment response (N-EVENT-REPORT) received has the status of “complete - failure exists”, the transaction is marked as failed, else the transaction is marked as “completed”. In both cases, a message is shown to the user.

The related status flags are set for the committed images in the local database.

The ARTIS one DICOM application will not support the Storage Media File Set ID attributes.

4.2.3 Storage SCP AE Specification

4.2.3.1 SOP Classes

For SOP Classes supported, please refer to "Table 1: Network Services" Sections "Transfer" on page 1.

4.2.3.2 Association Policies

4.2.3.2.1 General

The ARTIS one DICOM application will accept any number of verification or storage SOP classes that are referred to above. There is no limit on the number of presentation contexts accepted except for the DICOM limit. In case that the Siemens DICOM application runs out of resources, it will reject the association request.

When "trusted host functionality" is enabled ARTIS one will only accept Associations from known hosts with a known AET. IP address of the host and the AET must be entered in "Local Service" by a Siemens CSE.

The default PDU size used will be 512 KB.

4.2.3.2.2 Number of Associations

The Siemens ARTIS one DICOM application is able to accept multiple associations at a time. It can handle up to 10 associations in parallel.

The number of simultaneous DICOM associations can be configured via the Service-UI. The dialog can be found in "Configuration / DICOM / General".

4.2.3.2.3 Asynchronous Nature

The ARTIS one DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

4.2.3.2.4 Implementation 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

If the result from a previously accepted Storage Commitment request is evaluated, the ARTIS one DICOM application attempts to initiate a new association for

- DIMSE N-EVENT-REPORT for sending commitment result from a previous request.

4.2.3.3.1 Activity - Return commitment result

When ARTIS one Storage SCP AE received a Storage Commitment request it tries to send the response back on the same association. When the association is not open anymore it will initiate an association to send the storage commitment response (N-EVENT-REPORT) to the SCU.

4.2.3.3.1.1 Proposed Presentation Context

The ARTIS one DICOM application will propose Storage SCP Presentation Contexts for returning Storage Commitment results as shown in the following table:

Table 8 - Presentation Context Table "Return Commitment Result"

Presentation Context Table – "Return Commitment Result"				
Abstract Syntax	Transfer Syntax		Role	Ext. Neg.
Description	Name List	UID List		
Storage Commitment SOP Class as detailed in "Table 1: Network Services" section "Workflow Management".	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCP	None

4.2.3.3.1.2 SOP Specific Conformance

Storage Media File-Set ID and UID Attributes will not be supported in the N-EVENT-REPORT primitive invoked by the Storage SCP.

4.2.3.4 Association Acceptance Policy

The ARTIS one DICOM application attempts to accept a new association for

- DIMSE C-ECHO for incoming Verification requests
- DIMSE C-STORE for external image senders request storage of instances
- DIMSE N-ACTION for external systems requesting storage commitment
- DIMSE N-EVENT-REPORT for receiving commitment result from a previous request

4.2.3.4.1 Activity – Save to local disk

4.2.3.4.1.1 Description and Sequencing of Activity

The ARTIS one DICOM application will accept an association and will receive SOP Instances according to the listed presentation contexts on that association and will store the images to the local hard disk if the conformance check is performed successfully.

Upon successful receiving a C-STORE-RQ, the ARTIS one DICOM receiver performs a plausibility test on the received image and available system resources. If this test succeeds, it returns the Status SUCCESS, otherwise one of the following status codes is returned and the association is aborted:

Table 9 - Status codes "Save to local disk"

Code	Meaning
A700	<u>Refused</u> : This error status indicates a lack of Resources (e.g. not enough disk space) on the ARTIS one modality.
A900	<u>Invalid Dataset</u> : An error occurred while processing the image, which makes it impossible to proceed. The image will not be stored, and the association is aborted.
0110	<u>Processing Error</u> : An error occurred while processing the image, which makes it impossible to proceed. Association is aborted.

Note: The image will be saved after sending the response. If during this operation an error occurs, the association will be aborted. This implies that a C-STORE-RSP with status SUCCESS does not mean that the image was successfully stored into the database.

4.2.3.4.1.2 Accepted Presentation Context

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

Table 10 - Presentation Context Table "Save to local disk"

Presentation Context Table – "Save to local disk"				
Abstract Syntax	Transfer Syntax		Role	Ext. Neg.
Description	Name List	UID List		
Any image SOP Class detailed in "Table 1: Network Services" section „Transfer (Image SOP Class)".	JPEG Lossy Extended	1.2.840.10008.1.2.4.51	SCP	None
	JPEG Lossless, Process 14 (selection value 1)	1.2.840.10008.1.2.4.70		
	JPEG Lossy Baseline (Process 1)	1.2.840.10008.1.2.4.50		
	Explicit VR Little Endian	1.2.840.10008.1.2.1		
	Explicit VR Big Endian	1.2.840.10008.1.2.2		
	Implicit VR Little Endian	1.2.840.10008.1.2		
Any non-image SOP Class detailed in "Table 1: Network Services" section „Transfer (Non-image SOP Class)".	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		
Private SOP Class as detailed in Chapter "Table 1: Network Services" section „Transfer (Private SOP Class)".	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

The ARTIS one application conforms to the Full Storage Service Class at Level 2.

Any Explicit VR Transfer Syntax is preferred to be used by the Storage SCU when sending Composite Image Instances to the ARTIS one DICOM application.

If an image instance is received that is identified by a SOP Instance UID which is already used by an Instance stored in database then the actual received image will be discarded. The existing Instance is not superseded.

The order of preference in accepting Transfer Syntaxes within Presentation Contexts or Presentation Contexts with single Transfer Syntaxes is:

Table 11 - Order of Preference Transfer Syntax

Order	DICOM Transfer Syntax
1	JPEG Lossy Extended
2	JPEG Lossless Non-hierarchical
3	JPEG Lossy Baseline
4	Explicit VR Little Endian
5	Explicit VR Big Endian
6	Implicit VR Little Endian

ARTIS one DICOM application will decompress the image before storing it into the database.

The following sections will differentiate the attribute contents required for Image Viewing. The ARTIS one DICOM application supports more formats for Storage of Images than for Viewing.

The ARTIS one viewer supports only XA-Images for display. Only a number of pixel columns with a multiple of 4 is supported for display in the viewer.

Image Pixel Attribute Acceptance Criterion for Grayscale Images

The ARTIS one Viewing application accepts MONOCHROME2 photometric interpretation pixel format and graphic overlay with unsigned integer and 8 or 16 bits allocated. Accepted values:

Pixel plane

- Samples per Pixel (attribute 0028,0002) = 1
- Photometric Interpretation (attribute 0028,0004) = "MONOCHROME2"
- Only Aspect Ratio 1:1 is supported
- Pixel Representation (attribute 0028,0103) = 0
- Bits Allocated (attribute 0028,0100) = 8, 16
- Bits Stored (attribute 0028,0101) = 8, 10, 12
- High Bit (attribute 0028,0102) = 7, 9, 11
- Rows/Columns = 512, 1024 and all formats internally generated.

Overlay plane "embedded"

- Overlay Type (attribute 60xx,0040) = "G"
- Bits Allocated (attribute 60xx,0100) = 16
- Bit Position (attribute 60xx,0102) = 12, 13, 14, 15

Graphic Overlay will be shifted to fill Overlay Planes from Bit 12 and consecutive.

Overlay plane "explicit"

- Overlay Type (attribute 60xx,0040) = "G"
- Bits Allocated (attribute 60xx,0100) = 1
- Bit Position (attribute 60xx,0102) = 0
- Overlay Data (attribute 60xx,3000) = supported

For Modality LUT, both the linear LUT (Rescale Slope/Intercept) and the Modality LUT Sequence are supported and considered when pixel data is displayed. However, there are two limitations. The Modality LUT Sequence will be ignored in the following cases:

- 8-Bit signed pixels
- the pixel format is changed by the Modality LUT (e.g. 8bit -> 16bit)

If the Modality LUT Sequence contains multiple LUTs, then only the first one is used.

For VOI LUT, both the linear LUT (Window Center/Width) and the VOI LUT Sequence are supported (VOI LUT Sequence with 8 or 16 bit LUT data)

But if both, a VOI LUT Sequence and a linear Modality LUT, are specified within one image, then the value for Rescale Slope is restricted to 1.

If the VOI LUT Sequence contains multiple LUTs, then only the first one is used by default. The other VOI LUTs are selectable.

4.2.3.4.2 Activity – Evaluate Commit Request

4.2.3.4.2.1 Description and Sequencing of Activity

When receiving a Storage Commitment request the ARTIS one DICOM application will perform the necessary steps to check the received list Instances against the local database.

4.2.3.4.2.2 Accepted Presentation Context

The ARTIS one DICOM application will accept Storage Commitment Presentation Contexts as shown in the following table:

Table 12 - Presentation Context Table "Evaluate Commit Request"

Presentation Context Table – "Evaluate Commit Request"				
Abstract Syntax	Transfer Syntax		Role	Ext. Neg.
Description	Name List	UID List		
Storage Commitment SOP Class detailed in "Table 1: Network Services" section "Workflow Management".	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		

4.2.3.4.2.3 SOP specific Conformance

The ARTIS one Storage SCP AE will return success for images that are stored in the local database and failure for images that are not. However, the committed images can later be deleted by the user at the ARTIS one without notice!

Note: Storage Media File-Set ID and UID Attributes will not be supported in the N-EVENT-REPORT primitive invoked by the Storage Commitment SCP.

4.2.4 Query/Retrieve SCU Specification

4.2.4.1 SOP Classes

For SOP Classes supported, please refer to "Table 1: Network Services" section „Query/Retrieve“ in the "Conformance Statement Overview".

4.2.4.2 Association Policies

4.2.4.2.1 General

With the "Search..." function the query data can be entered, and the DICOM query/retrieve application is initiated. An initial query request will be sent out to one remote node that can be selected from a list of configured Query Providers. Depending on the replies to the initial request, sub-sequent query requests are issued to gather further data for lower information level entities. The results compiled from the response data will be displayed to the user. Upon request (Import), the retrieval of selected items is initiated.

The default PDU size used will be 512 KB.

4.2.4.2.2 Number of Associations

The ARTIS one DICOM application initiates several associations at a time.

For Query it initiates a new association to the remote node and issues the C-FIND request to retrieve all the requested patient and study information matching the search criteria. The ARTIS one initiates in parallel a second association to the destination node to query for all the series information for each study's information returned on the first association.

For the Retrieve request (C-MOVE) only one association is initiated per destination.

4.2.4.2.3 Asynchronous Nature

The ARTIS one DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

4.2.4.2.4 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

The ARTIS one DICOM application will request associations for the following DIMSE-C operations as SCU:

Table 13 - Supported DIMSE-C Operations - Query/Retrieve SCU

Supported DIMSE operations	Cancel Request supported
C-FIND	yes
C-MOVE	n. a.

Extended negotiation (relational query) is not supported for the above listed services.

4.2.4.3.1 Activity – Search for images (Search...)

4.2.4.3.1.1 Description and Sequencing of Activity

The associated activity is to fill out a query form with search data and pass it as query to the network application which issues a C-FIND over a previously built association. The remote SCP will respond with related data-entries that will be passed to a browser application. If needed, further associations are opened for querying data from sub-sequent entities. When data transfer is finished, each association is closed.

If the C-FIND Response from the remote Application contains an error status, the association is aborted.

4.2.4.3.1.2 Proposed Presentation Contexts

The ARTIS one DICOM application will propose Presentation Contexts as shown in the following table:

Table 14 - Presentation Context Table "Search..."

Presentation Context Table - "Search..."					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Query/Retrieve Model Patient Root - FIND	1.2.840.10008.5.1.4.1.2.1.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCU	None
Query/Retrieve Model Study Root - FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCU	None

Presentation Context Table - "Search..."					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Query/Retrieve Model Patient/Study Only - FIND	1.2.840.10008.5.1.4.1.2.3.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCU	None

Within the DICOM network configuration it is configurable which of the two query models (or both) are to be used by the ARTIS one DICOM Query SCU application for each node. If both Abstract Syntaxes are configured, the Find SCU will use the Patient Root Model only for C-FIND requests on PATIENT level. For all other levels it will use the Study Root model.

4.2.4.3.1.3 SOP Specific Conformance

The ARTIS one DICOM Query/Retrieve SCU supports hierarchical queries with all mandatory search keys. The interactive querying of attributes on IMAGE level is not supported by the Query SCU, hence retrieval of individual Objects is possible. The following table describes the search keys for the different query models that the SCU supports. Matching is either wildcard, which means that the user can supply a string containing wildcards, or universal, which means that the attribute is requested as return value.

Table 15 - C-FIND RQ Search Keys

Attribute Name	Tag	Type	Matching	User Input	Return Value Display
Patient Level²					
Patient's Name	(0010,0010)	R	Wildcard ³	Enter value	yes
Patient ID	(0010,0020)	U / R	Wildcard ³	Enter value	yes
Patient's Birth Date	(0010,0030)	O	Single Value	Enter value	yes
Patient's Sex	(0010,0040)	O	Single Value	Enter value	yes
Number of Patient related Studies	(0020,1200)	O	Universal (Null)	--	yes ⁴
Number of Patient related Series	(0020,1202)	O	Universal (Null)	--	no
Number of Patient related Instances	(0020,1204)	O	Universal (Null)	--	no
Study Level					
Patient's Name ⁵	(0010,0010)	R	Wildcard ³	Enter value	yes
Patient ID	(0010,0020)	U / R	Wildcard ³	Enter value	yes
Patient's Birth Date ⁵	(0010,0030)	O	Single Value	Enter value	yes
Patient's Sex ⁵	(0010,0040)	O	Single Value	Enter value	yes
Study Instance UID	(0020,000D)	U	Single Value	Enter value	yes
Study ID	(0020,0010)	R	Wildcard ³	Enter value	yes

² Patient Root Information Model only

³ Always a "*" is appended to the user-supplied string

⁴ Implicitly visualized in the UI if no study and series search attributes have been entered

⁵ Study Root Information Model only

Attribute Name	Tag	Type	Matching	User Input	Return Value Display
Study Date	(0008,0020)	R	Range	Enter value ⁶	yes
Study Time	(0008,0030)	R	Range	Enter value	yes
Accession Number	(0008,0050)	R	Wildcard	Enter value	yes
Study Description	(0008,1030)	O	Wildcard ³	Enter value	yes
Referring Physician's Name	(0008,0090)	O	Wildcard ³	Enter value	yes
Name of Physician Reading Study	(0008,1060)	O	Wildcard ³	Enter value	yes
Modalities in Study	(0008,0061)	O	Single Value	Enter value	yes
Number of Patient related Studies	(0020,1200)	O	Universal (Null)	--	no
Number of Patient related Series	(0020,1202)	O	Universal (Null)	--	no
Number of Patient related Instances	(0020,1204)	O	Universal (Null)	--	no
Number of Study related Series	(0020,1206)	O	Universal (Null)	--	yes ⁷
Number of Study related Instances	(0020,1208)	O	Universal (Null)	--	no
Series Level					
Series Instance UID	(0020,000E)	U	Single Value	Enter value	yes
Series Number	(0020,0011)	R	Single Value	Enter value	yes
Modality	(0008,0060)	R	Single Value	Enter value	yes
Series Date	(0008,0021)	O	Universal (Null)	--	yes
Series Time	(0008,0031)	O	Universal (Null)	--	yes
Series Description	(0008,103E)	O	Wildcard ³	Enter value	yes
Body Part Examined	(0018,0015)	O	Single Value	Enter value	yes
Performing Physician's Name	(0008,1050)	O	Wildcard ³	Enter value	yes
Request Attributes Sequence	(0040,0275)	O	--	--	yes
>Requested Procedure ID	(0040,1001)	O	Wildcard ³	Enter value	yes
>Scheduled Procedure Step ID	(0040,0009)	O	Wildcard ³	Enter value	yes
Performed Procedure Step Start Date	(0040,0244)	O	Range	Enter value	yes
Performed Procedure Step Start Time	(0040,0245)	O	Range	Enter value	yes
Number of Series related Instances	(0020,1209)	O	Universal (Null)	--	yes
Instance Availability	(0008,0056)	O	Universal (Null)		

⁶ Date range also possible

⁷ Implicitly if no series search attributes have been entered

Attribute Name	Tag	Type	Matching	User Input	Return Value Display
Image Level					
SOP Instance UID	(0008,0018)	U	Single Value	--	no
Instance Number	(0020,0013)	R	Universal (Null)	--	yes
SOP Class UID	(0008,0016)	O	Universal (Null)	--	no
Image Comments	(0020,4000)	O	Universal (Null)	--	yes
Number of Frames	(0028,0008)	O	Universal (Null)	--	yes
Content Date	(0008,0023)	O	Universal (Null)	--	yes
Content Time	(0008,0033)	O	Universal (Null)	--	yes

U = Unique Key, **R** = Required Key, **O** = Optional Key, - = not supported or applicable

The ARTIS one Search application supports a

- DIMSE C-FIND-CANCEL

if the user wishes to cancel a running Query request via the ARTIS one user interface ("Cancel" button while a "Search..." is active).

The Find SCU interprets following status codes:

Table 16 - Status Codes "Search..."

Service Status	Meaning	Error Codes	Related Fields
Refused	Out of Resources	A700	(0000,0902)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	Cxxx	(0000,0901) (0000,0902)
Cancel	Matching terminated due to Cancel request	FE00	None
Success	Matching is complete - No final Identifier is supplied	0000	None
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	Identifier
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this identifier	FF01	Identifier

4.2.4.3.2 Activity – Retrieve Images (Import...)

4.2.4.3.2.1 Description and Sequencing of Activity

When selecting a data entry in the Query UI and activating the "Import" function, a retrieval request is passed to the ARTIS one DICOM application which issues a C-MOVE service according to the Patient Root or Study Root query model. (The Storage Service Class Conformance Statement describes the C-STORE service, which is generated by processing the C-MOVE service.)

The received image data are processed as described in the storage class SCP descriptions.

The ARTIS one DICOM application will always insert the own Storage SCP AE as "Move Destination".

4.2.4.3.2.2 Proposed Presentation Contexts

The ARTIS one Server DICOM application will propose Presentation Contexts as shown in the following table:

Table 17 - Presentation Context Table "Import..."

Presentation Context Table - "Import..."					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Query/Retrieve Model Patient Root – MOVE	1.2.840.10008.5.1.4.1.2.1.2	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCU	None
Query/Retrieve Model Study Root – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCU	None
Query/Retrieve Model Patient/Study Only – MOVE	1.2.840.10008.5.1.4.1.2.3.2	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCU	None

Note: C-MOVE Extended Negotiation will be not supported by the SCU.

4.2.4.3.2.3 SOP Specific Conformance

All required keys will be provided in the retrieve request identifier, as defined in DICOM Standard.

The Move SCU interprets following status codes:

Table 18 - C-MOVE RSP Status Codes

Service Status	Meaning	Error Codes	Related Fields
Refused	Out of Resources - Unable to calculate number of matches	A701	(0000,0902)
	Out of Resources - Unable to perform sub operations	A702	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
	Move destination unknown	A801	(0000,0902)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	Cxxx	(0000,0901) (0000,0902)
Cancel	Sub-operations terminated due to Cancel Indication	FE00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)

Service Status	Meaning	Error Codes	Related Fields
Warning	Sub-operations Complete - One or more Failures of Warnings	B000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Success	Sub-operations Complete - No Failures or Warning	0000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Pending	Sub-operations are continuing	FF00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)

4.2.4.4 Association Acceptance Policy

See next section "Query/Retrieve SCP AE Specification".

4.2.5 Query/Retrieve SCP Specification

4.2.5.1 SOP Classes

For SOP Classes supported, please refer to "Table 1: Network Services" section „Query/Retrieve“ in the "Conformance Statement Overview".

4.2.5.2 Association Policies

4.2.5.2.1 General

When "trusted host" functionality is enabled ARTIS one will only accept Associations from known hosts with a known AET. Hosts and AETs have to be entered in "Local Service" by a Siemens CSE.

The default PDU size used will be 512 KB.

4.2.5.2.2 Number of Associations

The Siemens ARTIS one DICOM application is able to accept multiple associations at a time. It can handle up to 10 associations in parallel.

The number of simultaneous DICOM associations can be configured via the Service-UI. The dialog can be found in "Configuration / DICOM / General".

4.2.5.2.3 Asynchronous Nature

The ARTIS one DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

4.2.5.2.4 Implementation Identifying Information

For Implementation Identifying Information please refer to "Table 3 - Implementation Identifying Information".

4.2.5.3 Association Initiation Policy

See previous section "Query/Retrieve SCU AE Specification".

4.2.5.4 Association Acceptance Policy

The ARTIS one DICOM application will accept associations for the following DIMSE-C operations as SCP:

- C-FIND
- C-GET
- C-MOVE
- C-FIND-CANCEL
- C-GET-CANCEL
- C-MOVE-CANCEL

Extended negotiation - which is relational query or retrieve - is not supported for the above listed services. The ARTIS one DICOM application does support multiple C-FIND requests over the same association, while multiple C-MOVE or C-GET operations are not supported over the same association.

4.2.5.4.1 Activity - Process Search Requests

4.2.5.4.1.1 Description and Sequencing of Activity

The Query SCP AE will respond to incoming query requests from a SCU with the query model Patient Root, Study Root and Patient/Study Only. Relational retrieve operation is not supported. The content records of the local database are used to match the incoming query keys and fill the related return keys. With a C-FIND-CANCEL request the running query can be canceled at any time.

Multiple C-FIND requests over the same association are supported.

4.2.5.4.1.2 Accepted Presentation Contexts

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

Table 19 - Presentation Context Table "Process Search Requests"

Presentation Context Table - "Process Search Requests"					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Query/Retrieve Model Patient Root - FIND	1.2.840.10008.5.1.4.1.2.1.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None
Query/Retrieve Model Study Root - FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None

Query/Retrieve Model Patient/Study Only - FIND	1.2.840.10008.5.1.4.1.2.3.1	Implicit VR Little Endian Ex- plicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None
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Note: C-FIND Extended Negotiation will not be supported.

The order of preference for accepting Transfer Syntaxes is: 1. Explicit VR Little Endian, 2. Explicit VR Big Endian, 3. Implicit VR Little Endian.

4.2.5.4.1.3 SOP Specific Conformance

The ARTIS one DICOM Query/Retrieve SCP supports hierarchical queries for all mandatory and optional search keys.

The syntactical component structure of the attribute (0010,0010) Patient's Name is defined as follows (see [DICOM], Part 5, Definition of PN, Person Name):

<single byte group>=<ideographic group>=<phonetic group>

The Query/Retrieve SCP replies to queries for "Patient's Name" as follows:

1. Matching of Patient's Name attribute (0010, 0010) is done case-insensitively.
2. If a search string matches the complete value of a Patient's Name in the database, a match will be returned.
3. If a search string matches an individual group (single byte, ideographic or phonetic) of a Patient's Name in the database, a match will be returned.
4. If a search string matches two consecutive groups of a data base object's Patient's Name, a match will be returned.
5. Redundant group separators "=" or component separators "^" are treated as insignificant for matching.
6. Leading and trailing blanks within a component or a group of Patient's Name are treated as insignificant for matching.

Except for attribute Patient's Name (0010,0010) any queries for text string attributes will be treated case-sensitively.

The Find SCP will not differentiate "?" and "*", thus "?abc*" will be treated as "*abc*".

If the value for the patient-level unique key "Patient ID" is not known, it will be returned with zero length. The attribute "Image Comments" will not be included in the C-FIND-RSP, if it is not set in the DB, even if it was requested as return key in the related C-FIND-RQ.

Usage of Storage Media File-Set ID, Retrieve AE Title with C-FIND-RSP message:

- The Storage Media File-Set ID - if available - can be returned at Study/Series/Image Level. Only on Image Level, the values of ONLINE, NEARLINE or OFFLINE are returned to indicate the Storage Location of the related Instance.
- The Retrieve AE Title - if available - can only be returned at Image Level (for Patient Root and Study Root models) or Study Level (for Patient/Study Only model).

Relational Queries are not supported.

A remote DICOM AE can cancel the running query by sending a C-FIND-CANCEL. Matches are possibly continuing (more C-FIND response with status PENDING) until the cancel operation takes effect and query matching has completed.

The supported attributes on the various query levels of the three supported information models are listed in the following table.

Table 20 - Query/Retrieve SCP supported attributes

Attribute Name	Tag	PR	SR	PSo	Matching
Patient Level (PR or PSo) or Study Level (SR)					
Patient's Name	(0010,0010)	R	R	R	Single Value, Wildcard, Universal
Patient ID	(0010,0020)	U	R	U	Single Value, Wildcard, Universal
Patient's Birth Date	(0010,0030)	O	O	O	Single Value, Range, Universal
Patient's Birth Time	(0010,0032)	O	O	O	Single Value, Range, Universal
Patient's Sex	(0010,0040)	O	O	O	Single Value, Wildcard, Universal
Ethnic Group	(0010,2160)	O	-	O	Single Value, Wildcard, Universal
Patient Comments	(0010,4000)	O	O	O	Wildcard, Universal
Number of Patient related Studies	(0020,1200)	O	O	O	Universal
Number of Patient related Series	(0020,1202)	O	O	O	Universal
Number of Patient related Instances	(0020,1204)	O	O	O	Universal
Study Level					
Study Instance UID	(0020,000D)	U	U	U	Single Value, List of UIDs
Study ID	(0020,0010)	R	R	R	Single Value, Wildcard, Universal
Study Date	(0008,0020)	R	R	R	Single Value, Range, Universal
Study Time	(0008,0030)	R	R	R	Single Value, Range, Universal
Accession Number	(0008,0050)	R	R	R	Single Value, Wildcard, Universal
Referring Physician's Name	(0008,0090)	O	O	O	Single Value, Wildcard, Universal
Study Description	(0008,1030)	O	O	O	Single Value, Wildcard, Universal
Admitting Diagnosis Description	(0008,1080)	O	O	O	Single Value, Wildcard, Universal
Patient's Age	(0010,1010)	O	O	O	Single Value, Wildcard, Universal
Patient's Size	(0010,1020)	O	O	O	Single Value, Universal
Patient's Weight	(0010,1030)	O	O	O	Single Value, Universal
Occupation	(0010,2180)	O	O	O	Single Value, Wildcard, Universal
Additional Patient History	(0010,21B0)	O	O	O	Wildcard, Universal
Name of Physician reading the Study	(0008,1060)	O	O	O	Single Value, Wildcard, Universal
Modalities in Study	(0008,0061)	O	O	O	Multiple values, Universal
Number of Study Related Series	(0020,1206)	O	O	O	Universal
Number of Study Related Instances	(0020,1208)	O	O	O	Universal
Series Level					
Series Instance UID	(0020,000E)	U	U	-	Single Value, List of UIDs
Series Number	(0020,0011)	R	R	-	Single Value, Universal
Modality	(0008,0060)	R	R	-	Single Value, Wildcard, Universal
Laterality	(0020,0060)	O	O	-	Single Value, Wildcard, Universal

Attribute Name	Tag	PR	SR	PSo	Matching
Body Part Examined	(0018,0015)	O	O	-	Single Value, Wildcard, Universal
Patient Position	(0018,5100)	O	O	-	Single Value, Wildcard, Universal
Smallest Pixel Value in Series	(0028,0108)	O	O	-	Single Value, Universal
Largest Pixel Value in Series	(0028,0109)	O	O	-	Single Value, Universal
Protocol Name	(0018,1030)	O	O	-	Single Value, Wildcard, Universal
Series Date	(0008,0021)	O	O	-	Single Value, Range, Universal
Series Time	(0008,0031)	O	O	-	Single Value, Range, Universal
Series Description	(0008,103E)	O	O	-	Single Value, Wildcard, Universal
Operator's Name	(0008,1070)	O	O	-	Single Value, Wildcard, Universal
Performing Physician's name	(0008,1050)	O	O	-	Single Value, Wildcard, Universal
Performed Procedure Step Start Date	(0040,0244)	O	O	-	Universal
Performed Procedure Step Start Time	(0040,0245)	O	O	-	Universal
Number of Series related Instances	(0020,1209)	O	O	-	Universal
Image or SR Document Level					
SOP Instance UID	(0008,0018)	U	U	-	Single Value, List of UIDs
Image Number	(0020,0013)	R	R	-	Single Value, Universal
Content Date	(0008,0023)	O	O	-	Single Value, Range, Universal
Content Time	(0008,0033)	O	O	-	Single Value, Range, Universal
Modality	(0008,0060)	O	O	-	Single Value, Wildcard, Universal
Image Comments	(0020,4000)	O	O	-	Universal
Referenced Request Sequence	(0040,A370)	O	O	-	Sequence matching
>Accession Number	((0008,0050)	O	O	-	Single Value, Universal
>Requested Procedure ID	(0040,1000)	O	O	-	Single Value, Universal
Concept Name Code Sequence	(0040,A043)	O	O	-	Sequence matching
>Code Value	(0008,0100)	O	O	-	Single Value, Wildcard, Universal
>Coding Scheme Designator	(0008,0102)	O	O	-	Single Value, Wildcard, Universal
>Coding Scheme Version	(0008,0103)	O	O	-	Single Value, Wildcard, Universal
>Code Meaning	(0008,0104)	O	O	-	Single Value, Wildcard, Universal
Template Identifier	(0040,DB00)	O	O	-	Single Value, Wildcard, Universal
Completion Flag	(0040,A491)	O	O	-	Single Value, Wildcard, Universal
Verification Flag	(0040,A493)	O	O	-	Single Value, Wildcard, Universal
Verifying Observer Sequence	(0040,A073)	O	O	-	Sequence matching
>Verifying Organization	(0040,A027)	O	O	-	Single Value, Wildcard, Universal
>Verifying Date Time	(0040,A030)	O	O	-	Single Value, Range, Universal

Attribute Name	Tag	PR	SR	PSo	Matching
>Verifying Observer Name	(0040,A075)	O	O	-	Single Value, Wildcard, Universal
>Verifying Observer Identification Code Sequence	(0040,A088)	O	O	-	Sequence matching
>>Code Value	(0008,0100)	O	O	-	Single Value, Wildcard, Universal
>>Coding Scheme Designator	(0008,0102)	O	O	-	Single Value, Wildcard, Universal
>>Coding Scheme Version	(0008,0103)	O	O	-	Single Value, Wildcard, Universal
>>Code Meaning	(0008,0104)	O	O	-	Single Value, Wildcard, Universal

PR = Patient Root Model, SR = Study Root Model, PSo = Patient/Study Only Model

U = Unique Key, R = Required Key, O = Optional Key, - = not supported or applicable

The "Process Search Requests" activity can return the following status codes:

Table 21 - Status Codes Process Search Request

Service Status	Meaning	Error Codes	Related Fields
Refused	Out of Resources	A700	(0000,0902)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	C001	(0000,0901) (0000,0902)
Cancel	Matching terminated due to Cancel request	FE00	None
Success	Matching is complete - No final Identifier is supplied	0000	None
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	Identifier
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this identifier	FF01	Identifier

4.2.5.4.2 Activity - Process Retrieve Requests

4.2.5.4.2.1 Description and Sequencing of Activity

The associated activity is to respond to retrieve requests initiated from a foreign SCU. Relational retrieve operation is not supported.

Multiple C-GET or C-MOVE requests over the same association are not supported.

4.2.5.4.2.1 Accepted Presentation Contexts

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

Table 22 - Presentation Context Table "Process Retrieve Requests"

Presentation Context Table - "Process Retrieve Requests"					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Query/Retrieve Model Patient Root - GET	1.2.840.10008.5.1.4.1.2.1.3	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None
Query/Retrieve Model Study Root - GET	1.2.840.10008.5.1.4.1.2.2.3	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None
Query/Retrieve Model Patient/Study Only - GET	1.2.840.10008.5.1.4.1.2.3.3	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None
Query/Retrieve Model Patient Root - MOVE	1.2.840.10008.5.1.4.1.2.1.2	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None
Query/Retrieve Model Study Root - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None
Query/Retrieve Model Patient/Study Only - MOVE	1.2.840.10008.5.1.4.1.2.3.2	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None

Note: C-FIND Extended Negotiation will not be supported.

The order of preference for accepting Transfer Syntaxes is: 1. Explicit VR Little Endian, 2. Explicit VR Big Endian, 3. Implicit VR Little Endian.

4.2.5.4.2.2 SOP Specific Conformance

Relational retrieve operation is not supported.

All unique keys must be supplied according to the selected Query/Retrieve Level. The related tables in the C-FIND SCP section will give information about "U" marked key attributes.

The C-STORE can only be performed to AEs that are configured in the ARTIS one.

The "Process Retrieve Requests" activity can return the following status codes:

Table 23 - Status Codes "Process Retrieve Requests"

Service Status	Meaning	Error Codes	Related Fields
Refused	Out of Resources - Unable to calculate number of matches	A701	(0000,0902)
	Out of Resources - Unable to perform sub operations	A702	(0000,1020) (0000,1021) (0000,1022) (0000,1023)

Service Status	Meaning	Error Codes	Related Fields
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	C001	(0000,0901) (0000,0902)
Cancel	Sub-operations terminated due to Cancel Indication	FE00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Warning	Sub-operations Complete - One or more Failures of Warnings	B000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Success	Sub-operations Complete - No Failures or Warning	0000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Pending	Sub-operations are continuing	FF00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)

4.2.6 Print SCU Specification

4.2.6.1 SOP Classes

For SOP Classes supported, please refer to "Table 1: Network Services" section "Print Management" in the "Conformance Statement Overview".

4.2.6.2 Association Policies

4.2.6.2.1 General

Whenever a film-sheet is completely set up and printed by command or automated rule, the job is prepared for processing. As soon as the queue is ready to process the job, it is activated and worked according to the processing data. The Print application will initiate an association to the print destination and process the printing.

The default PDU size used will be 512 KB.

4.2.6.2.2 Number of Associations

The ARTIS one DICOM application initiates one association at a time for each different print device configured.

4.2.6.2.3 Asynchronous Nature

The ARTIS one DICOM print application does not support asynchronous communication (multiple outstanding transactions over a single association).

4.2.6.2.4 Implementation Identifying Information

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

4.2.6.3 Association Initiation Policy

Triggered by the Print job queue the Print Management SCU establishes an association by using the DICOM association services. An N-GET request determines the printer status prior to printing. If the printer status is "normal", the print job is started.

After the last film is printed from queue, the Print application will leave open the association for another 60 seconds. If a new film job is ready for printing within this time-limit, the job will be immediately processed over the still open association. If there is no new job, the association is closed.

During the "idle-time" (no open association to printer) the Print application will issue a cyclic camera status request (using N-GET of the Printer SOP Class) every 5 minutes.

4.2.6.3.1 Activity - Print Film

4.2.6.3.1.1 Description and Sequencing of Activity

The film sheet is internally processed, converted to a Standard/1-1 page and then the page image is sent. Status is controlled by awaiting any N-EVENT message through 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 association is aborted.

4.2.6.3.1.2 Proposed Presentation Context

The ARTIS one DICOM application will propose Presentation Contexts as shown in the following table:

Table 24 - Presentation Context Table "Print Film"

Presentation Context Table - "Print Film"					
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 Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Printer SOP Class	1.2.840.10008.5.1.1.16	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

Presentation Context Table - "Print Film"					
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 Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Presentation LUT SOP Class	1.2.840.10008.5.1.1.23	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

4.2.6.3.1.3 SOP Specific Conformance

The ARTIS one DICOM print management SCU conforms to the DICOM Basic Grayscale Print Management Meta SOP Class.

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

- maximum number of print jobs in the queue
- maximum number of print copies
- supported film sizes of the connected DICOM SCP
- supported film formats of the DICOM SCP
- lookup table definition.

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 hard-copy printer.

The ARTIS one DICOM 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 following attributes:

Table 25 - Basic Film Session N-CREATE attributes

Attribute Name	Tag	Usage SCU	Supported Values
Number of Copies	(2000,0010)	U	"1"
Medium Type	(2000,0030)	U	BLUE FILM CLEAR FILM PAPER
Film Destination	(2000,0040)	U	MAGAZINE PROCESSOR

U = User Option

The number of copies sent to the DICOM Printer is always 1, the job is sent n times for n copies.

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 – see below:

Table 26 - Affected SOP Instance UID

Attribute Name	Tag	Source of Information
Requested SOP Instance UID	(0000,1000) → (0000,1001)	Affected SOP Instance UID of N-CREATE-RSP on Basic Film Session

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

The Basic Film Session SOP Class interprets the following status codes (from N-CREATE-RSP, N-DELETE-RSP messages):

Table 27 - Basic Film Session Status Codes

Service Status	Meaning	Error Codes
Failure	Film session SOP instances hierarchy does not contain film box SOP instances	C600
	Unable to create print job, print queue is full	C601
	Image size is larger than images box size	C603
Warning	Memory allocation not supported	B600
	Film session printing is not supported	B601
	Film box does not contain image box (empty page)	B602
Success	Film belonging to the film session are accepted for printing	0000

Basic Film Box SOP Class

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

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

Supported Service Elements as SCU are:

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

The Basic Film Box SOP Class N-CREATE-RQ message uses the following attributes (the actual values for each attribute depend on DICOM printer configuration within the ARTIS one DICOM print management SCU):

Table 28 - Basic Film Box N-CREATE attributes

Attribute Name	Tag	Usage SCU	Supported Values
Image Display Format	(2010,0010)	M	STANDARD\1,1
Referenced Film Session Sequence	(2010,0500)	M	n. a.

> 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
Film Size ID	(2010,0050)	M	8INX10IN, 10INX12IN, 10INX14IN, 11INX14IN,, 14INX14IN, 14INX17IN, 24CMX24CM, 24CMX30CM
Magnification Type	(2010,0060)	M	BILINEAR, CUBIC, NONE, REPLICATE
Max Density	(2010,0130)	U	> 0
Min Density	(2010,0120)	U	50 > value > 0
Illumination	(2010,015E)	U	> 0 Required if Presenta- tion LUT is present.
Reflective Ambient Light	(2010,0160)	U	> 0 Required if Presenta- tion LUT is present.
Referenced Presentation LUT Se- quence	(2050,0500)	U	

M = Mandatory, **U** = User Option

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 and 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 DICOM 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 - see below:

Table 29 - Affected SOP Instance UID

Attribute Name	Tag	Source of Information
Requested SOP Instance UID	(0000,1000) → (0000,1001)	Affected SOP Instance UID of N-CREATE-RSP on Basic Film Box

The Basic Film Box SOP Class interprets the following status codes:

Table 30 - Basic Film Box Status Codes

Service Status	Meaning	Error Codes
Failure	Unable to create print job, print queue is full	C601
	Image size is larger than images box size	C603
Warning	Film box does not contain image box (empty page)	B603
	Requested MinDensity or MaxDensity outside of Printer's operating range	B605
Success	Film accepted for printing	0000

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 Grayscale 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 following attributes:

Table 31 - Basic Grayscale Image Box N-SET attributes

Attribute Name	Tag	Usage SCU	Supported Values
Image Position	(2020,0010)	M	1
BASIC Grayscale Image Sequence	(2020,0110)	M	n. a.
> Samples per Pixel	(0028,0002)	M	1
> Photometric Interpretation	(0028,0004)	M	MONOCHROME2
> Rows	(0028,0010)	M	<Printer/Film config>
> Columns	(0028,0011)	M	<Printer/Film config>
> Pixel Aspect Ratio	(0028,0034)	M	(1:1)
> 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	

M = Mandatory

The Grayscale Image Box SOP Class interprets the following status codes:

Table 32 - Basic Grayscale Image Box Status Codes

Service Status	Meaning	Error Codes
Failure	Image contains more pixel than printer can print in Image Box	C603
	Insufficient memory in printer to store the image	C605

Service Status	Meaning	Error Codes
Warning	Requested MinDensity or MaxDensity outside of Printer's operating range	B605
Success		0000

Presentation LUT SOP Class

The Presentation LUT tailors image hardcopy printing 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 Presentation LUT SOP Class uses only the N-CREATE-RQ with the following attributes:

Table 33 - Presentation LUT N-CREATE attribute

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

U = User Option

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) - see below:

Table 34 - Affected SOP Instance UID

Attribute Name	Tag	Source of Information
Requested SOP Instance UID	(0000,1000) → (0000,1001)	Affected SOP Instance UID of N-CREATE-RSP on Presentation LUT

The Presentation LUT SOP Class interprets the following status codes:

Table 35 - Presentation LUT Status Codes

Service Status	Meaning	Error Codes
Success	Presentation LUT successfully created	0000
Warning	Requested MinDensity or MaxDensity outside of printer's operating range. The printer will use its respective minimum or maximum density value instead.	B605

Printer SOP Class

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

The SCU uses the mandatory N-EVENT Report DIMSE service to monitor the changes of the printer status in an asynchronous way.

The following returned information is supported:

Table 36 - Used Printer N-EVENT Report attributes

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

U = User Option

Table 37 - Mandatory Printer N-GET-RSP, N-EVENT-REPORT-RQ attributes

Attribute Name	Tag	Usage SCP	Supported Values
Printer Status	(2110,0010)	M	NORMAL, FAILURE, WARNING
Printer Status Info	(2110,0020)	M	See tables in Annex for details.

M = Mandatory

Note: For a detailed description on how ARTIS one reacts on different printer status messages, please refer to the Annex section "DICOM Print SCU - detailed status displays".

Print Job SOP Class

The Print Job SOP Class allows to monitor the execution of the print process.

The ARTIS one DICOM Print Management application supports the optional N-EVENT-REPORT DIMSE Service to receive the changes of the Print Job Status in an asynchronous way.

It can receive Events from the Print SCP asynchronously:

- N-EVENT-REPORT

Note: The underlying syngo DICOM Print AE does not support receiving of N-EVENT-REPORT messages from camera during open print sessions. This is typically configurable in the camera setup.

The following information is supported:

Table 38 - Used Print Job N-EVENT Report attributes

Event-type Name	Event	Attributes	Tag	Usage SCU
Normal	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

Event-type Name	Event	Attributes	Tag	Usage SCU
		Printer Name	(2110,0030)	U
Done	3	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
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

U = User Option

Note: For a detailed description on how ARTIS one reacts on different printer status messages, please refer to the Annex section "DICOM Print SCU - detailed status displays".

4.2.6.3.2 Activity - Show Device Status

4.2.6.3.2.1 Description and Sequencing of Activity

With no printing activity ongoing ("idle time"), the ARTIS one DICOM Print SCU application will cyclically request the printer status to update the related printer state in the Printing UI.

4.2.6.3.2.2 Proposed Presentation Context

The ARTIS one DICOM application will propose Presentation Contexts as shown in the following table:

Table 39 - Presentation Context Table "Show Device Status"

Presentation Context Table - "Show Device Status"					
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
		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

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

The Print SCU AE application will cyclically "ask" the Printer (SCP) for its status synchronously:

- N-GET as SCU

The following information is supported:

Table 40 - Used Printer N-EVENT Report attributes

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

U = User Option

Table 41 - Mandatory Printer N-GET-RSP, N-EVENT-REPORT-RQ attributes

Attribute Name	Tag	Usage SCP	Supported Values
Printer Status	(2110,0010)	M	NORMAL, FAILURE, WARNING
Printer Status Info	(2110,0020)	M	See tables in Annex for details.

M = Mandatory

Note: For a detailed description on how ARTIS one reacts on different printer status messages, please refer to the Annex section “DICOM Print SCU - detailed status displays”.

4.2.6.4 Association Acceptance Policy

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4.2.7 Worklist SCU AE

4.2.7.1 SOP Classes

For SOP Classes supported, please refer to “Table 1: Network Services” section „Workflow Management” in the “Conformance Statement Overview”.

4.2.7.2 Association Policies

4.2.7.2.1 General

It is possible to configure a cyclic update of the modality Scheduler DB through a background worklist request with date/time and modality information.

In addition, the user can request worklist update with “Update Worklist”. No duplicate entries will be added in the Scheduler DB. Entries are uniquely identified by the Study Instance UID (0020,000D) for the Requested Procedure and the SPS ID (0040,009) in the SPS Sequence (0040,0100).

An interactive worklist query can be issued with search criteria entered in the patient-based Query dialog from the patient browser.

The default PDU size used will be 512 KB.

4.2.7.2.2 Number of Associations

The ARTIS one DICOM application initiates one association at a time to query worklist entry data.

4.2.7.2.3 Asynchronous Nature

The ARTIS one DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

4.2.7.2.4 Implementation Identifying Information

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

4.2.7.3 Association Initiation Policy

The ARTIS one DICOM application will cyclically query the worklist provider and by request from the patient registration interface. It establishes an association by using the

- C-FIND with Worklist information model

It is possible to configure multiple worklist providers but only one can be active at a time. The active worklist provider can be selected in the user settings.

4.2.7.3.1 Activity - (cyclic) Update Worklist

4.2.7.3.1.1 Description and Sequencing of Activity

A network application will perform worklist queries with the C-FIND request at regular intervals. In addition, it can be triggered by immediate request. The received worklist items will be compared with the contents of the local Scheduler DB. New items will be inserted into Scheduler DB.

After each broad query, all Requested Procedures / Scheduled Procedure Steps that were canceled or rescheduled to another modality at the RIS will be automatically removed from the Scheduler DB if :

1. the Examination of this procedure has not been started or finished yet, and
2. the corresponding configuration item "Automatic removal of canceled/rescheduled Request" was checked in the Service UI under DICOM/HIS-RIS Node.

No automatic clean-up of the Scheduler DB is performed after a Patient-based Query since the worklist received - due to restricted search criteria - does not correspond to the list of all currently scheduled procedures for the modality.

4.2.7.3.1.2 Proposed Presentation Context

The ARTIS one DICOM application will propose Presentation Contexts as shown in the following table:

Table 42 - Presentation Context "Update Worklist"

Presentation Context Table – "Update Worklist"				
Abstract Syntax	Transfer Syntax		Role	Ext. Neg.
Description	Name List	UID List		
1.2.840.10008.5.1.4.31 Modality Worklist Information Model - FIND	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
	Explicit VR Big Endian	1.2.840.10008.1.2.2		
	Implicit VR Little Endian	1.2.840.10008.1.2		

4.2.7.3.1.3 SOP Specific Conformance

- Search Key Attributes for the Worklist C-FIND

The ARTIS one DICOM worklist SCU supports “broad worklist queries” with all required search keys. The following table describes the “broad query” search keys that the SCU supports.

Table 43 - Supported Broad Worklist Query Search Key Attributes

Attribute Name	Tag	Matching Key Type	Query Value
Scheduled Procedure Step			
Scheduled Procedure Step Sequence	(0040,0100)	R	
>Scheduled Station AE Title (It depends on user configuration (Options->Configuration-> Patient Registration) if the "own AET" is provided or not. Use the "HIS/RIS" tab card for configuration.)	(0040,0001)	R	<own AET> or <zero length>
>Schedule Procedure Step Start Date (It depends on user configuration (Options->Configuration-> Patient Registration) if Date range with a fulltime range or an interactive input dialog for date/time specification is used.)	(0040,0002)	R	<config. Date>-<config. Date> or range from UI
>Schedule Procedure Step Start Time (It depends on user configuration (Options->Configuration-> Patient Registration) if the actual Date with a fulltime range or an interactive input dialog for date/time specification is used.)	(0040,0003)	R	00.00-235959.00 or range from UI
>Modality (It depends on user configuration (Options->Configuration-> Patient Registration) if the "Modality" is provided or not. Use the "HIS/RIS" tab card for configuration.)	(0008,0060)	R	<zero length> or <configured Modality>

R = Required

- Return Key Attributes of the Worklist C-FIND

The ARTIS one DICOM Worklist SCU supports worklist queries with return key attributes of all types. The following table describes the return keys that the SCU supports.

An “x” in the **UI** column will indicate the attribute is displayed in the user interface. The display is influenced by the related configuration.

A tag in the **IOD** column will indicate that the related attribute is included into the SOP Instances of the IODs created during processing of this worklist request.

A tag in the **MPPS** column will indicate that the related attribute is included into the SOP Instances of the MPPS objects created during processing of this worklist request. (See also the tables “Attributes used for the Performed Procedure Step N-CREATE” and “Attributes used for the Performed Procedure Step N-SET”.)

Table 44 - Basic Worklist C-FIND-RSP Return Key Attributes

Attribute Name	Tag	Return Key Type	UI	IOD	MPPS
SOP Common					
Specific Character Set	(0008,0005)	1C	-	(0008,0005)	(0008,0005)
Scheduled Procedure Step					
Scheduled Procedure Step Sequence	(0040,0100)	1			
>Modality	(0008,0060)	1	x	(0008,0060)	(0008,0060)
>Requested Contrast Agent	(0032,1070)	2C	x		
>Scheduled Station AE Title (<i>"Scheduled Station AE Title" is taken as default for "Performed Station AE Title"</i>)	(0040,0001)	1	-		(0040,0241)
>Scheduled Procedure Step Start Date	(0040,0002)	1	x		
>Scheduled Procedure Step Start Time	(0040,0003)	1	x		
>Scheduled Procedure Step End Date	(0040,0004)	3	-		
>Scheduled Procedure Step End Time	(0040,0005)	3	-		
>Scheduled Performing Physician's Name (<i>"Scheduled Performing Physician's Name" is taken as default for "Performing Physician's Name"</i>)	(0040,0006)	1	x	(0008,1050)	(0008,1050)
>Scheduled Procedure Step Description (<i>"Scheduled Procedure Step Description" is taken as default for "Performed Procedure Step Description"</i>)	(0040,0007)	1C	x	(0040,0007) (0040,0254)	(0040,0007) (0040,0254)
>Scheduled Protocol Code Sequence (<i>Universal Sequence Match</i>) (<i>"Scheduled Protocol Code Sequence" is taken as default for "Performed Protocol Code Sequence"</i>)	(0040,0008)	1C	-	(0040,0008) (0040,0260)	(0040,0008) (0040,0260)
>>Code Value	(0008,0100)	1C	x		
>>Coding Scheme Designator	(0008,0102)	1C	x		
>>Coding Scheme Version	(0008,0103)	3	x		
>>Code Meaning	(0008,0104)	3	x		
>Scheduled Procedure Step ID (<i>"Scheduled Procedure Step ID" is taken as default for "Performed Procedure Step ID"</i>)	(0040,0009)	1	x	(0040,0009) (0040,0253)	(0040,0009) (0040,0253)
>Scheduled Station Name	(0040,0010)	2	x		
>Scheduled Procedure Step Location (<i>"Scheduled Procedure Step Location" is taken as default for "Performed Location"</i>)	(0040,0011)	2	x		(0040,0243)
>Pre-Medication	(0040,0012)	2C	x		
>Scheduled Procedure Step Status	(0040,0020)	3	x		
>Comments on the Scheduled Procedure Step	(0040,0400)	3	x		

Attribute Name	Tag	Return Key Type	UI	IOD	MPPS
Requested Procedure					
Referenced Study Sequence (<i>Universal Sequence Match</i>)	(0008,1110)	2	-	(0008,1110)	(0008,1110)
>Referenced SOP Class UID	(0008,1150)	1C	-		
>Referenced SOP Instance UID	(0008,1155)	1C	-		
Study Instance UID	(0020,000D)	1	x	(0020,000D)	(0020,000D)
Requested Procedure Description	(0032,1060)	1C	x	(0032,1060)	(0032,1060)
Requested Procedure Code Sequence (<i>Universal Sequence Match</i>) ("Requested Procedure Code Sequence" is taken as default for "Procedure Code Sequence")	(0032,1064)	1C	-	(0008,1032) (0032,1064)	(0008,1032)
>Code Value	(0008,0100)	1C	x		
>Coding Scheme Designator	(0008,0102)	1C	x		
>Coding Scheme Version	(0008,0103)	3	x		
>Code Meaning	(0008,0104)	3	x		
Requested Procedure ID ("Requested Procedure ID" is taken as default for "Study ID")	(0040,1001)	1	x	(0040,1001) (0020,0010)	(0040,1001) (0020,0010)
Reason for the Requested Procedure	(0040,1002)	3	-		
Requested Procedure Priority	(0040,1003)	2	x		
Patient Transport Arrangements	(0040,1004)	2	-		
Requested Procedure Location	(0040,1005)	3	-		
Confidentiality Code	(0040,1008)	3	x		
Reporting Priority	(0040,1009)	3	-		
Names of Intended Recipients of Results	(0040,1010)	3	x	(0008,1048)	
Requested Procedure Comments	(0040,1400)	3	x		
Imaging Service Request					
Accession Number	(0008,0050)	2	x	(0008,0050)	(0008,0050)
Referring Physician's Name	(0008,0090)	2	x	(0008,0090)	
Requesting Physician	(0032,1032)	2	x	(0032,1032) (0008,1048)	
Requesting Service	(0032,1033)	3	x	(0032,1033)	
Issuing Date of Imaging Service Request	(0040,2004)	3	-		
Issuing Time of Imaging Service Request	(0040,2005)	3	-		
Placer Order Number / Imaging Service Request (Old tag (0040,2006) is retired and not used.)	(0040,2016)	3	-		(0040,2016)
Filler Order Number / Imaging Service Request (Old tag (0040,2007) is retired and not used.)	(0040,2017)	3	-		(0040,2017)
Order entered by ...	(0040,2008)	3	-		

Attribute Name	Tag	Return Key Type	UI	IOD	MPPS
Order Enterer's location	(0040,2009)	3	-		
Order Callback Phone Number	(0040,2010)	3	-		
Imaging Service Request Comments	(0040,2400)	3	x		
Visit Identification					
Institution Name	(0008,0080)	3	x	(0008,0080)	
Institution Address	(0008,0081)	3	-	(0008,0081)	
Institution Code Sequence (<i>Universal Sequence Match</i>)	(0008,0082)	3	-		
Admission ID	(0038,0010)	2	x		
Issuer of Admission ID	(0038,0011)	3	-		
Visit Status					
Visit Status ID	(0038,0008)	3	-		
Current Patient Location	(0038,0300)	2	x		
Patient's Institution Residence	(0038,0400)	3	-		
Visit Comments	(0038,4000)	3	-		
Visit Relationship					
Referenced Study Sequence (<i>Universal Sequence Match</i>)	(0008,1110)	3	-	(0008,1110)	(0008,1110)
>Referenced SOP Class UID	(0008,1150)	1C	-		
>Referenced SOP Instance UID	(0008,1155)	1C	-		
Referenced Patient Sequence (<i>Universal Sequence Match</i>)	(0008,1120)	2	-	(0008,1120)	(0008,1120)
>Referenced SOP Class UID	(0008,1150)	1C	-		
>Referenced SOP Instance UID	(0008,1155)	1C	-		
Visit Admission					
Referring Physician's Name	(0008,0090)	2	x	(0008,0090)	
Admitting Diagnosis Description	(0008,1080)	3	x	(0008,1080)	
Patient Identification					
Patient's Name	(0010,0010)	1	x	(0010,0010)	(0010,0010)
Patient ID	(0010,0020)	1	x	(0010,0020)	(0010,0020)
Issuer of Patient ID	(0010,0021)	3	-	(0010,0021)	
Other Patient IDs	(0010,1000)	3	x	(0010,1000)	
Other Patient IDs Sequence	(0010,1002)	3	-	(0010,1002)	
>Patient ID	(0010,0020)	1C	x	(0010,0020)	
>Issuer of Patient ID	(0010,0021)	3	x	(0010,0021)	
>Type of Patient ID	(0010,0022)	1C	x	(0010,0022)	
Other Patient Names	(0010,1001)	3	x	(0010,1001)	

Attribute Name	Tag	Return Key Type	UI	IOD	MPPS
Patient's Birth Name	(0010,1005)	3	-	(0010,1005)	
Patient's Mother's Birth Name	(0010,1060)	3	-	(0010,1060)	
Medical Record Locator	(0010,1090)	3	-	(0010,1090)	
Patient Demographic					
Patient's Birth Date	(0010,0030)	2	x	(0010,0030)	(0010,0030)
Patient's Birth Time	(0010,0032)	3	-	(0010,0032)	
Patient's Sex	(0010,0040)	2	x	(0010,0040)	(0010,0040)
Patient's Insurance Plan Code Sequence (<i>Universal Sequence Match</i>)	(0010,0050)	3	-	(0010,0050)	
>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	x	(0010,1010)	
Patient's Size	(0010,1020)	3	x	(0010,1020)	
Patient's Weight	(0010,1030)	2	x	(0010,1030)	
Patient's Address	(0010,1040)	3	x	(0010,1040)	
Military Rank	(0010,1080)	3	x	(0010,1080)	
Branch of Service	(0010,1081)	3	-	(0010,1081)	
Country of Residence	(0010,2150)	3	-	(0010,2150)	
Region of Residence	(0010,2152)	3	-	(0010,2152)	
Patient's Telephone Numbers	(0010,2154)	3	-	(0010,2154)	
Ethnic Group	(0010,2160)	3	x	(0010,2160)	
Occupation	(0010,2180)	3	-	(0010,2180)	
Patient's Religious Preference	(0010,21F0)	3	-	(0010,21F0)	
Patient Comments	(0010,4000)	3	x	(0010,4000)	
Patient Data Confidentiality Constraint Description	(0040,3001)	2	-	(0040,3001)	
Patient Medical					
Medical Alerts	(0010,2000)	2	x	(0010,2000)	
Contrast Allergies	(0010,2110)	2	x	(0010,2110)	
Pregnancy Status	(0010,21C0)	2	x	(0010,21C0)	
Smoking Status	(0010,21A0)	3	x	(0010,21A0)	
Last Menstrual Date	(0010,21D0)	3	x	(0010,21D0)	
Additional Patient History	(0010,21B0)	3	x	(0010,21B0)	
Special Needs	(0038,0050)	2	x	(0038,0050)	
Patient State	(0038,0500)	2	x	(0038,0500)	

Attribute Name	Tag	Return Key Type	UI	IOD	MPPS
Patient Relationship					
Referenced Study Sequence (<i>Universal Sequence Match</i>)	(0008,1110)	3	-	(0008,1110)	(0008,1110)
>Referenced SOP Class UID	(0008,1150)	1C	-		
>Referenced SOP Instance UID	(0008,1155)	1C	-		
Referenced Visit Sequence (<i>Universal Sequence Match</i>)	(0008,1125)	3	-		
Referenced Patient Alias Sequence (<i>Universal Sequence Match</i>)	(0038,0004)	3	-		

- The Worklist SCU interprets the following status codes:

Table 45 - Status Codes "Update Worklist"

Service Status	Meaning	Error Codes	Related Fields
Refused	Out of Resources	A700	(0000,0902)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	Cxxx	(0000,0901) (0000,0902)
Cancel	Matching terminated due to Cancel request	FE00	None
Success	Matching is complete - No final Identifier is supplied	0000	None
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	Identifier
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this identifier	FF01	Identifier

4.2.7.3.2 Activity - Get Worklist

4.2.7.3.2.1 Description and Sequencing of Activity

With "Get Worklist" in the patient-based Worklist Query dialog, the entered attributes are used to form a worklist request identifier. The response data is used to fill the Patient Registration dialog. The response data are additionally placed in the Scheduler DB.

4.2.7.3.2.2 Proposed Presentation Context

This Activity will propose the same Presentation Context as with "Update Worklist". Please see related table in section 4.2.7.3.1.2.

4.2.7.3.2.3 SOP Specific Conformance

The ARTIS one DICOM worklist SCU supports “narrow worklist queries” with all required search keys. The following tables describe the “narrow query” search keys that the SCU supports.

Table 46 - Patient based "narrow query" Search Key Attributes

Attribute Name	Tag	Matching Key Type	Query Value
Scheduled Procedure Step			
Scheduled Procedure Step Sequence	(0040,0100)	R	
>Scheduled Performing Physician's Name	(0040,0006)	R	input from UI or <zero length>
Requested Procedure			
Requested Procedure ID	(0040,1001)	O	input from UI or <zero length>
Imaging Service Request			
Accession Number	(0008,0050)	O	input from UI or <zero length>
Referring Physician's Name	(0008,0090)	O	input from UI or <zero length>
Visit Status			
Current Patient Location	(0038,0300)	O	input from UI or <zero length>
Patient Identification			
Patient's Name	(0010,0010)	R	input from UI or <zero length>
Patient ID	(0010,0020)	R	input from UI or <zero length>

R = Required Key, O = Optional Key

The Return Key Attribute handling and supported Status Codes are identical to the “Update Worklist” activity. Please see 4.2.7.3.1.3 for details.

4.2.7.4 Association Acceptance Policy

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4.2.8 Modality PPS SCU AE

4.2.8.1 SOP Classes

For SOP Classes supported, please refer to “Table 1: Network Services” section „Workflow Management” in the “Conformance Statement Overview”.

4.2.8.2 Association Policies

4.2.8.2.1 General

The creation of MPPS Instance is done automatically by ARTIS one whenever a patient is registered for image acquisition through the Patient Registration dialog.

Further updates on the MPPS data can be done interactively from the related MPPS user interface. The MPPS "Complete" or "Discontinued" states can be set from user interface.

The default PDU size used will be 512 KB.

4.2.8.2.2 Number of Associations

The ARTIS one DICOM application initiates one association at a time to create or set the MPPS instance.

4.2.8.2.3 Asynchronous Nature

The ARTIS one DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

4.2.8.2.4 Implementation Identifying Information

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

4.2.8.3 Association Initiation Policy

The ARTIS one DICOM application will notify a RIS (MPPS Manager) about the status of a procedure while it is performed. It establishes an association by using the

- N-CREATE DIMSE according to the CREATE Modality Performed Procedure Step SOP Instance operation or a
- N-SET DIMSE to update the contents and state of the MPPS according to the SET Modality Performed Procedure Step Information operation.

It is possible to configure multiple MPPS providers but only one can be active at a time. The active MPPS provider can be selected in the user settings.

4.2.8.3.1 Activity - Patient registered

4.2.8.3.1.1 Description and Sequencing of Activity

A patient is registered by the Patient Registration "Exam" action. From this event the trigger to create a MPPS Instance is derived. The related Instance is then immediately communicated to the configured RIS system. An association is established and the MPPS Instance is sent.

4.2.8.3.1.2 Proposed Presentation Context

The ARTIS one DICOM application will propose Presentation Contexts as shown in the following table:

Table 47 - Presentation Context "Patient Registered"

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

4.2.8.3.1.3 SOP Specific Conformance

- Attributes for the Performed procedure Step N-CREATE

The Siemens ARTIS one DICOM Modality Performed Procedure Step SCU informs the remote SCP when the examination of a scheduled procedure step will be performed (i.e. the patient is registered). The N-CREATE message is sent when the examination is started with successful registration of the patient data. The following table describes the supported attributes of an N-CREATE message.

Table 48 - Performed Procedure Step N-CREATE Attributes

Attribute Name	Tag	Type	Value
SOP Common			
Specific Character Set	(0008,0005)	1C	from MWL or created
Performed Procedure Step Relationship			
Scheduled Step Attribute Sequence	(0040,0270)	1	
>Study Instance UID	(0020,000D)	1	from MWL or created
>Referenced Study Sequence	(0008,1110)	2	from MWL or <zero length>
>>Referenced SOP Class UID	(0008,1150)	1C	
>>Referenced SOP Instance UID	(0008,1155)	1C	
>Accession Number	(0008,0050)	2	from MWL or user input
>Placer Order Number/Imaging Service Request	(0040,2016)	3	from MWL or <zero length>
>Filler Order Number/Imaging Service Request	(0040,2017)	3	from MWL or <zero length>
>Requested Procedure ID	(0040,0001)	2	from MWL or user input
>Requested Procedure Description	(0032,1060)	2	from MWL or <zero length>
>Scheduled Procedure Step ID	(0040,0009)	2	from MWL or <zero length>
>Scheduled Procedure Step Description	(0040,0007)	2	from MWL or <zero length>
>Scheduled Protocol Code Sequence	(0040,0008)	2	from MWL or <zero length>
>>Code Value	(0008,0100)	1C	
>>Coding Scheme Designator	(0008,0102)	1C	
>>Coding Scheme Version	(0008,0103)	3	
>>Code Meaning	(0008,0104)	3	

Attribute Name	Tag	Type	Value
Patient's Name	(0010,0010)	2	from MWL or user input
Patient ID	(0010,0020)	2	from MWL or user input
Patient's Birth Date	(0010,0030)	2	from MWL or user input
Patient's Sex	(0010,0040)	2	from MWL or user input
Referenced Patient Sequence	(0008,1120)	2	from MWL or <zero length>
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Performed Procedure Step Information			
Performed Procedure Step ID	(0040,0253)	1	From SPS ID or created
Performed Station AE Title	(0040,0241)	1	own AE Title
Performed Station Name	(0040,0242)	2	own hostname
Performed Location	(0040,0243)	2	from SPS location or <zero length>
Performed Procedure Step Start Date	(0040,0244)	1	created
Performed Procedure Step Start Time	(0040,0245)	1	created
Performed Procedure Step Status	(0040,0252)	1	"IN PROGRESS"
Performed Procedure Step Description	(0040,0254)	2	from SPS Description or <zero length>
Performed Procedure Type Description	(0040,0255)	2	<zero length>
Procedure Code Sequence	(0008,1032)	2	from Requested Procedure Code or <zero length>
>Code Value	(0008,0100)	1C	
>Coding Scheme Designator	(0008,0102)	1C	
>Coding Scheme Version	(0008,0103)	3	
>Code Meaning	(0008,0104)	3	
Performed Procedure Step End Date	(0040,0250)	2	<zero length>
Performed Procedure Step End Time	(0040,0251)	2	<zero length>
Comments on the Performed Procedure Steps	(0040,0280)	3	<zero length>
Image Acquisition Results			
Modality	(0008,0060)	1	XA
Study ID	(0020,0010)	2	from Requested Procedure ID or created
Performed Protocol Code Sequence	(0040,0260)	2	from Scheduled Protocol Code Sequence or <zero length>
>Code Value	(0008,0100)	1C	
>Coding Scheme Designator	(0008,0102)	1C	

Attribute Name	Tag	Type	Value
>Coding Scheme Version	(0008,0103)	3	
>Code Meaning	(0008,0104)	3	
Performed Series Sequence	(0040,0340)	2	
>Performing Physician's Name	(0008,1050)	2C	from MWL or user input
>Operator's Name	(0008,1070)	2C	User input
>Series Instance UID	(0020,000E)	1C	created
>Series Description	(0008,103E)	2C	<zero length>
>Retrieve AE Title	(0008,0054)	2C	<zero length>
>Protocol Name	(0018,1030)	1C	from organ program
>Referenced Image Sequence	(0008,1140)	2C	<zero length>
>Referenced Non-Image Composite SOP Instance Sequence	(0040,0220)	2C	<zero length>
Radiation Dose			
Anatomic Structure, Space or Region Sequence	(0008,2229)	3	<zero length>
Total Time of Fluoroscopy	(0040,0300)	3	<zero length>
Total Number of Exposures	(0040,0301)	3	<zero length>
Distance Source to Detector	(0018,1110)	3	<zero length>
Distance Source to Entrance	(0040,0306)	3	<zero length>
Entrance Dose	(0040,0302)	3	<zero length>
Entrance Dose in mGy	(0040,8302)	3	<zero length>
Exposed Area	(0040,0303)	3	<zero length>
Image and Fluoroscopy Area Dose Product	(0018,115E)	3	<zero length>
Comments on Radiation Dose	(0040,0310)	3	<zero length>
Exposure Dose Sequence	(0040,030E)	3	<zero length>
Billing and Material Management Code			
Billing Procedure Step Sequence	(0040,0320)	3	<zero length>
Film Consumption Sequence	(0040,0321)	3	
>Number of Films	(2100,0170)	3	<zero length>
>Medium Type	(2000,0030)	3	<zero length>
>Film Size ID	(2010,0050)	3	<zero length>
Billing Supplies and Devices Sequence	(0040,0324)	3	
>Billing Item Sequence	(0040,0296)	3	<zero length>
>Quantity Sequence	(0040,0293)	3	
>>Quantity	(0040,0294)	3	<zero length>

Attribute Name	Tag	Type	Value
>>Measuring Units Sequence	(0040,0295)	3	<zero length>

- The Performed Procedure Step SCU interprets the following N-CREATE status codes:

Table 49 - Status Codes "Patient Registered"

Service Status	Meaning	Error Codes
Failure	Processing Failure	0110
	No such attribute	0105
	Invalid attribute value	0106
	Duplicate SOP Instance	0111
	No such SOP Instance	0112
	No such SOP Class	0118
	Class Instance conflict	0119
	Missing attribute	0120
	Missing attribute value	0121
	Resource limitation	0213
Success	MPPS Instance created	0000

4.2.8.3.2 Activity - MPPS Update

4.2.8.3.2.1 Description and Sequencing of Activity

With the MPPS UI the status of the MPPS Instance can be set to "COMPLETED" or "DISCONTINUED". During performance of the procedure the status will remain "IN PROGRESS".

4.2.8.3.2.2 Proposed Presentation Context

For "MPPS Update" the same Presentation Contexts as with "Patient registered" are proposed. Please see related table in section 4.2.8.3.1.2.

4.2.8.3.2.3 SOP Specific Conformance

- Attributes for the Performed procedure Step N-SET

The Siemens ARTIS one DICOM Modality Performed Procedure Step SCU informs the remote SCP about the performed examination and its status. The N-SET message is sent after each acquisition (status "IN PROGRESS") and per finished examination (finished status "COMPLETED", or incomplete status "DISCONTINUED"). The following table describes the supported attributes of an N-SET message.

Table 50 - Performed Procedure Step N-SET Attributes

Attribute Name	Tag	Type	Value
Performed Procedure Step Information			
Performed Procedure Step Status	(0040,0252)	3	"IN PROGRESS" during procedure, "COMPLETED" or "DISCONTINUED" for final N-SET
Performed Procedure Step Description	(0040,0254)	3	from SPS Description or user input
Procedure Code Sequence	(0008,1032)	3	from Requested Procedure
>Code Value	(0008,0100)	1C	
>Coding Scheme Designator	(0008,0102)	1C	
>Coding Scheme Version	(0008,0103)	3	
>Code Meaning	(0008,0104)	3	
Performed Procedure Step End Date	(0040,0250)	1	created
Performed Procedure Step End Time	(0040,0251)	1	created
Comments on the Performed Procedure Steps	(0040,0280)	3	user input
Image Acquisition Results			
Performed Protocol Code Sequence	(0040,0260)	3	from Scheduled 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	
Performed Series Sequence	(0040,0340)	1	
>Performing Physician's Name	(0008,1050)	2C	from MWL or user input
>Protocol Name	(0018,1030)	1C	from related SOP Instance
>Operator's Name	(0008,1070)	2C	user input
>Series Instance UID	(0020,000E)	1C	from related SOP Instance
>Series Description	(0008,103E)	2C	from related SOP Instance
>Retrieve AE Title	(0008,0054)	2C	
>Referenced Image Sequence	(0008,1140)	2C	Series related SOP Instances as items
>>Referenced SOP Class UID	(0008,1150)	1C	
>>Referenced SOP Instance UID	(0008,1155)	1C	
>Referenced Standalone SOP Instance Sequence	(0040,0220)	2C	<zero length>

Attribute Name	Tag	Type	Value
Radiation Dose			
Total Time of Fluoroscopy	(0040,0300)	3	
Total Number of Exposures	(0040,0301)	3	
Entrance Dose in mGy	(0040,8302)	3	accumulated over complete procedure step
Image and Fluoroscopy Area Dose Product	(0018,115E)	3	accumulated over complete procedure step (dGy*cm ²)
Exposure Dose Sequence	(0040,030E)	3	on item for each irradiation event (acquisition or fluoro)
>Radiation Mode	(0018,115A)	3	"PULSED"
>KVP	(0018,0060)	3	peak KV used for this event (KV)
>X-ray Tube Current in μ A	(0018,8151)	3	tube current used for this event
>Exposure Time	(0018,1150)	3	time of x-ray in ms for this event
>Comments on Radiation Dose	(0040,0310)	3	additional acquisition specific information (Entrance Dose, Dose Area Product, X-Ray Filter, etc.) as text
Comments on Radiation Dose	(0040,0310)	3	user input
Billing and Material Management Code			
Film Consumption Sequence	(0040,0321)	3	
>Number of Films	(2100,0170)	3	
>Medium Type	(2000,0030)	3	
>Film Size ID	(2010,0050)	3	

- The Performed Procedure Step SCU interprets the following N-SET status codes:

Table 51 - Status Codes "MPPS Update"

Service Status	Meaning	Error Codes
Failure	Processing Failure: Performed Procedure Step Object may no longer be updated.	0110
	No such attribute	0105
	Invalid attribute value	0106
	No such SOP Instance	0112
	Invalid Object instance	0117
	No such SOP Class	0118
	Class Instance conflict	0119
	Missing attribute value	0121
	Resource limitation	0213
Success	MPPS Instance set	0000

- Handling of Performed Procedure Step ID in case
 - MPPS is not configured or
 - Unscheduled case

The attribute "Performed Procedure Step ID" (0040,0253) will be encoded based on "YYYYMMDDHHMMSS". This date and time are based on the time when the first image is acquired.

4.2.8.4 Association Acceptance Policy

n. a.

4.3 Network Interfaces

4.3.1 Physical Network Interface

The DICOM Interface of the ARTIS one provides DICOM TCP/IP Network Communication Support and uses the TCP/IP protocol stack from the operating system. It uses the MergeCOM subroutine library. All available Ethernet interfaces are supported.

4.3.2 Additional Protocols

n. a.

4.4 Configuration

4.4.1 AE Title/Presentation Address Mapping

Local AE Titles

According to the DICOM Standard, the AET string can be up to 16 characters long and must not contain any extended characters, only 7-bit ASCII characters (excluding Control Characters).

Note: The current implementation of *syngo* does not allow Spaces and special characters (like &<> ") in the AE title string.

Change of the default AE Titles chosen by the system can be performed in the Service UI under "Configuration / DICOM / General" item - first page.

Table 52 - Default AET Characteristics

Application Entity	Default AE Title	TCP/IP Port
Verification SCU	STU_<hostname>	-
Verification SCP		104 (fixed) 2762 (TLS)
Storage SCU		-
Storage SCP		104 (fixed) 2762 (TLS)
Query/Retrieve SCU		-
Query/Retrieve SCP		104 (fixed) 2762 (TLS)
Print SCU	PRI_<hostname>	-
Worklist SCU	HRI_<hostname>	-
MPPS SCU		-

Remote AE Titles

When "trusted host functionality" is enabled, all external AE Titles have to be configured to be able to communicate with ARTIS one.

For each remote AE the following data and capabilities can be configured:

Table 53 - Remote AE Configuration Items

Remote AE Configuration Item	Comment
Host Name	As defined in the network domain. This has to be configured also for any DICOM AE that wishes to connect to SCP services of ARTIS one.
TCP/IP address	As defined in the network domain. This has to be configured also for any DICOM AE that wishes to connect to SCP services of ARTIS one.
Logical Name	Name for the AE used in the user interfaces of the ARTIS one applications.
AE Title	AET, as provided by network administration
Port Number	Port Number, as provided by network administration
If Storage Service support is checked	
Transfer Syntax	Selection of uncompressed transfer Syntaxes supported by remote AE
Compression	Selection of additional compression Syntaxes supported for remote AE

Remote AE Configuration Item	Comment
Default Node	"first default"/"second default"/["no default"] - activating this feature will show "Send to <logical name>" in the Transfer tool menu for quick access.
Preference Node	When checked, the remote AE will be assigned to a keyboard shortcut key.
Archive Node	When checked, sending to remote AET will set status of a (rchived), else s (ent) is indicated.
Default Archive	When checked, the remote AE will be listed as default archive in User interfaces.
Graphics in Pixel Data	When checked, the DICOM overlay will not be encoded in attribute (60xx,3000) Overlay Data, but masked in the "unused bits" of the pixel data (only for uncompressed transfer syntaxes). For backwards compatibility with legacy AE.
Select SC node	Select a previously configured node as target for Storage Commitment when sending DICOM objects to the configured AE. Default is the same node as to which the Objects are sent.
Select SC AET	Select AET that corresponds to the above selected node that receives the Storage Commitment request. Default is the above specified "AE Title".
SC Result in same association	When checked the ARTIS one DICOM application will await the Storage Commitment N-EVENT-REPORT on the same association. Default is "not checked" (= different association).
SC result timeout	Timeout in hours and minutes to wait at the open association. Default: 01:00 (hours:minutes).
If Storage Commitment Service support is checked	
n. a.	The related Storage Commitment configuration is either in the Storage section of the same AET or different AET (in case the current AET is only Storage Commitment Provider).
If Query Service support is checked	
provides DICOM Query model	The Query models supported by this AET can be selected. When possible, the STUDY ROOT model should preferably be configured
If Retrieve Service support is checked	
n. a.	Checking Retrieve support for an AET is the only needed configuration item. This will allow access to the "Import" feature in the Query result browser.
If Modality Worklist Service support is checked	
Query Waiting time	The time to wait for the C-FIND-RSP after sending the C-FIND-RQ (default 20 sec.)
Max Query Match Number	The maximum number of entries accepted in one worklist (default is 200)
Query Interval	The time between two C-FIND-RQ to the Hospital Information system (default is 60 min, minimum is 3 min, maximum is 1440 min i.e. 24 hours)
Automatic removal of canceled/rescheduled Requests	Checking this item will remove all unused entries from the scheduler list prior to inserting the worklist responses with each query.
General	
Trusted Host	When checked, association is only accepted when pair of AET and TCP/IP address is known in the configuration.

4.4.2 Parameters

System parameters can be changed in the Service UI under "Configuration / DICOM / General" item - second page.

Table 54 - General parameter settings and timeouts

Time-out Values				
Parameter	Default Value [sec]	Min [sec]	Max [sec]	Comment
Accepting/Rejecting an Association Request	60	15	600	Wait for an Association Request or wait for a Peer to shut down the Association
Association Open Request	60	15	600	Wait for a reply to an Association Accept Request
Association Close Request	60	15	600	Wait for a reply to an Association Release Request
Accepting a Message over Network	60	15	600	Wait for a Network Write to be accepted
Waiting for Data between TCP/IP Packets	60	15	600	Wait for Data between TCP/IP packets
Response from Remote Node for Storage/Query/Retrieve	600	15	600	Time between Service Request and Service Response
Accept network connect	60	15	600	
General Transfer Setting				
Simultaneous DICOM associations	10	1	10	Number of simultaneous associations running.
Maximum PDU Size	512 KB	4 KB	1 MB	Proposed PDU size, each selectable value is doubled from previous, starting with 4 KB. Additionally, for optimization for some networks 28 KB are provided.

5 Media Interchange

5.1 Implementation Model

5.1.1 Application Data Flow Diagram

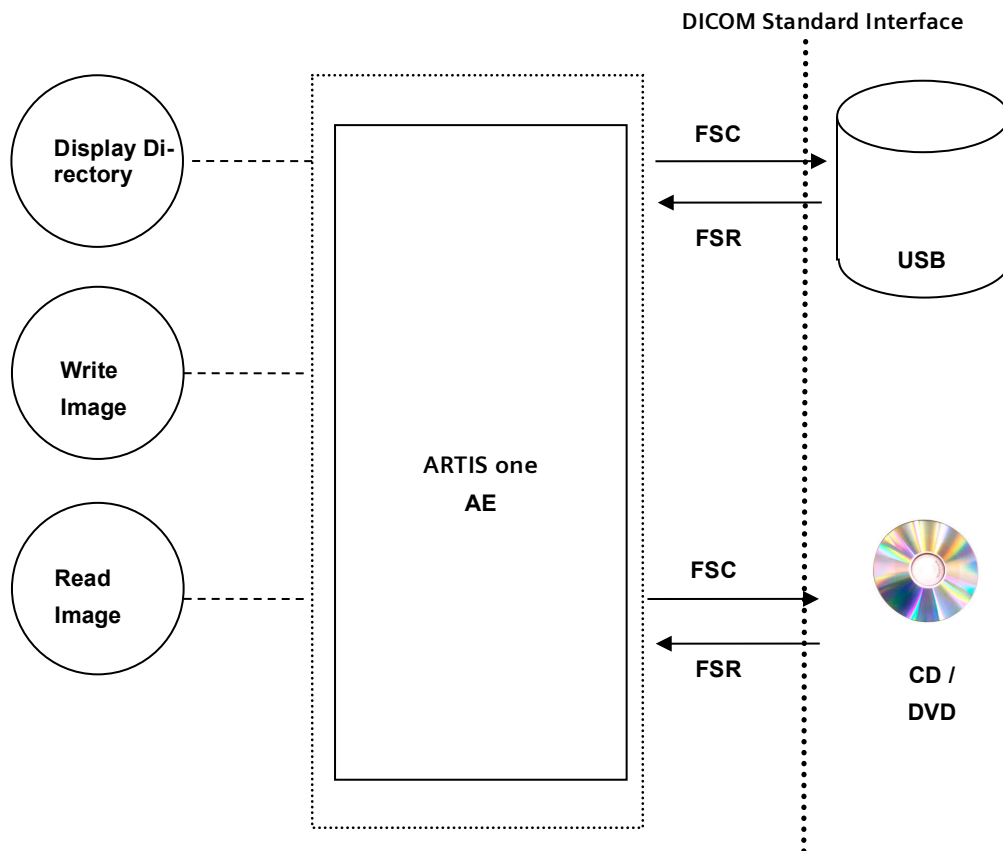


Figure 3: Media Interchange Application Data Flow Diagram

The ARTIS one 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 one 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 one 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.

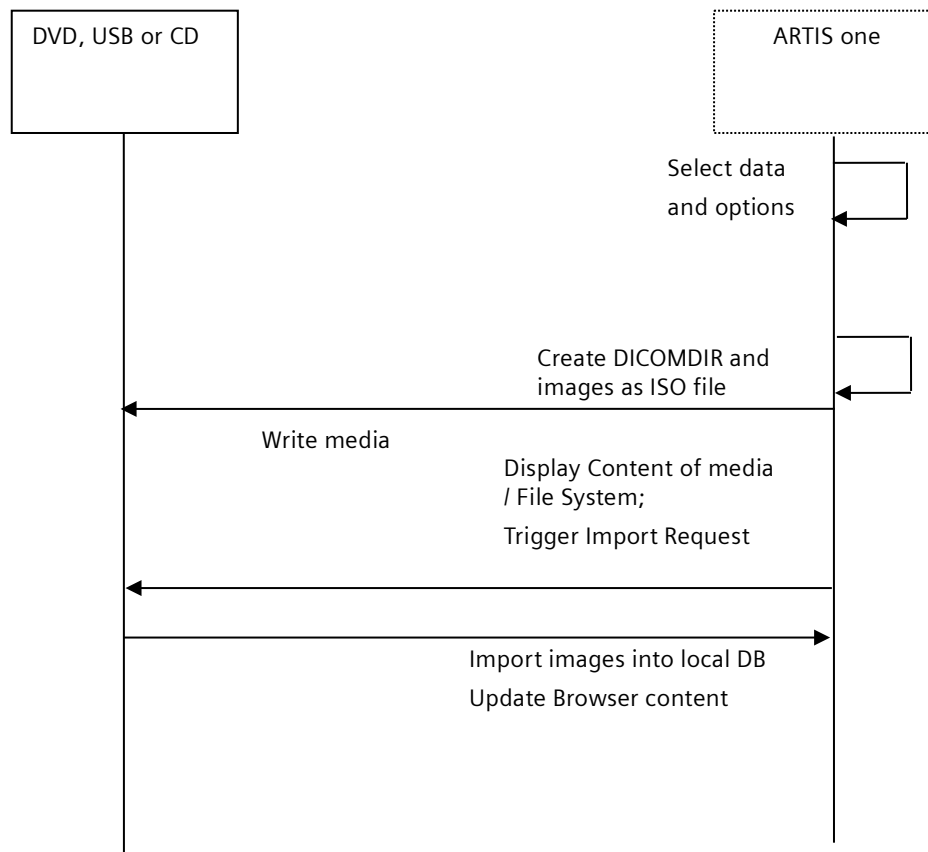


Figure 4: Sequence diagram – Media creation

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 55: Implementation Class/Version Name - Media Interchange

File Meta Information Version	0001
Implementation Class UID	1.3.12.2.1107.5.4
Implementation Version Name	"SIEMENS_EAS_VA10"

5.2 AE Specifications

5.2.1 Media Storage AE – Specification

The ARTIS one 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).

Table 56: Media - Application Profiles and Real-World Activities

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

5.2.1.1 Real-World Activities

5.2.1.1.1 Activity “Browse Directory Information”

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

The ARTIS one 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 one 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 one, can be retrieved from media.

5.2.1.1.3 Real-World Activity “Export to local Archive Media”

The ARTIS one 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 one has not already processed the generated ISO file.

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

Using the Application Profiles supporting compression (STD-GEN-xxx) the following Transfer Syntaxes are supported:

Table 57: Transfer Syntaxes for STD-GEN-xxx

UID value	Transfer Syntax	Image Objects
1.2.840.10008.1.2.1	Explicit Value Representation Little Endian native	yes
1.2.840.10008.1.2.4.50	JPEG Baseline (Process 1) lossy compressed	yes
1.2.840.10008.1.2.4.51	JPEG Extended (Process 2 & 4) lossy compressed	yes
1.2.840.10008.1.2.4.70	JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14) lossless compressed	yes

5.3 Augmented and Private Application Profiles

n. a.

5.4 Media Configuration

5.4.1 Single- / Multi-Session CD burning

Please refer to most recent Service / Configuration documentation of ARTIS one for changing between the single-session and multi-session recording modes.

5.4.2 "Viewer on CD"

Please refer to most recent Service / Configuration documentation of ARTIS one for changing between the

ACOM.PC Lite 2.0 or **syngo FastView**

as application that is included onto the medium as part of the "Viewer on CD" feature, if the feature is checked in the Media Creation user interface (see also next configuration item).

5.4.3 Auto-Labeling

Please refer to most recent Service / Configuration documentation of ARTIS one for activating the auto-labeling of CD media to avoid the label inquiry dialog when using automatic media export. The auto-labeling can be activated with the "Viewer on CD" feature being implicitly checked or not.

6 Support of Extended Character Sets

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

Table 58: 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

Table 59: 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 60: 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 61: 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 87	ISO 2022	ESC 02/04 04/02	ISO-IR 87	JIS X 0208: Kanji
	ISO 2022 IR 159	ISO 2022	ESC 02/04 02/08 04/04	ISO-IR 159	JIS X 0212: Supplementary Kanji set
Chinese ⁸	ISO 2022 IR 58	ISO 2022	ESC 02/04 04/01	ISO-IR 58	GB2312-80 (China Association for Standardization)

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.

⁸ Note: This Character Set is an extension of DICOM for the Chinese language.

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

7 Security

7.1 Security Profile

The ARTIS one DICOM application conforms to the IHE Basic Security Integration Profile that is used for the DICOM Communication.

It allows the use of either a conventional (non-secure) DICOM communication or a secure DICOM communication. For secure DICOM communication the application uses Transport Layer Protocol (TLS v1.1 and TLS v1.2). Following features are supported for the secure DICOM communication. The port in which the application acts as SCP for secure DICOM communication is 2762 (fixed). The port in which the application acts as SCP for unsecure DICOM communication is 104 (fixed).

The following security profile are done in ARTIS one DICOM application using TLS protocols

- Secure authentication of node
- Integrity and confidentiality of transmitted data.
- Generation of audit trail records access control and user authentication.

7.1.1 Security Transport Connection Profiles

The ARTIS one DICOM application conforms to the Basic TLS Transport Connection Profile.

The ARTIS one DICOM application initiates the TLS connections and accepts TLS connections with Storage commitment. It provides a configuration panel by which local systems can configure the certificate that needs to bind for DICOM communication. Secure communication is a “mode of operation” supported by the implementation of the DICOM Basic TLS Secure Transport Connection Profile. This functionality will be used by the nodes that can authenticate each other before they exchange DICOM information. For secure communication the TLS protocol is used which provides message authentication, integrity and confidentiality. The application supports the following protocol versions TLS Protocol v1.1 and v1.2.

The ARTIS one DICOM application supports X.509 certificates. The type of X.509 certificates that are supported are:

- 1) Self-Signed certificate
- 2) Certificate for which chain building (Trusted chain building, Trusted CA) is possible.

The following TLS certification checks will be done (TLS Handshake). The machine (either server or client) that will send its certificate will :

- Choose the certificate according to Common Name (CN), if the local self-signed is used. If customer specific certificate needs to be used then Serial Number of the certificate is used for choosing the certificate.

The server verifies

- that the client certificate is X.509 certificate which is not tampered with
- that the client certificate is in the list of trusted certificates (Trust Chain Building)
- that the client certificate is not in the revoked list.
- that the client certificate is not expired (present time is between “Valid From” and “Valid To” fields of X.509 certificate)
- that the client certificate has the correct purpose (at least the client authentication purpose).

The client verifies

- that the server certificate is a X.509 certificate which is not tampered with
- that the server certificate is in the list of trusted certificates (Trust Chain Building)
- that the server certificate is not in the revoked list.
- that the server certificate is not expired (present time is between "Valid From" and "Valid To" fields of X.509 certificate)
- that the server certificate has the correct purpose (at least the server authentication purpose).

In addition, the following validation is done:

- 1) 'Direct certificate validation' for self-signed certificate, i. e. the self-signed certificate of the remote node must be present in the 'Trusted Root Certificate' Store. Certificate received from peer have multiple X.509 certificates within the TLS Handshake.
- 2) ARTIS one DICOM application can receive X.509 certificate chain (Full certificate chain, Partial certificate chain or only End certificate) in the TLS handshake from peer. For all the cases for successful Trust chain Building all the certificates shall be installed in the Windows certificate Store of the Local Machine. i.e. All The intermediate must be imported to Intermediate Certificate Authorities → Certificates and the root certificate must be imported to the Trusted Root Certificates → Certificates.

The X.509 certificate imported and used for DICOM communication

- 1) must have purpose set for Client and Server Authentication.
- 2) must be exportable to generate the certificate file and private key file.

If intermediate and root X.509 certificates are present then the intermediate certificate must be imported to Intermediate Certificate Authorities → Certificates. The root certificate must be imported to the Trusted Root Certificates → Certificates.

The ARTIS one DICOM application communicates with either of the following Cipher suites for encrypting the data send across the network.

TLS_RSA_WITH_AES_128_CBC_SHA

TLS_RSA_WITH_3DES_EDE_CBC_SHA

Note: Support for NULL Cipher (TLS_RSA_WITH_NULL_SHA) is not there. The secure communication is FIPS mode enabled

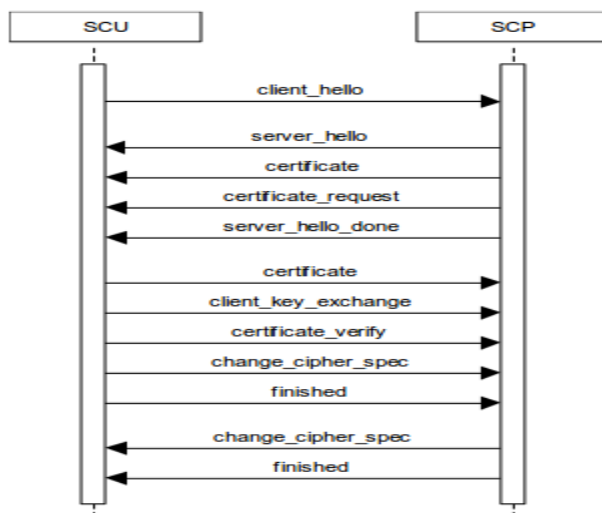


Figure 5: TLS Handshake Message Protocol

7.2 Application Level Confidentiality Profile

Application Level Confidentiality Profiles address the following aspects of security *Data Confidentiality at the application layer*.

These Profiles are targeted toward creating a special purpose, de-identified version of an already existing Data Set. This profile is not intended to replace the original SOP Instance from which the de-identified SOP Instance is created. The de-identified SOP Instances are useful, for example, in creating teaching or research files, performing clinical trials, or submission to registries where the identity of the patient and other individuals is required to be protected.

7.2.1 Anonymization workflow (De-identifier)

syngo provides a functionality to export the DICOM data to configured offline directories (Local Path / Network path / USB). The data exported can be exported anonymous where the Patient Identification parameters like Patient Name, Patient ID etc., are removed or replaced as per the table below.

Table 62: Application Level Confidentiality Profile attributes (standard tags)

DICOM Tag	Attribute Name	Anonymized
(0002,0003)	Media Storage SOP Instance UID	Yes
(0008,0014)	Instance Creator UID	Yes
(0008,0018)	SOP Instance UID	Yes
(0008,0050)	Accession Number	Yes
(0008,0080)	Institution Name	Yes
(0008,0081)	Institution Address	Yes
(0008,0090)	Referring Physician's Name	Yes
(0008,0092)	Referring Physician's Address	Yes
(0008,0094)	Referring Physician's Telephone Numbers	Yes
(0008,1010)	Station Name	Yes
(0008,1030)	Study Description	Yes
(0008,103E)	Series Description	Yes
(0008,1040)	Institutional Department Name	Yes
(0008,1048)	Physician(s) of Record	Yes
(0008,1050)	Performing Physicians' Name	Yes
(0008,1060)	Name of Physician(s) Reading Study	Yes
(0008,1070)	Operators' Name	Yes
(0008,1080)	Admitting Diagnoses Description	Yes
(0008,1120)	Referenced Patient Sequence	Yes
(0008,1155)	Referenced SOP Instance UID	Yes
(0008,1250)	Related Series Sequence	Yes
(0008,2111)	Derivation Description	Yes
(0010,0010)	Patient's Name	Yes
(0010,0020)	Patient ID	Yes
(0010,0030)	Patient's Birth Date	Yes
(0010,0032)	Patient's Birth Time	Yes
(0010,0040)	Patient's Sex	Yes
(0010,1000)	Other Patient IDs	Yes
(0010,1001)	Other Patient Names	Yes
(0010,1005)	Patient's Birth Name	Yes
(0010,1010)	Patient's Age	Yes

DICOM Tag	Attribute Name	Anonymized
(0010,1020)	Patient's Size	Yes
(0010,1030)	Patient's Weight	Yes
(0010,1040)	Patient Address	Yes
(0010,1060)	Patient's Mother's Birth Name	Yes
(0010,1090)	Medical Record Locator	Yes
(0010,2154)	Patient's Telephone Numbers	Yes
(0010,2160)	Ethnic Group	Yes
(0010,2180)	Occupation	Yes
(0010,2180)	Additional Patient's History	Yes
(0010,4000)	Patient Comments	Yes
(0018,1000)	Device Serial Number	Yes
(0018,1030)	Protocol Name	Yes
(0020,000D)	Study Instance UID	Yes
(0020,000E)	Series Instance UID	Yes
(0020,0010)	Study ID	Yes
(0020,0052)	Frame of Reference UID	Yes
(0020,0200)	Synchronization Frame of Reference UID	Yes
(0020,4000)	Image Comments	Yes
(0040,0275)	Request Attributes Sequence	Yes
(0040,A124)	UID	Yes
(0040,A730)	Content Sequence	Yes
(0088,0140)	Storage Media File-set UID	Yes
(3006,0024)	Referenced Frame of Reference UID	Yes
(3006,00C2)	Related Frame of Reference UID	Yes

8 Annexes

8.1 IOD Contents

8.1.1 Created SOP Instances

8.1.1.1 X-Ray Angiographic Image Standard Extended SOP Class

The ARTIS one 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.

8.1.1.1.1 “Acquired Image” or derived XA image

Table 63 - XA acquired or derived image

Attribute Name	Tag	Value
Specific Character Set	(0008,0005)	From Configuration / RIS
Image Type	(0008,0008)	See “8.5.1.6 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)
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
Institution Name	(0008,0080)	From RIS or “Institution Name” input
Institution Address	(0008,0081)	From RIS or from configuration
Referring Physician's Name	(0008,0090)	From RIS or input
Station Name	(0008,1010)	From Configuration

Attribute Name	Tag	Value
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.: Exam Protocol SR
Physicians of Record	(0008,1048)	From RIS (0040,1010) Names of Intended Recipients of Results
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 Study Sequence	(0008,1110)	From RIS
>Referenced SOP Class UID	(0008,1150)	
>Referenced SOP Instance UID	(0008,1155)	
Referenced Performed Procedure Step Sequence	(0008,1111)	
>Referenced SOP Class UID	(0008,1150)	
>Referenced SOP Instance UID	(0008,1155)	
Referenced Patient Sequence	(0008,1120)	From RIS
>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
Patient's Sex	(0010,0040)	From RIS or input
Other Patient IDs	(0010,1000)	From RIS
Other Patient Names	(0010,1001)	From RIS
Other Patient IDs Sequence	(0010,1002)	From RIS

Attribute Name	Tag	Value
>Patient ID	(0010,0020)	From RIS
>Issuer of Patient ID	(0010,0021)	From RIS
>Type of Patient ID	(0010,0022)	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
Patient's Mother's Birth Name	(0010,1060)	From RIS
Military Rank	(0010,1080)	From RIS
Branch of Service	(0010,1081)	From RIS
Medical Record Locator	(0010,1090)	From RIS
Medical Alerts	(0010,2000)	From RIS
Allergies	(0010,2110)	From RIS
Country of Residence	(0010,2150)	From RIS
Region of Residence	(0010,2152)	From RIS
Ethnic Group	(0010,2160)	From RIS
Occupation	(0010,2180)	From RIS
Smoking Status	(0010,21A0)	From RIS
Additional Patient History	(0010,21B0)	From RIS
Pregnancy Status	(0010,21C0)	From RIS
Last Menstrual Date	(0010,21D0)	From RIS
Patient's Religious Preference	(0010,21F0)	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 Versions	(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)

Attribute Name	Tag	Value
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>
Exposure Time	(0018,1150)	<duration of x-Ray exposure>(msec)
X-Ray Tube Current	(0018,1151)	(mA)
Exposure in μ As	(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)
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)	
Private Creator	(0019,00xx)	SIEMENS SMS-AX VIEW 1.0
<i>Attributes according to "8.5.1.2 Angio Viewing Module"</i>		
Study Instance UID	(0020,000D)	From RIS or system generated

Attribute Name	Tag	Value
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
<i>Attributes according to "8.5.1.3 Angio Acquisition Data Module"</i>		
Private Creator	(0023,00xx)	SIEMENS SMS-AX QUANT 1.0
<i>Attributes according to "8.5.1.4 Angio Quantification Module" if image was calibrated</i>		
Private Creator	(0025,00xx)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0
<i>Attributes according to "8.5.1.5 Original Image Info Module"</i>		
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 2480
Columns	(0028,0011)	Up to 2480
Bits Allocated	(0028,0100)	8 16
Bits Stored	(0028,0101)	8 12 16
High Bit	(0028,0102)	7 11 15
Pixel Representation	(0028,0103)	0
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)

Attribute Name	Tag	Value
>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
<i>Attributes according to "8.5.1.1 Edge Enhancement Module"</i>		
Private Creator	(0029,00xx)	SIEMENS MEDCOM HEADER
<i>Private platform attributes</i>		
Study ID Issuer	(0032,0012)	internal study identifier
Requesting Physician	(0032,1032)	From RIS
Requesting Service	(0032,1033)	From RIS
Requested Procedure Description	(0032,1060)	From RIS
Requested Procedure Code Sequence	(0032,1064)	From RIS
>Code Value	(0008,0100)	From RIS
>Coding Scheme Designator	(0008,0102)	From RIS
>Coding Scheme Version	(0008,0103)	From RIS
>Code Meaning	(0008,0104)	From RIS
Study Comments	(0032,4000)	Patient Registration input
Admission ID	(0038,0010)	From RIS
Special Needs	(0038,0050)	From RIS
Patient State	(0038,0500)	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)	
>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
Confidentiality Constraint on Patient Data Description	(0040,3001)	From RIS

Attribute Name	Tag	Value
Private Creator	(2121,00xx)	PMI Private Calibration Module Version 2.0
<i>Attributes according to "8.5.1.4 Angio Quantification Module" if image was calibrated</i>		
Curve Dimensions	(5000,0005)	2
Number of Points	(5000,0010)	<number of data points>
Type of Data	(5000,0020)	ECG
Axis Units	(5000,0030)	DPPSINONE (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
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>
Pixel Data	(7FE0,0010)	

8.1.1.1.2 Quant Report Images - derived XA

The ARTIS one will generate result images from performing Quantitative Analysis Functions. To ensure image interchange, the resulting reports can be converted to standard XA multi-frame images. The pixel data contain the result information as an image.

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

Acquisition specific information (e.g. KVP, mA) is taken from the original image that was subject to the analysis. Not applicable information is set either to default values or not set at all.

The overlay graphic and curve module are not used with Quant images.

Quant images are always sent as 1024x1024 12 bit. Multi-frames are used to support reports with multiple pages.

8.1.1.1.3 Exam Protocol as XA Image

The ARTIS one 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 are 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.

8.1.1.2 SR Document SOP Class

The ARTIS one 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.

8.1.1.2.1 X-Ray Radiation Dose SR SOP Class

The ARTIS one 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 "Study". Updating of a SR will not change the SOP Instance UID.

All patient level, study level and equipment information are 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.

Table 64 - 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 [Gym ²].
Dose (RP) Total	Calculated accumulated dose at the RP applied during fluoro and acquisition [Gy]. (Not corrected for backscatter)
Fluoro Dose Area Product Total	The accumulated dose area product applied during fluoro [Gym ²].
Fluoro Dose (RP) Total	Calculated accumulated dose at the RP applied during fluoro [Gy].
Total Fluoro Time	Total time of fluoro [s]. (pedal time)
Acquisition Dose Area Product Total	The accumulated dose area product applied during acquisition [Gym ²].
Acquisition Dose (RP) Total	Calculated accumulated dose at the RP applied during acquisition [Gy].
Total Acquisition Time	Total time of acquisition [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 65 - Details on Dose SR Irradiation Event Data

Concept Name	Comments on Concept Value
Acquisition Plane	"Single Plane"
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"
Acquired Image	SOP Instance UID of the acquired image as link to that image.
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 ">"

Concept Name	Comments on Concept Value
>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 one uses uniform filter thickness, so this value always matches the minimal thickness value.
Fluoro Mode	Only with "Fluoroscopy" - ARTIS one 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.
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 [μ As]
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.

Concept Name	Comments on Concept Value
Table Height End Position	Table Height Position at end of irradiation event [mm]. Only set when table was moved during the event.
Distance Source to Reference Point	The value of the Source to Reference Point (defined according to IEC 60601-2-43) distance in [mm].
Target Region	Fixed value of "Entire body" is used.
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.

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"/>
<PeriDynaStepCount SRData=" "/>
<SceneName SRData="FL xLow"/>
<AngulationStep SRData=" "/>
<Dose SRData="0.010000"/>
<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"/>
</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"/>
<PeriDynaStepCount SRData=" "/>
<SceneName SRData="Coro RL"/>
<AcqType SRData="FIXED"/>
<AngulationStep SRData=" "/>
<Dose SRData="0.070000"/>
<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"/>
</AcquisitionData>

```

8.1.1.2.2 Comprehensive SR SOP Class

The ARTIS one will utilize the Comprehensive SR SOP Class to report measurements from the quantification application. It is implementing TID 3202 *Ventricular Analysis* to create the SR.

All patient level, study level and equipment information are 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. Please refer to Table 44 - Basic Worklist C-FIND-RSP Return Key Attributes for mapping of worklist information.

8.1.2 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.

8.1.3 Attribute mapping

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

8.1.4 Coerced/Modified fields

The ARTIS one DICOM Application is not performing data coercion.

8.2 Data Dictionary of Private Attributes

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

Table 66: 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
(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

Tag	Private Owner Code	Name	VR	VM
(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,xx1A)	SIEMENS SMS-AX VIEW 1.0	Quant 1K Overlay	OB	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,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
(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,xx06)	SIEMENS SMS-AX ACQ 1.0	Skin Dose Percent	SL	1
(0021,xx07)	SIEMENS SMS-AX ACQ 1.0	Skin Dose Accumulation	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

Tag	Private Owner Code	Name	VR	VM
(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	US	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,xx13)	SIEMENS SMS-AX ACQ 1.0	Acquisition Zoom	US	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
(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,xx1A)	SIEMENS SMS-AX ACQ 1.0	FD Flag	US	1
(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

Tag	Private Owner Code	Name	VR	VM
(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
(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,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,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,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
(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,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

Tag	Private Owner Code	Name	VR	VM
(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
(0023,xx08)	SIEMENS SMS-AX QUANT 1.0	Calibration TOD Value	IS	1
(0025,xx00)	SIEMENS SMS-AX ORIGINAL IM- AGE INFO 1.0	View Native	US	1
(0025,xx01)	SIEMENS SMS-AX ORIGINAL IM- AGE INFO 1.0	Original Series Number	US	1
(0025,xx02)	SIEMENS SMS-AX ORIGINAL IM- AGE INFO 1.0	Original Image Number	US	1
(0025,xx03)	SIEMENS SMS-AX ORIGINAL IM- AGE INFO 1.0	Win Center	US	1
(0025,xx04)	SIEMENS SMS-AX ORIGINAL IM- AGE INFO 1.0	Win Width	US	1
(0025,xx05)	SIEMENS SMS-AX ORIGINAL IM- AGE INFO 1.0	Win Brightness	US	1
(0025,xx06)	SIEMENS SMS-AX ORIGINAL IM- AGE INFO 1.0	Win Contrast	US	1
(0025,xx07)	SIEMENS SMS-AX ORIGINAL IM- AGE INFO 1.0	Original Frame Number	US	1
(0025,xx08)	SIEMENS SMS-AX ORIGINAL IM- AGE INFO 1.0	Original Mask Frame Number	US	1
(0025,xx09)	SIEMENS SMS-AX ORIGINAL IM- AGE INFO 1.0	Opac	US	1
(0025,xx0A)	SIEMENS SMS-AX ORIGINAL IM- AGE INFO 1.0	Original Number of Frames	US	1
(0025,xx0B)	SIEMENS SMS-AX ORIGINAL IM- AGE INFO 1.0	Original Scene Duration	DS	1
(0025,xx0C)	SIEMENS SMS-AX ORIGINAL IM- AGE INFO 1.0	Image Object ID	LO	1
(0025,xx0D)	SIEMENS SMS-AX ORIGINAL IM- AGE INFO 1.0	Original Scene VFR Info	SS	1-n
(0025,xx0E)	SIEMENS SMS-AX ORIGINAL IM- AGE INFO 1.0	Original Frame ECG Position	SS	1
(0025,xx10)	SIEMENS SMS-AX ORIGINAL IM- AGE INFO 1.0	Zoom Flag	SS	1
(0025,xx11)	SIEMENS SMS-AX ORIGINAL IM- AGE INFO 1.0	Flexible Pixel Shift	US	1
(0025,xx12)	SIEMENS SMS-AX ORIGINAL IM- AGE INFO 1.0	Number of Mask Frames	US	1
(0025,xx13)	SIEMENS SMS-AX ORIGINAL IM- AGE INFO 1.0	Number of Fill Frames	US	1
(0025,xx14)	SIEMENS SMS-AX ORIGINAL IM- AGE INFO 1.0	Series Number	IS	1

Tag	Private Owner Code	Name	VR	VM
(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
(0029,xx08)	SIEMENS CSA NON-IMAGE	CSA Data Type	CS	1
(0029,xx09)	SIEMENS CSA NON-IMAGE	CSA Data Version	LO	1
(0029,xx10)	SIEMENS CSA NON-IMAGE	CSA Data Info	OB	1
(0029,xx08)	SIEMENS MEDCOM HEADER	MedCom Header Type	CS	1
(0029,xx09)	SIEMENS MEDCOM HEADER	MedCom Header Version	LO	1
(0029,xx10)	SIEMENS MEDCOM HEADER	MedCom Header Info	OB	1
(0029,xx20)	SIEMENS MEDCOM HEADER	MedCom History Information	OB	1
(0029,xx31)	SIEMENS MEDCOM HEADER	PMTF Information 1	LO	1
(0029,xx32)	SIEMENS MEDCOM HEADER	PMTF Information 2	UL	1
(0029,xx33)	SIEMENS MEDCOM HEADER	PMTF Information 3	UL	1
(0029,xx34)	SIEMENS MEDCOM HEADER	PMTF Information 4	CS	1
(0029,xx35)	SIEMENS MEDCOM HEADER	PMTF Information 5	UL	1
(0029,xx40)	SIEMENS MEDCOM HEADER	Application Header Sequence	SQ	1
(0029,xx41)	SIEMENS MEDCOM HEADER	Application Header Type	CS	1
(0029,xx42)	SIEMENS MEDCOM HEADER	Application Header ID	LO	1
(0029,xx43)	SIEMENS MEDCOM HEADER	Application Header Version	LO	1
(0029,xx44)	SIEMENS MEDCOM HEADER	Application Header Info	OB	1
(0029,xx50)	SIEMENS MEDCOM HEADER	Workflow Control Flags	LO	8
(0029,xx51)	SIEMENS MEDCOM HEADER	Arch. Management Flag Keep Online	CS	1
(0029,xx52)	SIEMENS MEDCOM HEADER	Arch. Mgmt Flag Do Not Archive	CS	1
(0029,xx53)	SIEMENS MEDCOM HEADER	Image Location Status	CS	1
(0029,xx54)	SIEMENS MEDCOM HEADER	Estimated Retrieve Time	DS	1
(0029,xx55)	SIEMENS MEDCOM HEADER	Data Size of Retrieved Images	DS	1
(0029,xx08)	SIEMENS MEDCOM OOG	MedCom OOG Type	CS	1
(0029,xx09)	SIEMENS MEDCOM OOG	MedCom OOG Version	LO	1
(0029,xx10)	SIEMENS MEDCOM OOG	MedCom OOG Info	OB	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
(2121,xx01)	PMI Private Calibration Module Version 2.0	Calibration Method	ST	1

Tag	Private Owner Code	Name	VR	VM
(2121,xx02)	PMI Private Calibration Module Version 2.0	Calibration Method Info	ST	1
(2121,xx03)	PMI Private Calibration Module Version 2.0	Calibration Object Size	FL	1
(2121,xx04)	PMI Private Calibration Module Version 2.0	Calibration Object S Dev	FL	1
(2121,xx05)	PMI Private Calibration Module Version 2.0	Calibration Horizontal Pixel Spacing	FL	1
(2121,xx06)	PMI Private Calibration Module Version 2.0	Calibration Vertical Pixel Spacing	FL	1
(2121,xx08)	PMI Private Calibration Module Version 2.0	Calibration File Name	ST	1
(2121,xx09)	PMI Private Calibration Module Version 2.0	Calibration Frame Number	IS	1
(2121,xx0A)	PMI Private Calibration Module Version 2.0	Calibration Object Unit	SH	1
(2121,xx0B)	PMI Private Calibration Module Version 2.0	Averaged Calibrations Performed	SS	1
(2121,xx0C)	PMI Private Calibration Module Version 2.0	Auto Magnify Factor	FL	1
(2121,xx0D)	PMI Private Calibration Module Version 2.0	Horizontal Pixel S Dev	FL	1
(2121,xx0E)	PMI Private Calibration Module Version 2.0	Vertical Pixel S Dev	FL	1
(2121,xx01)	PMI Private 3D Reconstruction Attributes Version 1.0	Binary 3D Vessel Data	OB	1
(2121,xx02)	PMI Private 3D Reconstruction Attributes Version 1.0	3D Control Displayed Area Sequence	SQ	1
(2121,xx03)	PMI Private 3D Reconstruction Attributes Version 1.0	3D Control Displayed Area Top Left Corner	SL	2
(2121,xx04)	PMI Private 3D Reconstruction Attributes Version 1.0	3D Control Displayed Area Bottom Right Corner	SL	2

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<sp><sp>VIEW 1.0

SIEMENS SMS-AX<sp><sp>ACQ 1.0

SIEMENS SMS-AX<sp><sp>QUANT 1.0

SIEMENS SMS-AX<sp><sp>ORIGINAL IMAGE INFO 1.0

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

8.2.1 Usage of Attributes from received IODs

N/A

8.2.2 Attribute mapping

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

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8.2.3 Coerced / Modified fields

N/A

8.3 Coded Terminology and Templates

8.3.1 Context Groups

N/A

8.3.2 Template Specifications

N/A

8.3.3 Private Code definitions

N/A

8.4 Grayscale Image Consistency

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

8.5 Standard Extended / Specialized / Private SOP Classes

8.5.1 Standard Extended XA

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

Table 67 - Private Modules for Standard Extended XA

IE	Module	Refer- ence	Usage	Note
Image	Edge Enhancement	8.5.1.1	U	private Filter Information
	Angio Viewing	8.5.1.2	U	private Viewing information
	Angio Acquisition	8.5.1.3	U	additional private Information about image Acquisition
	Angio Quantification	8.5.1.4	U	if image is calibrated for Quant
	Original Image Info	8.5.1.5	U	if derived image

U = User Option

8.5.1.1 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 68 - (Private) Edge Enhancement Module

Attribute Name	Tag	Owner	Type	Notes
Standard Edge Enhancement 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 present
>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

8.5.1.2 Angio Viewing Module

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

Table 69 - (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

Attribute Name	Tag	Owner	Type	Notes
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.
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	
Quant 1K Overlay	(0019,xx1A)	SIEMENS SMS-AX VIEW 1.0	3	Only Store Monitor and Store Reference Images in Quant (128 kbyte)
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	

Attribute Name	Tag	Owner	Type	Notes
Auto Window Correct Value	(0019,xx1E)	SIEMENS SMS-AX VIEW 1.0	3	
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	
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	

8.5.1.3 Angio Acquisition Data Module

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

Table 70 - (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), 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	(μ As)
Dose	(0021,xx05)	SIEMENS SMS-AX ACQ 1.0	3	(nGy/pulse)
Skin Dose Percent	(0021,xx06)	SIEMENS SMS-AX ACQ 1.0	3	
Skin Dose Accumulation	(0021,xx07)	SIEMENS SMS-AX ACQ 1.0	3	(0.01 mGy)
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
Dyna X-Ray Info	(0021,xx0F)	SIEMENS SMS-AX ACQ 1.0	3	Per frame info (4 * number of frames). (V, μ A value, μ s, μ As) Only with rotational images
Gamma Input	(0021,xx10)	SIEMENS SMS-AX ACQ 1.0	3	

Attribute Name	Tag	Owner	Type	Notes
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.
Acquisition Zoom	(0021,xx13)	SIEMENS SMS-AX ACQ 1.0	3	
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 acquisition
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
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	

Attribute Name	Tag	Owner	Type	Notes
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	
Dipp Mode	(0021,xx45)	SIEMENS SMS-AX ACQ 1.0	3	
Artis System Type	(0021,xx46)	SIEMENS SMS-AX ACQ 1.0	3	
Artis Table Type	(0021,xx47)	SIEMENS SMS-AX ACQ 1.0	3	
Artis Table Top Type	(0021,xx48)	SIEMENS SMS-AX ACQ 1.0	3	
Water Value	(0021,xx49)	SIEMENS SMS-AX ACQ 1.0	3	Equivalent water value of the patient/object in 0.1 mm
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

Attribute Name	Tag	Owner	Type	Notes
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
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	
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 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
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
Detector Rotation	(0021,xx71)	SIEMENS SMS-AX ACQ 1.0	3	In deg One value / frame for rotational images one single value otherwise

Attribute Name	Tag	Owner	Type	Notes
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	"Artis-One"

8.5.1.4 Angio Quantification Module

The table in this section contains private IOD attributes that describe extensions for calibration results features.

Table 71 - (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
Calibration Method	(2121,xx01)	PMI Private Calibration Module Version 2.0	3	Only for images calibrated for Quant
Calibration Method Info	(2121,xx02)	PMI Private Calibration Module Version 2.0	3	Only for images calibrated for Quant
Calibration Object Size	(2121,xx03)	PMI Private Calibration Module Version 2.0	3	Only for images calibrated for Quant
Calibration Object S Dev	(2121,xx04)	PMI Private Calibration Module Version 2.0	3	Only for images calibrated for Quant
Calibration Horizontal Pixel Spacing	(2121,xx05)	PMI Private Calibration Module Version 2.0	3	Only for images calibrated for Quant
Calibration Vertical Pixel Spacing	(2121,xx06)	PMI Private Calibration Module Version 2.0	3	Only for images calibrated for Quant
Calibration File Name	(2121,xx08)	PMI Private Calibration Module Version 2.0	3	Only for images calibrated for Quant
Calibration Frame Number	(2121,xx09)	PMI Private Calibration Module Version 2.0	3	Only for images calibrated for Quant
Calibration Object Unit	(2121,xx0A)	PMI Private Calibration Module Version 2.0	3	Only for images calibrated for Quant
Averaged Calibrations Performed	(2121,xx0B)	PMI Private Calibration Module Version 2.0	3	Only for images calibrated for Quant
Auto Magnify Factor	(2121,xx0C)	PMI Private Calibration Module Version 2.0	3	Only for images calibrated for Quant

Attribute Name	Tag	Owner	Type	Notes
Horizontal Pixel S Dev	(2121,xx0D)	PMI Private Calibration Module Version 2.0	3	Only for images calibrated for Quant
Vertical Pixel S Dev	(2121,xx0E)	PMI Private Calibration Module Version 2.0	3	Only for images calibrated for Quant
Binary 3D Vessel Data	(2121,xx01)	PMI Private 3D Reconstruction Attributes Version 1.0	3	Only for Quant 3D models
3D Control Displayed Area Sequence	(2121,xx02)	PMI Private 3D Reconstruction Attributes Version 1.0	3	Only for Quant 3D models
>3D Control Displayed Area Top Left Corner	(2121,xx03)	PMI Private 3D Reconstruction Attributes Version 1.0	3	Only for Quant 3D models
>3D Control Displayed Area Bottom Right Corner	(2121,xx04)	PMI Private 3D Reconstruction Attributes Version 1.0	3	Only for Quant 3D models

8.5.1.5 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 72 - (Private) Original Image Info Module Attributes

Attribute Name	Tag	Owner	Type	Notes
View Native	(0025,xx00)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Original Series Number	(0025,xx01)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Original Image Number	(0025,xx02)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Win Center	(0025,xx03)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Win Width	(0025,xx04)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Win Brightness	(0025,xx05)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Win Contrast	(0025,xx06)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Original Frame Number	(0025,xx07)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	

Attribute Name	Tag	Owner	Type	Notes
Original Mask Frame Number	(0025,xx08)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Opac	(0025,xx09)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Original Number of Frames	(0025,xx0A)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Original Scene Duration	(0025,xx0B)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Image Object ID	(0025,xx0C)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	Set to "AXIM_READY_PROCESSED" when Ready Processing was ap- plied
Original Scene VFR Info	(0025,xx0D)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	Number of phases, then fol- lowed by n pairs (Last Frame Number, then Frame Rate)
Original Frame ECG Posi- tion	(0025,xx0E)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Zoom Flag	(0025,xx10)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Flexible Pixel Shift	(0025,xx11)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Number of Mask Frames	(0025,xx12)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Number of Fill Frames	(0025,xx13)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Series Number	(0025,xx14)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Image Number	(0025,xx15)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Ready Processing Status	(0025,xx16)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	1 = ready processed, 2 = resized, 3 = both 4 = resize 14 to 16 bit (rota- tional images) 5 = acquired with 16 bit (rota- tional images)

8.5.1.6 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 one system. Please see the following table for details.

Table 73 - Image Type Extensions

Type of Scene/Image	Image Type
Scene and Single Image	ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A
Scene and Single Image acquired with alternate footswitch	ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A\ALT ACQ
Reference Image	DERIVED\SECONDARY\SINGLE PLANE\SINGLE A\REFIMAGE
CLEARstent Reference Image	DERIVED\SECONDARY\SINGLE PLANE\SINGLE A\REFIMAGE\ICSTENT REF
Dynamic CLEARstent Image	DERIVED\SECONDARY\SINGLE PLANE\SINGLE A\ICSTENT DYNAMIC
CLEARstent Live Image	DERIVED\SECONDARY\SINGLE PLANE\SINGLE A\CLEARSTENT_LIVE
Store Monitor	DERIVED\SECONDARY\SINGLE PLANE\SINGLE A\STORE MONITOR
Perivision	ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A\PERI\MASK\1 ¹ ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A\PERI\FILL\1 ¹
Dynavision	ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A\DYNA\2 ²
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
Heartsweep	ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A\3D ACQ\ COROSCAN\FILL
Store Fluoro Loop	DERIVED\PRIMARY\SINGLE PLANE\SINGLE A\STORE FLUORO
Store Roadmap	DERIVED\PRIMARY\SINGLE PLANE\SINGLE A\ROADMAP
Quant Result Image	DERIVED\SECONDARY\<3rd to nth value from Original>\QUANT DERIVED\SECONDARY\SINGLE PLANE\SINGLE A(B)\ STORE MONITOR\QUANT3DMODEL
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

8.6 Private Transfer Syntaxes

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

8.7 Sorting Order ARTIS one

This section discusses the sorting algorithms for Artis within the patient browser and directory overview.

8.7.1 Identification of Images

Original acquired images are identified by the following attribute contents:

Table 74 - Attributes for Identification of Original Images

Attribute Name	Tag	Value
Image Type	(0008,0008)	ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A \PERI\\n ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A \DYNA\MASK ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A \DYNA\INJECTION ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A \DYNA\FILL ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A \DYNA\WASHOUT ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A\3D ACQ\DR ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A\3D ACQ\DSA DERIVED\PRIMARY\SINGLE PLANE\SINGLE A\STORE FLUORO DERIVED\PRIMARY\SINGLE PLANE\SINGLE A\ROADMAP
Series Time	(0008,0031)	Same as Acquisition Time
Acquisition Time	(0008,0032)	Time the acquisition of this image was performed
Content Time	(0008,0033)	Same as Acquisition Time (rule for acquired images)
Series Number	(0020,0011)	Same as Acquisition Number
Acquisition Number	(0020,0012)	Counts number of acquisitions. All images created during performance of this acquisition have the same number.
Instance Number	(0020,0013)	"1-based" counter for images. Indicates the creation order within the acquisition.

Store Monitor images, derived from original images or Fluoro LIH, are identified by the following attribute contents:

Table 75 - Attributes for Identification of Store Monitor Images

Attribute Name	Tag	Value
Image Type	(0008,0008)	DERIVED\SECONDARY\SINGLE PLANE\SINGLE A\STORE MONITOR
Series Time	(0008,0031)	Same as Acquisition Time. Store Monitor is in same series.
Acquisition Time	(0008,0032)	Time the acquisition of the original image was performed
Content Time	(0008,0033)	Time this image was created (Store Monitor was performed)
Series Number	(0020,0011)	Same Number as Acquisition Number. (Reference to original Image)
Acquisition Number	(0020,0012)	Counts number of acquisitions. Refers to the acquisition number of the original image where this image was derived from.
Instance Number	(0020,0013)	"300-based" counter for images. Indicates the creation order of Store Monitor Reference images within this series

Store Reference images, derived from original images or Fluoro LIH, are identified by the following attribute contents:

Table 76 - Attributes for Identification of Store Ref Images

Attribute Name	Tag	Value
Image Type	(0008,0008)	DERIVED\SECONDARY\SINGLE PLANE\SINGLE A\REFIMAGE
Series Time	(0008,0031)	Same as Acquisition Time. Store Reference image is in same series.
Acquisition Time	(0008,0032)	Time the acquisition of the original image was performed

Attribute Name	Tag	Value
Content Time	(0008,0033)	Time this image was created (Store Reference image was performed)
Series Number	(0020,0011)	Same Number as Acquisition Number. (Reference to original Image)
Acquisition Number	(0020,0012)	Counts number of acquisitions. Refers to the acquisition number of the original image where this image was derived from.
Instance Number	(0020,0013)	"100-based" counter for images. Indicates the creation order of Store Reference images within this series

Quant Report images, derived from original images or Fluoro LIH, are identified by the following attribute contents:

Table 77 - Attributes for Identification of Quant Report Images

Attribute Name	Tag	Value
Image Type	(0008,0008)	DERIVED\SECONDARY\SINGLE PLANE\SINGLE A\QUANT
Series Time	(0008,0031)	Time this Quant image was created (Quant was performed)
Acquisition Time	(0008,0032)	Time the acquisition of the original image was performed
Content Time	(0008,0033)	Time this Quant image was created (Quant was performed)
Series Number	(0020,0011)	Same Number as Acquisition Number. (Reference to original Image)
Acquisition Number	(0020,0012)	Counts number of acquisitions. Refers to the acquisition number of the original image where this image was derived from.
Instance Number	(0020,0013)	"1-based" counter for images. Quant Reports are stored in new series.

EXAM PROTOCOL as XA image, created during transfer of X-Ray Radiation Dose SR, is identified by the following attribute contents:

Table 78 - Attributes for Identification of EXAM Protocol XA Image

Attribute Name	Tag	Value
Image Type	(0008,0008)	ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A\EXAM PROTOCOL
SOP Class UID	(0008,0016)	1.2.840.10008.5.1.4.1.1.12.1
Series Time	(0008,0031)	Exam Protocol is allocated with Patient Registration.
Acquisition Time	(0008,0032)	Time this protocol was created (i.e. transferred)
Content Time	(0008,0033)	Time this protocol was created (i.e. transferred)
Series Number	(0020,0011)	Fixed value of "999"
Acquisition Number	(0020,0012)	Fixed value of "999"
Instance Number	(0020,0013)	Fixed value of "999"

8.7.2 The Sorting Algorithms of the Artis Viewer

ARTIS one has implemented sorting algorithms to display DICOM objects in the directory overview in a specific order. Sorting/Grouping in the Viewer Directory Overview occurs according the following rules:

1. Sort by Series Number
2. If Series Number matches: Group on Series Number, Sort by Instance Number

3. If Series Number and Instance Number each match: Group on Series Number, Sort by Content Time

In the case, that the user has selected "Scenes + Ref Images" or "Scenes + Store Monitor", the reference images or the store monitor images follow directly the image they had been derived from.

Example 1:

Patient "Test 1" with one Study, three Series with one acquired image, three Store Monitor Images and one Reference Image in each Series. "Scenes" is selected under the "Dir Overview" button => only the acquired images are displayed.

Patient "Test 1"

Table 79 - Viewer image ordering - simple case

Study 1 Series 1 Image 1	Study 1 Series 2 Image 1	Study 1 Series 3 Image 1	

	Acquired Image
	Store Monitor Image
	Store Reference Image

Example 2:

Patient "Test 2" with one Study, three Series with one acquired image, three Store Monitor Images and one Reference Image in each Series. "Scenes + Ref Images" is selected under the "Dir Overview" button => the acquired images and the corresponding reference images are displayed.

Patient "Test 2"

Table 80 - Viewer image ordering - with Reference images

Study 1 Series 1 Image 1	Study 1 Series 1 Image 100	Study 1 Series 2 Image 1	Study 1 Series 2 Image 100
Study 1 Series 3 Image 1	Study 1 Series 3 Image 100		

	Acquired Image
	Store Monitor Image
	Store Reference Image

Example 3:

Patient "Test 3" with one Study, three Series with one acquired image, three Store Monitor Images and one Reference Image in each Series. "Scenes + Store Monitor" is selected under the "Dir Overview" button => the acquired images and the corresponding store monitor images are displayed.

Patient "Test 3"

Table 81 - Viewer image ordering - with Store Monitor images

Study 1 Series 1 Image 1	Study 1 Series 1 Image 300	Study 1 Series 1 Image 301	Study 1 Series 1 Image 302
Study 1 Series 2 Image 1	Study 1 Series 2 Image 300	Study 1 Series 2 Image 301	Study 1 Series 2 Image 302
Study 1 Series 3 Image 1	Study 1 Series 3 Image 300	Study 1 Series 3 Image 301	Study 1 Series 3 Image 302

	Acquired Image
	Store Monitor Image
	Store Reference Image

Example 4:

For Scene #2 of Patient "Test 3" now a Quant Report is performed. According to Example 3, the Overview now sorts as follows:

Patient "Test 3"

Table 82 - Viewer image ordering - Store Monitor and Quant images

Study 1 Series 1 Image 1	Study 1 Series 1 Image 300	Study 1 Series 1 Image 301	Study 1 Series 1 Image 302
Study 1 Series 2 Image 1	Study 1 Series 2(Quant) Image	Study 1 Series 2 Image 300	Study 1 Series 2 Image 301
Study 1 Series 2 Image 302	Study 1 Series 3 Image 300	Study 1 Series 3 Image 301	Study 1 Series 3 Image 302
Study 1 Series 3 Image 1			

	Acquired Image
	Store Monitor Image
	Store Reference Image
	Quant Report Image

8.7.3 The Sorting Algorithms of the Artis Browser

Besides the default sorting criteria, Artis supports the following sorting algorithms for the patient browser.

The default *syngo* sorting settings are as follows

- Artis displays images - within a Series - with the order they had been acquired
- Artis displays Series - within a Study - with the order they had been acquired
- Artis displays Studies - within a Patient - with the order they had been acquired

Therefore, the Quant Report Series will not necessarily be displayed adjacent to the original scene, if created later at the end of all scenes.

8.8 Supported Matrix Sizes of ARTIS one

Depending on detector mode the ARTIS one supports different matrix sizes. These matrix sizes are also used by the Storage AE when sending the images to a remote SCP. Additionally, it is possible to send images resized/processed to 512x512 and 1024x1024 and 1200x1200.

Table 83 - ARTIS one uses following original Matrix Sizes

Detector Size	Rows (0028,0010)	Columns (0028,0011)
FD 26x30	1560	1424
	1424	1560
	1216	1216
	960	960
	776	776
	776	712
	712	776
	608	608
	520	472
	472	520
	480	480
	424	424
	384	352
	352	384

8.9 DICOM Print SCU - detailed status displays

The following tables document the behavior of the ARTIS one DICOM Print AE in response to messages received for the Printer SOP Class and the Print Job SOP Class.

Definition of camera symbols:

- Idle: Camera is installed and ready; idle icon is displayed.
- Interact: The user has to react in near future, but not immediately.
Example: A camera was low in 8x10 clear sheets: LOW 8x10 CLR was sent by N-EVENT-REPORT.
- Queue Stopped: The user has to react immediately. Either the camera needs immediate interaction, or a job has been aborted.
Example: A camera is out of 8x10 clear sheets, or camera is down, or a film job is aborted

Note: different camera symbols are displayed according to the Printer Status Info.

8.9.1 Common Status Information

Table 84 - Print SCU Common Status Information

Printer Status Info/ Execution Status Info	Description	Message string visible in 'Status Bar'	Other action for UI/ 'camera symbol'
NORMAL	Camera is ready	Camera is ready	<None>/idle
BAD RECEIVE MGZ	There is a problem with the film receive magazine. Films from the printer cannot be transported into the magazine.	Problem with receive magazine.	<None>/interact
BAD SUPPLY MGZ	There is a problem with the film supply magazine. Films from this magazine cannot be transported into the printer.	Problem with supply magazine.	<None>/interact
CALIBRATING	Printer is performing self-calibration; it is expected to be available for normal operation shortly.	Self-calibration. Please wait.	<None>/idle
CALIBRATION ERR	An error in the printer calibration has been detected, quality of processed films may not be optimal.	Problem in calibration. Film quality may not be optimal.	<None>/interact
CHECK CHEMISTRY	A problem with the processor chemicals has been detected, quality of processed films may not be optimal.	Problem with chemistry. Film quality may not be optimal.	<None>/interact
CHECK SORTER	There is an error in the film sorter	Error in film sorter.	<None>/interact
CHEMICALS EMPTY	There are no processing chemicals in the processor, films will not be printed and processed until the processor is back to normal.	Camera chemistry empty. Please check.	<None>/interact
CHEMICALS LOW	The chemical level in the processor is low, if not corrected, it will probably shut down soon.	Camera chemistry low. Please check.	<None>/interact
COVER OPEN	One or more printer or processor covers, drawers, doors are open.	Camera cover, drawer or door open.	<None>/interact
ELEC CONFIG ERR	Printer configured improperly for this job.	Camera configured improperly for this job. Queue stopped.	Queue for this camera will be STOPPED/ Queue stopped
ELEC DOWN	Printer is not operating due to some unspecified electrical hardware problem.	Camera electrical hardware Problem.	<None>/interact
ELEC SW ERROR	Printer not operating for some unspecified software error.	Camera software problem. Queue stopped.	Queue for this camera will be STOPPED/ Queue stopped
EMPTY 8x10	The 8x10 inch film supply magazine is empty.	8x10 film supply empty.	<None>/interact

Printer Status Info/ Execution Status Info	Description	Message string visible in 'Status Bar'	Other action for UI/ 'camera symbol'
EMPTY 8x10 BLUE	The 8x10 inch blue film supply magazine is empty.	8x10 blue film supply empty.	<None>/interact
EMPTY 8x10 CLR	The 8x10 inch clear film supply magazine is empty.	8x10 clear film supply empty.	<None>/interact
EMPTY 8x10 PAPR	The 8x10 inch paper supply magazine is empty.	8x10 paper supply empty.	<None>/interact
EMPTY 10x12	The 10x12 inch film supply magazine is empty.	10x12 film supply empty.	<None>/interact
EMPTY 10x12 BLUE	The 10x12 inch blue film supply magazine is empty.	10x12 blue film supply empty.	<None>/interact
EMPTY 10x12 CLR	The 10x12 inch clear film supply magazine is empty.	10x12 clear film supply empty.	<None>/interact
EMPTY 10x12 PAPR	The 10x12 inch paper supply magazine is empty.	10x12 paper supply empty.	<None>/interact
EMPTY 10x14	The 10x14 inch film supply magazine is empty.	10x14 film supply empty.	<None>/interact
EMPTY 10x14 BLUE	The 10x14 inch blue film supply magazine is empty.	10x14 blue film supply empty.	<None>/interact
EMPTY 10x14 CLR	The 10x14 inch clear film supply magazine is empty.	10x14 clear film supply empty.	<None>/interact
EMPTY 10x14 PAPR	The 10x14 inch paper supply magazine is empty.	10x14 paper supply empty.	<None>/interact
EMPTY 11x14	The 11x14 inch film supply magazine is empty.	11x14 film supply empty.	<None>/interact
EMPTY 11x14 BLUE	The 11x14 inch blue film supply magazine is empty.	11x14 blue film supply empty.	<None>/interact
EMPTY 11x14 CLR	The 11x14 inch clear film supply magazine is empty.	11x14 clear film supply empty.	<None>/interact
EMPTY 11x14 PAPR	The 11x14 inch paper supply magazine is empty.	11x14 paper supply empty.	<None>/interact
EMPTY 14x14	The 14x14 inch film supply magazine is empty.	14x14 film supply empty.	<None>/interact
EMPTY 14x14 BLUE	The 14x14 inch blue film supply magazine is empty.	14x14 blue film supply empty.	<None>/interact
EMPTY 14x14 CLR	The 14x14 inch clear film supply magazine is empty.	14x14 clear film supply empty.	<None>/interact
EMPTY 14x14 PAPR	The 14x14 inch paper supply magazine is empty.	14x14 paper supply empty.	<None>/interact
EMPTY 14x17	The 14x17 inch film supply magazine is empty.	14x17 film supply empty.	<None>/interact
EMPTY 14x17 BLUE	The 14x17 inch blue film supply magazine is empty.	14x17 blue film supply empty.	<None>/interact

Printer Status Info/ Execution Status Info	Description	Message string visible in 'Status Bar'	Other action for UI/ 'camera symbol'
EMPTY 14x17 CLR	The 14x17 inch clear film supply magazine is empty.	14x17 clear film supply empty.	<None>/interact
EMPTY 14x17 PAPR	The 14x17 inch paper supply magazine is empty.	14x17 paper supply empty.	<None>/interact
EMPTY 24x24	The 24x24 inch film supply magazine is empty.	24x24 film supply empty.	<None>/interact
EMPTY 24x24 BLUE	The 24x24 inch blue film supply magazine is empty.	24x24 blue film supply empty.	<None>/interact
EMPTY 24x24 CLR	The 24x24 inch clear film supply magazine is empty.	24x24 clear film supply empty.	<None>/interact
EMPTY 24x24 PAPR	The 24x24 inch paper supply magazine is empty.	24x24 paper supply empty	<None>/interact
EMPTY 24x30	The 24x30 inch film supply magazine is empty.	24x30 film supply empty.	<None>/interact
EMPTY 24x30 BLUE	The 24x30 inch blue film supply magazine is empty.	24x30 blue film supply empty.	<None>/interact
EMPTY 24x30 CLR	The 24x30 inch clear film supply magazine is empty.	24x30 clear film supply empty.	<None>/interact
EMPTY 24x30 PAPR	The 24x30 inch paper supply magazine is empty.	24x30 paper supply empty.	<None>/interact
EMPTY A4 PAPR	The A4 paper supply magazine is empty.	A4 paper supply empty	<None>/interact
EMPTY A4 TRANS	The A4 transparency supply magazine is empty.	A4 transparency supply empty.	<None>/interact
EXPOSURE FAILURE	The exposure device has failed due to some unspecified reason.	Exposure device has failed.	<None>/interact
FILM JAM	A film transport error has occurred and a film is jammed in the printer or processor.	Film jam.	<None>/interact
FILM TRANSP ERR	There is a malfunction with the film transport, there may or may not be a film jam.	Film transport problem.	<None>/interact
FINISHER EMPTY	The finisher is empty.	Finisher is empty.	<None>/interact
FINISHER ERROR	The finisher is not operating due to some unspecified reason	Finisher problem.	<None>/interact
FINISHER LOW	The finisher is low on supplies.	Finisher low.	<None>/interact
LOW 8x10	The 8x10 inch film supply magazine is low.	8x10 film supply low.	<None>/interact
LOW 8x10 BLUE	The 8x10 inch blue film supply magazine is low.	8x10 blue film supply low.	<None>/interact
LOW 8x10 CLR	The 8x10 inch clear film supply magazine is low.	8x10 clear film supply low.	<None>/interact

Printer Status Info/ Execution Status Info	Description	Message string visible in 'Status Bar'	Other action for UI/ 'camera symbol'
LOW 8x10 PAPR	The 8x10 inch paper supply magazine is low.	8x10 paper supply low.	<None>/interact
LOW 10x12	The 10x12 inch film supply magazine is low.	10x12 film supply low.	<None>/interact
LOW 10x12 BLUE	The 10x12 inch blue film supply magazine is low.	10x12 blue film supply low.	<None>/interact
LOW 10x12 CLR	The 10x12 inch clear film supply magazine is low.	10x12 clear film supply low.	<None>/interact
LOW 10x12 PAPR	The 10x12 inch paper supply magazine is low.	10x12 paper supply low.	<None>/interact
LOW 10x14	The 10x14 inch film supply magazine is low.	10x14 film supply low.	<None>/interact
LOW 10x14 BLUE	The 10x14 inch blue film supply magazine is low.	10x14 blue film supply low.	<None>/interact
LOW 10x14 CLR	The 10x14 inch clear film supply magazine is low.	10x14 clear film supply low.	<None>/interact
LOW 10x14 PAPR	The 10x14 inch paper supply magazine is low.	10x14 paper supply low.	<None>/interact
LOW 11x14	The 11x14 inch film supply magazine is low.	11x14 film supply low.	<None>/interact
LOW 11x14 BLUE	The 11x14 inch blue film supply magazine is low.	11x14 blue film supply low.	<None>/interact
LOW 11x14 CLR	The 11x14 inch clear film supply magazine is low.	11x14 clear film supply low.	<None>/interact
LOW 11x14 PAPR	The 11x14 inch paper supply magazine is low.	11x14 paper supply low.	<None>/interact
LOW 14x14	The 14x14 inch film supply magazine is low.	14x14 film supply low.	<None>/interact
LOW 14x14 BLUE	The 14x14 inch blue film supply magazine is low.	14x14 blue film supply low.	<None>/interact
LOW 14x14 CLR	The 14x14 inch clear film supply magazine is low.	14x14 clear film supply low.	<None>/interact
LOW 14x14 PAPR	The 14x14 inch paper supply magazine is low.	14x14 paper supply low.	<None>/interact
LOW 14x17	The 14x17 inch film supply magazine is low.	14x17 film supply low.	<None>/interact
LOW 14x17 BLUE	The 14x17 inch blue film supply magazine is low.	14x17 blue film supply low.	<None>/interact
LOW 14x17 CLR	The 14x17 inch clear film supply magazine is low.	14x17 clear film supply low.	<None>/interact
LOW 14x17 PAPR	The 14x17 inch paper supply magazine is low.	14x17 paper supply low.	<None>/interact

Printer Status Info/ Execution Status Info	Description	Message string visible in 'Status Bar'	Other action for UI/ 'camera symbol'
LOW 24x24	The 24x24 inch film supply magazine is low.	24x24 film supply low.	<None>/interact
LOW 24x24 BLUE	The 24x24 inch blue film supply magazine is low.	24x24 blue film supply low.	<None>/interact
LOW 24x24 CLR	The 24x24 inch clear film supply magazine is low.	24x24 clear film supply low.	<None>/interact
LOW 24x24 PAPR	The 24x24 inch paper supply magazine is low.	24x24 paper supply low.	<None>/interact
LOW 24x30	The 24x30 inch film supply magazine is low.	24x30 film supply low.	<None>/interact
LOW 24x30 BLUE	The 24x30 inch blue film supply magazine is low.	24x30 blue film supply low.	<None>/interact
LOW 24x30 CLR	The 24x30 inch clear film supply magazine is low.	24x30 clear film supply low.	<None>/interact
LOW 24x30 PAPR	The 24x30 inch paper supply magazine is low.	24x30 paper supply low.	<None>/interact
LOW A4 PAPR	The A4 paper supply magazine is low.	A4 paper supply low.	<None>/interact
LOW A4 TRANS	The A4 transparency supply magazine is low..	A4 transparency supply low.	<None>/interact
NO RECEIVE MGZ	The film receive magazine is not available.	Film receiver not available.	<None>/interact
NO RIBBON	The ribbon cartridge needs to be replaced.	Replace ribbon cartridge.	<None>/interact
NO SUPPLY MGZ	The film supply magazine is not available.	Film supply not available.	<None>/interact
CHECK PRINTER	The printer is not ready at this time, operator intervention is required to make the printer available.	Check camera.	<None>/interact
CHECK PROC	The processor is not ready at this time, operator intervention is required to make the printer available.	Check processor.	<None>/interact
PRINTER DOWN	The printer is not operating due to some unspecified reason.	Camera down.	<None>/interact
PRINTER INIT	The printer is not ready at this time, it is expected to become available without intervention. For example, it may be in a normal warm-up state.	Camera initializing.	<None>/Idle
PRINTER OFFLINE	The printer has been disabled by an operator or service person.	Camera off-line.	<None>/interact
PROC DOWN	The processor is not operating due to some unspecified reason.	Processor down.	<None>/interact

Printer Status Info/ Execution Status Info	Description	Message string visible in 'Status Bar'	Other action for UI/ 'camera symbol'
PROC INIT	The processor is not ready at this time, it is expected to become available without intervention. For example, it may be in a normal warm-up state.	Processor initializing.	<None>/Idle
PROC OVERFLOW FL	Processor chemicals are approaching the overflow full mark.	Processor chemicals near overflow.	<None>/interact
PROC OVERFLOW HI	Processor chemicals have reached the overflow full mark.	Processor chemicals overflow.	<None>/interact
QUEUED	Print job in Queue	--	<None>/Idle
RECEIVER FULL	The film receive magazine is full.	Receiver full.	<None>/interact
REQ MED NOT INST	The requested film, paper, or other media supply magazine is not installed in the printer but may be available with operator intervention.	Install media supply.	<None>/interact
REQ MED NOT AVAI	The requested film, paper, or other media requested is not available on this printer.	Media supply not available on this camera. Queue stopped. Change camera.	Queue for this camera will be STOPPED/ Queue stopped
RIBBON ERROR	There is an unspecified problem with the print ribbon.	Error with print ribbon.	<None>/interact
SUPPLY EMPTY	The printer is out of film.	Camera out of film.	<None>/interact
SUPPLY LOW	The film supply is low.	Film supply low.	<None>/interact
UNKNOWN	There is an unspecified problem.	Unspecified problem with camera.	<None>/interact

8.9.2 Additional DICOM Execution Status Information

Table 85 - Print SCU additional DICOM Execution Status Info evaluation

Printer Status Info/ Execution Status Info	Description	Message string visible in 'Status Bar'	Other action for UI/ 'camera symbol'
INVALID PAGE DES	The specified page layout cannot be printed, or other page description errors have been detected.	Film Job cannot be printed on this camera. Queue stopped. Please redirect film job.	Queue for this camera will be STOPPED/ Queue stopped
INSUFFICIENT MEMORY	There is not enough memory available to complete this job.	Not enough memory available in camera. Queue stopped. Please continue queue or change camera.	Queue for this camera will be STOPPED/ Queue stopped

Printer Status Info/ Execution Status Info	Description	Message string visible in 'Status Bar'	Other action for UI/ 'camera symbol'
NONE	General printer warning, no specific information is available. Spooling of print jobs to disk is still possible.	--	<None>/Idle

8.9.3 Unknown 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 one Print AE shall be flexible.

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

Table 86 - Print SCU Unknown DICOM Execution Status Information

Printer Status/ Execution	Printer / Execution Status Info	Description	Message string visible in the HCD 'Status Bar'	Other action for UI/ '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

9 Annex Software Applications

9.1 Created SOP Instances

9.1.1 Common Modules

9.1.1.1 Supported attributes on Patient level

The ARTIS one copies the listed attributes – if provided – from original images.

Table 87: Patient level attributes

Attribute Name	Tag
Referenced Patient Sequence	(0008,1120)
>Referenced SOP Class UID	(0008,1150)
>Referenced SOP Instance UID	(0008,1155)
Patient's Name	(0010,0010)
Patient ID	(0010,0020)
Patient's Birth Date	(0010,0030)
Patient's Sex	(0010,0040)
Other Patient IDs	(0010,1000)
Other Patient Names	(0010,1001)
Other Patient IDs Sequence	(0010,1002)
>Patient ID	(0010,0020)
>Issuer of Patient ID	(0010,0021)
>Type of Patient ID	(0010,0022)
Ethnic Group	(0010,2160)
Patient Comments	(0010,4000)

9.1.1.2 Supported attributes on Study level

The ARTIS one copies the listed attributes – if provided – from original images.

Table 88: Study level attributes

Attribute Name	Tag
Study Date	(0008,0020)
Study Time	(0008,0030)
Accession Number	(0008,0050)
Referring Physician's Name	(0008,0090)
Study Description	(0008,1030)

Attribute Name	Tag
Procedure Code Sequence	(0008,1032)
>Code Value	(0008,0100)
>Coding Scheme Designator	(0008,0102)
>Code Meaning	(0008,0104)
Physician(s) of Record	(0008,1048)
Admitting Diagnoses Description	(0008,1080)
Referenced Study Sequence	(0008,1110)
>Referenced SOP Class UID	(0008,1150)
>Referenced SOP Instance UID	(0008,1155)
Patient's Age	(0010,1010)
Patient's Size	(0010,1020)
Patient's Weight	(0010,1030)
Occupation	(0010,2180)
Additional Patient History	(0010,21B0)
Study Instance UID	(0020,000D)
Study ID	(0020,0010)

9.1.2 SC Standard Extended SOP Class

The ARTIS one will create functional images from special applications. Those will be encoded as SC Standard extended SOP Class. Please see the following tables for a complete overview of supplied Type 1/2/3 Standard and Private attributes.

9.1.2.1 Captured Projection Image

Table 89: SC Derived Image (RGB) from 3D Projections

Attribute Name	Tag	Value
<i>Attributes according to 9.1.1.1 Supported attributes on Patient level</i>		
<i>Attributes according to 9.1.1.2 Supported attributes on Study level</i>		
Specific Character Set	(0008,0005)	from Original
Image Type	(0008,0008)	DERIVED\SECONDARY\OTHER\IAE_PRJ <Filter_Type> <Filter_Type> values: MPR MIP MINIP VRT OVERVIEW
Instance Creation Date	(0008,0012)	<yyyymmdd>
Instance Creation Time	(0008,0013)	<hhmmss.ffffff>

Attribute Name	Tag	Value
Instance Creator UID	(0008,0014)	<implementation_class_uid>.<individual_id>
SOP Class UID	(0008,0016)	1.2.840.10008.5.1.4.1.1.7
SOP Instance UID	(0008,0018)	
Series Date	(0008,0021)	<yyyymmdd>
Acquisition Date	(0008,0022)	from Original
Content Date	(0008,0023)	<yyyymmdd>
Acquisition DateTime	(0008,002A)	from Original
Series Time	(0008,0031)	<hhmmss.ffffff>
Acquisition Time	(0008,0032)	from Original
Content Time	(0008,0033)	<hhmmss.ffffff>
Modality	(0008,0060)	OT or XA or CT (default = OT, can be configured)
Conversion Type	(0008,0064)	WSD
Manufacturer	(0008,0070)	from Original
Institution Name	(0008,0080)	from WS Configuration
Institution Address	(0008,0081)	from WS Configuration
Station Name	(0008,1010)	from WS Configuration
Series Description	(0008,103E)	
Institutional Department Name	(0008,1040)	from WS Configuration
Performing Physician's Name	(0008,1050)	from Original / input via "Correct" possible
Operator's Name	(0008,1070)	from Original
Manufacturer's Model Name	(0008,1090)	from Original
Related Series Sequence	(0008,1250)	from Original
>Study Instance UID	(0020,000D)	from Original
>Series Instance UID	(0020,000E)	from Original
>Purpose of Reference Code Sequence	(0040,A170)	<zero length>
Derivation Description	(0008,2111)	from Original
Source Image Sequence	(0008,2112)	if derived from single image
Body Part Examined	(0018,0015)	from Original
Device Serial Number	(0018,1000)	from Original
Secondary Capture Device ID	(0018,1010)	from WS Configuration
Date of Secondary Capture	(0018,1012)	<yyyymmdd>
Time of Secondary Capture	(0018,1014)	<hhmmss.ffffff>
Body Part Examined	(0018,0015)	from Original

Attribute Name	Tag	Value
Secondary Capture Device Manufacturer	(0018,1016)	"Siemens"
Secondary Capture Device Manufacturer's Model Name	(0018,1018)	from WS Configuration
Secondary Capture Device Software Version	(0018,1019)	from WS Configuration
Software Versions	(0018,1020)	from Original
Protocol Name	(0018,1030)	from Original
Patient Position	(0018,5100)	from Original
Series Instance UID	(0020,000E)	
Series Number	(0020,0011)	970
Acquisition Number	(0020,0012)	from Original
Instance Number	(0020,0013)	n-m (n, m >0) 0 for reference image
Patient Orientation	(0020,0020)	from original (derived from single image) or calculated or <zero length> (derived from multiple images).
Images in Acquisition	(0020,1002)	from Original
Image Comments	(0020,4000)	from Original if derived from single image
Samples per Pixel	(0028,0002)	3
Photometric Interpretation	(0028,0004)	RGB
Planar Configuration	(0028,0006)	0
Rows	(0028,0010)	
Columns	(0028,0011)	
Pixel Spacing	(0028,0030)	If image has been calibrated
Bits Allocated	(0028,0100)	8
Bits Stored	(0028,0101)	8
High Bit	(0028,0102)	7
Pixel Representation	(0028,0103)	0
Burned In Annotation	(0028,0301)	YES, if set to YES in Original or if any text flag is set to "On". Not set otherwise.
Pixel Spacing Calibration Type	(0028,0A02)	from Original
Pixel Spacing Calibration Description	(0028,0A04)	from Original
Lossy Image Compression	(0028,2110)	from Original
Performed Procedure Step Start Date	(0040,0244)	from Original
Performed Procedure Step Start Time	(0040,0245)	from Original

Attribute Name	Tag	Value
Performed Procedure Step ID	(0040,0253)	from Original
Performed Procedure Step Description	(0040,0254)	from Original
Performed Protocol Code Sequence	(0040,0260)	from Original
Request Attributes Sequence	(0040,0275)	from Original
>Scheduled Procedure Step Description	(0040,0007)	from Original
>Scheduled Procedure Step ID	(0040,0009)	from Original
>Requested Procedure ID	(0040,1001)	from Original
>Reason For The Requested Procedure	(0040,1002)	from Original
Comments on the Performed Procedure Step	(0040,0280)	from Original
Pixel Data	(7FE0,0010)	

9.1.2.2 Bookmarks

Table 90: SC Derived Image (RGB) for 4D Viewer Bookmarks

Attribute Name	Tag	Value
<i>Attributes according to 9.1.1.1 Supported attributes on Patient level</i>		
<i>Attributes according to 9.1.1.2 Supported attributes on Study level</i>		
Specific Character Set	(0008,0005)	from Original
Image Type	(0008,0008)	DERIVED\SECONDARY\OTHER\IAE_BOOKMARK
Instance Creation Date	(0008,0012)	<yyyymmdd>
Instance Creation Time	(0008,0013)	<hhmmss.ffffff>
Instance Creator UID	(0008,0014)	<implementation_class_uid>.<individual_id>
SOP Class UID	(0008,0016)	1.2.840.10008.5.1.4.1.1.7
SOP Instance UID	(0008,0018)	
Series Date	(0008,0021)	<yyyymmdd>
Acquisition Date	(0008,0022)	from Original
Content Date	(0008,0023)	<yyyymmdd>
Acquisition DateTime	(0008,002A)	from Original
Series Time	(0008,0031)	<hhmmss.ffffff>
Acquisition Time	(0008,0032)	from Original
Content Time	(0008,0033)	<hhmmss.ffffff>
Modality	(0008,0060)	XA
Conversion Type	(0008,0064)	WSD

Attribute Name	Tag	Value
Manufacturer	(0008,0070)	from Original
Institution Name	(0008,0080)	from WS Configuration
Institution Address	(0008,0081)	from WS Configuration
Station Name	(0008,1010)	from WS Configuration
Series Description	(0008,103E)	
Institutional Department Name	(0008,1040)	from WS Configuration
Performing Physician's Name	(0008,1050)	from Original / Input via "Correct" possible
Operator's Name	(0008,1070)	from Original
Manufacturer's Model Name	(0008,1090)	from Original
Related Series Sequence	(0008,1250)	from Original
>Study Instance UID	(0020,000D)	from Original
>Series Instance UID	(0020,000E)	from Original
>Purpose of Reference Code Sequence	(0040,A170)	<zero length>
Derivation Description	(0008,2111)	from Original
Source Image Sequence	(0008,2112)	If derived from single image
Device Serial Number	(0018,1000)	from Original
Secondary Capture Device ID	(0018,1010)	from WS Configuration
Date of Secondary Capture	(0018,1012)	<yyyymmdd>
Time of Secondary Capture	(0018,1014)	<hhmmss.ffffff>
Body Part Examined	(0018,0015)	from Original
Secondary Capture Device Manufacturer	(0018,1016)	"Siemens"
Secondary Capture Device Manufacturer's Model Name	(0018,1018)	from WS Configuration
Secondary Capture Device Software Version	(0018,1019)	from WS Configuration
Software Versions	(0018,1020)	from Original
Protocol Name	(0018,1030)	
Patient Position	(0018,5100)	from Original
Private Creator	(0019,00xx)	"SIEMENS SMS-AX IAE"
<i>Attributes according to 9.2 Data Dictionary of Private Attributes</i>		
Series Instance UID	(0020,000E)	
Series Number	(0020,0011)	980
Acquisition Number	(0020,0012)	from Original
Instance Number	(0020,0013)	1 - n

Attribute Name	Tag	Value
Patient Orientation	(0020,0020)	From original (derived from single image) or calculated or <zero length> (derived from multiple images).
Images in Acquisition	(0020,1002)	from Original
Image Comments	(0020,4000)	from Original if derived from single image
Samples per Pixel	(0028,0002)	3
Photometric Interpretation	(0028,0004)	RGB
Planar Configuration	(0028,0006)	0
Rows	(0028,0010)	
Columns	(0028,0011)	
Bits Allocated	(0028,0100)	8
Bits Stored	(0028,0101)	8
High Bit	(0028,0102)	7
Pixel Representation	(0028,0103)	0
Pixel Spacing Calibration Type	(0028,0A02)	from Original
Pixel Spacing Calibration Description	(0028,0A04)	from Original
Lossy Image Compression	(0028,2110)	from Original
Private Creator	(0029,00xx)	"SIEMENS MEDCOM HEADER"
<i>Attributes according to 9.2 Data Dictionary of Private Attributes</i>		
Performed Procedure Step Start Date	(0040,0244)	from Original
Performed Procedure Step Start Time	(0040,0245)	from Original
Performed Procedure Step ID	(0040,0253)	from Original
Performed Procedure Step Description	(0040,0254)	from Original
Performed Protocol Code Sequence	(0040,0260)	from Original
Request Attributes Sequence	(0040,0275)	from Original
>Scheduled Procedure Step Description	(0040,0007)	from Original
>Scheduled Procedure Step ID	(0040,0009)	from Original
>Requested Procedure ID	(0040,1001)	from Original
>Reason For The Requested Procedure	(0040,1002)	from Original
Comments on the Performed Procedure Step	(0040,0280)	from Original
Pixel Data	(7FE0,0010)	Representative image icon.

9.1.3 CT Standard Extended SOP Class

9.1.3.1 DynaCT Reconstructed Volume Data

The ARTIS one will create 3D volume data-sets from 3D reconstruction application package. Those will be encoded as CT Standard etendd SOP Class. Please see the following table for a complete overview of supplied Type 1/2/3 Standard and Private attributes:

Table 91: CT Derived Image (Monochrome) from Reconstruction

Attribute Name	Tag	Value
<i>Attributes according to 9.1.1.1 Supported attributes on Patient level</i>		
<i>Attributes according to 9.1.1.2 Supported attributes on Study level</i>		
Specific Character Set	(0008,0005)	from Original
Image Type	(0008,0008)	DERIVED\SECONDARY\AXIAL\3DANGIO\<Data_Type> <Data_Type> values: NAT_MASK Images acquired w/o contrast media NAT_FILL Images acquired with contrast media SUB Subtracted acquisition PBV "Parenchymal Blood Volume" acq.
Instance Creation Date	(0008,0012)	<yyyymmdd>
Instance Creation Time	(0008,0013)	<hhmmss.fffff>
SOP Class UID	(0008,0016)	1.2.840.10008.5.1.4.1.1.2 (CT Image Storage)
SOP Instance UID	(0008,0018)	
Series Date	(0008,0021)	<yyyymmdd> (date of creation)
Acquisition Date	(0008,0022)	derived from original Acquisition/Content Date
Content Date	(0008,0023)	<yyyymmdd> (date of creation)
Acquisition DateTime	(0008,002A)	from Original or calculated
Series Time	(0008,0031)	<hhmmss.fffff> (time of creation)
Acquisition Time	(0008,0032)	derived from original Acquisition/Content Time
Content Time	(0008,0033)	<hhmmss.fffff> (time of creation)
Modality	(0008,0060)	from Original
Manufacturer	(0008,0070)	"Siemens"
Institution Name	(0008,0080)	from Original
Institution Address	(0008,0081)	from Original
Station Name	(0008,1010)	from WS Configuration
Series Description	(0008,103E)	contains information about used reconstruction parameters
Institutional Department Name	(0008,1040)	from WS Configuration
Performing Physician's Name	(0008,1050)	from Original
Operator's Name	(0008,1070)	from Original

Attribute Name	Tag	Value
Manufacturer's Model Name	(0008,1090)	"AXIOM-Artis"
Derivation Description	(0008,2111)	applied correction algorithms
Contrast/Bolus Agent	(0018,0010)	from Original
Body Part Examined	(0018,0015)	from Original
Scan Options	(0018,0022)	for images created by "Gated Cardiac 3D Acquisition"
Slice Thickness	(0018,0050)	calculated
KVP	(0018,0060)	from Original
Device Serial Number	(0018,1000)	from WS Configuration
Gantry ID	(0018,1008)	from WS Configuration
Software Versions	(0018,1020)	from Original\<WS version>\<WS version IAE>
Protocol Name	(0018,1030)	from Original <zoom size(nnn)> <step width(n.nn)> <dose(nn.nn)> <correction(aaa)>
Reconstruction Diameter	(0018,1100)	set for reconstructed slice
Distance Source to Detector	(0018,1110)	from Original
Contrast/Bolus Ingredient	(0018,1048)	from Original
Date of Last Calibration	(0018,1200)	<yyyymmdd> (date of last 3D calibration)
Time of Last Calibration	(0018,1201)	<hhmmss.ffffff> (time of last 3D calibration)
Convolution Kernel	(0018,1210)	<kernel type>\<Image characteristics> Values for kernel type: "EE" (Default for high contrast) "HU" (Default for DynaCT) Values for image characteristics: "Auto", "Sharp", "Normal", "Smooth", "Very Smooth"
Patient Position	(0018,5100)	from Original
Private Creator	(0019,00xx)	"SIEMENS AX DYNACT"
<i>Attributes according to 9.2 Data Dictionary of Private Attributes</i>		
Series Instance UID	(0020,000E)	<new UID>
Series Number	(0020,0011)	from Original
Acquisition Number	(0020,0012)	from Original
Instance Number	(0020,0013)	1 (feet) continuous to number of slices (head)
Patient Orientation	(0020,0020)	<removed>
Image Position (Patient)	(0020,0032)	calculated during reconstruction
Image Orientation (Patient)	(0020,0037)	calculated during reconstruction
Frame of Reference UID	(0020,0052)	<new UID> (per reconstructed image-set)
Laterality	(0020,0060)	from Original
Position Reference Indicator	(0020,1040)	from Original
Private Creator	(0021,00xx)	"SIEMENS SMS-AX ACQ 1.0"

Attribute Name	Tag	Value
<i>Attributes according to 9.2 Data Dictionary of Private Attributes</i>		
Samples per Pixel	(0028,0002)	1
Photometric Interpretation	(0028,0004)	MONOCHROME2
Rows	(0028,0010)	256, 512, 768 or 1024.
Columns	(0028,0011)	256, 512, 768 or 1024.
Pixel Spacing	(0028,0030)	calculated during reconstruction
Bits Allocated	(0028,0100)	16
Bits Stored	(0028,0101)	16
High Bit	(0028,0102)	15
Pixel Representation	(0028,0103)	0
Smallest Image Pixel Value	(0028,0106)	
Largest Image Pixel Value	(0028,0107)	
Pixel Padding Value	(0028,0120)	
Burned In Annotation	(0028,0301)	NO
Window Center	(0028,1050)	Value from the "Visualization Preset" configuration
Window Width	(0028,1051)	Value from the "Visualization Preset" configuration
Rescale Intercept	(0028,1052)	0.0 or -1024 (only for HU values)
Rescale Slope	(0028,1053)	1
Rescale Type	(0028,1054)	"HU" for Hounsfield Units, only expected with CT "US" for unspecified
VOI LUT Function	(0028,1056)	
Lossy Image Compression	(0028,2110)	00
VOI LUT Sequence	(0028,3010)	from Original
Requested Procedure Description	(0032,1060)	from Original
Performed Procedure Step Start Date	(0040,0244)	from Original
Performed Procedure Step Start Time	(0040,0245)	from Original
Performed Procedure Step ID	(0040,0253)	from Original
Performed Procedure Step Description	(0040,0254)	from Original
Performed Protocol Code Sequence	(0040,0260)	from Original
Request Attributes Sequence	(0040,0275)	from Original
>Scheduled Procedure Step Description	(0040,0007)	from Original
>Scheduled Procedure Step ID	(0040,0009)	from Original

Attribute Name	Tag	Value
>Requested Procedure ID	(0040,1001)	from Original
>Reason For The Requested Procedure	(0040,1002)	from Original
Comments on the Performed Procedure Step	(0040,0280)	from Original
Pixel Data	(7FE0,0010)	

9.1.3.2 Save Image as Derived Volume Data

The ARTIS one will store "Save image" functionality based on CT, XR3D or Enhanced CT Images as CT Standard extended SOP Class.

Please see the following table for complete overview of supplied Type 1/2/3 Standard and Private attributes:

Table 92: Save Image as CT Derived Image (Monochrome)

Attribute Name	Tag	Value
<i>Attributes according to 9.1.1.1 Supported attributes on Patient level</i>		
<i>Attributes according to 9.1.1.2 Supported attributes on Study level</i>		
Specific Character Set	(0008,0005)	From Original or conf. Character Set
Image Type	(0008,0008)	DERIVED\SECONDARY\<image type>\<filter type>\lll <image type> values: AXIAL LOCALIZER <filter type> values: MPR MIP MINIP
Instance Creation Date	(0008,0012)	<yyyymmdd>
Instance Creation Time	(0008,0013)	<hhmmss.ffffff>
Instance Creator UID	(0008,0014)	<implementation_class_uid>.<individual_id>
SOP Class UID	(0008,0016)	1.2.840.10008.5.1.4.1.1.2 (CT Image Storage)
SOP Instance UID	(0008,0018)	
Series Date	(0008,0021)	<yyyymmdd> (date of creation)
Acquisition Date	(0008,0022)	derived from original Acquisition/Content Date
Content Date	(0008,0023)	<yyyymmdd> (date of creation)
Acquisition DateTime	(0008,002A)	derived from original Acquisition Date/Time
Series Time	(0008,0031)	<hhmmss.ffffff> (time of creation)
Acquisition Time	(0008,0032)	derived from original Acquisition/Content Time
Content Time	(0008,0033)	<hhmmss.ffffff> (time of creation)
Modality	(0008,0060)	from Original

Attribute Name	Tag	Value
Manufacturer	(0008,0070)	from Original
Institution Name	(0008,0080)	from WS Configuration
Institution Address	(0008,0081)	from WS Configuration
Station Name	(0008,1010)	from WS Configuration
Series Description	(0008,103E)	
Institutional Department Name	(0008,1040)	from WS Configuration
Performing Physician's Name	(0008,1050)	from Original
Manufacturer's Model Name	(0008,1090)	from Original
Derivation Description	(0008,2111)	Description of how this image was derived.
Scan Options	(0018,0022)	from Original if original is a CT image, not set in case original is XR3D or Enhanced CT image
Slice Thickness	(0018,0050)	calculated
KVP	(0018,0060)	from Original
Device Serial Number	(0018,1000)	from Original
Software Versions	(0018,1020)	from Original
Protocol Name	(0018,1030)	from Original
Reconstruction Diameter	(0018,1100)	from Original
Distance Source to Detector	(0018,1110)	from Original
Date of last Calibration	(0018,1200)	from Original
Time of last Calibration	(0018,1201)	from Original
Convolution Kernel	(0018,1210)	from Original
Patient Position	(0018,5100)	from Original
Series Instance UID	(0020,000E)	<new UID>
Series Number	(0020,0011)	from Original
Acquisition Number	(0020,0012)	from Original
Instance Number	(0020,0013)	n-m (n, m >0) 0 for reference image
Patient Orientation	(0020,0020)	<removed>
Image Position (Patient)	(0020,0032)	calculated during reconstruction
Image Orientation (Patient)	(0020,0037)	calculated during reconstruction
Frame of Reference UID	(0020,0052)	<new UID>
Laterality	(0020,0060)	from Original
Position Reference Indicator	(0020,1040)	
Image Comments	(0020,4000)	
Samples per Pixel	(0028,0002)	1

Attribute Name	Tag	Value
Photometric Interpretation	(0028,0004)	MONOCHROME2
Rows	(0028,0010)	256 or 512
Columns	(0028,0011)	256 or 512
Pixel Spacing	(0028,0030)	calculated during reconstruction
Bits Allocated	(0028,0100)	from Original
Bits Stored	(0028,0101)	from Original
High Bit	(0028,0102)	from Original
Pixel Representation	(0028,0103)	from Original
Burned In Annotation	(0028,0301)	from Original
Window Center	(0028,1050)	as set
Window Width	(0028,1051)	as set
Rescale Intercept	(0028,1052)	from Original
Rescale Slope	(0028,1053)	
Rescale Type	(0028,1054)	
Window Center & Width Explanation	(0028,1055)	
VOI LUT Function	(0028,1056)	from Original or may be set by application
Lossy Image Compression	(0028,2110)	from Original
VOI LUT Sequence	(0028,3010)	from Original
Requested Procedure Description	(0032,1060)	from Original
Study Comments	(0032,4000)	from Original
Special Needs	(0038,0050)	from Original
Patient State	(0038,0500)	from Original
Performed Procedure Step Start Date	(0040,0244)	from Original
Performed Procedure Step Start Time	(0040,0245)	from Original
Performed Procedure Step ID	(0040,0253)	from Original
Performed Procedure Step Description	(0040,0254)	from Original
Performed Protocol Code Sequence	(0040,0260)	from Original
Request Attributes Sequence	(0040,0275)	from Original
>Scheduled Procedure Step Description	(0040,0007)	from Original
>Scheduled Procedure Step ID	(0040,0009)	from Original
>Requested Procedure ID	(0040,1001)	from Original

Attribute Name	Tag	Value
>Reason For The Requested Procedure	(0040,1002)	from Original
Comments on the Performed Procedure Step	(0040,0280)	from Original
Confidentiality Constraint on Patient Data Description	(0040,3001)	from Original
Pixel Data	(7FE0,0010)	
Confidentiality Constraint on Patient Data Description	(0040,3001)	from Original
Pixel Data	(7FE0,0010)	

9.1.4 MR Standard Extended SOP Class

9.1.4.1 Save Image as Derived Volume Data

The ARTIS one will store "Save image" functionality based on MR or MR Enhanced Images as MR Standard extended SOP Class.

Please see the following table for complete overview of supplied Type 1/2/3 Standard and Private attributes:

Table 93: Save Image as MR Derived Image (Monochrome)

Attribute Name	Tag	Value
<i>Attributes according to 9.1.1.1 Supported attributes on Patient level</i>		
<i>Attributes according to 9.1.1.2 Supported attributes on Study level</i>		
Specific Character Set	(0008,0005)	from Original or conf. Character Set
Image Type	(0008,0008)	DERIVED\SECONDARY\<image type copied from original>\<filter type>\<copied from original>\<copied from original> <image type> values: Replaced for Localizer image: OTHER <filter type> values: MPR MIP MINIP
SOP Class UID	(0008,0016)	1.2.840.10008.5.1.4.1.1.4 (MR Image Storage)
SOP Instance UID	(0008,0018)	
Series Date	(0008,0021)	<yyyymmdd> (date of creation)
Acquisition Date	(0008,0022)	derived from original Acquisition/Content Date
Content Date	(0008,0023)	<yyyymmdd> (date of creation)
Acquisition DateTime	(0008,002A)	derived from original Acquisition Date/Time
Series Time	(0008,0031)	<hhmmss.ffffff> (time of creation)
Acquisition Time	(0008,0032)	derived from original Acquisition/Content Time

Attribute Name	Tag	Value
Content Time	(0008,0033)	<hhmmss.ffffff> (time of creation)
Modality	(0008,0060)	from Original
Manufacturer	(0008,0070)	from Original
Institution Name	(0008,0080)	from WS Configuration
Institution Address	(0008,0081)	from WS Configuration
Station Name	(0008,1010)	from WS Configuration
Series Description	(0008,103E)	
Institutional Department Name	(0008,1040)	from WS Configuration
Performing Physician's Name	(0008,1050)	from Original
Manufacturer's Model Name	(0008,1090)	from Original
Derivation Description	(0008,2111)	Description of how this image was derived.
Body Part Examined	(0018,0015)	from Original
Scanning Sequence	(0018,0020)	from Original if original is an MR image, "SE", "GR"; "SE\GR", "IR" or "EP" in case original is an Enhanced MR image
Sequence Variant	(0018,0021)	from Original if original is an MR image; "SP", "MTC", "SS", "OSP" or "SK" in case original is an Enhanced MR image
Scan Options	(0018,0022)	from Original if original is an MR image; "FC", "SP", "PFP", "PFP\PFF", "CG", "RG" or "FS" in case original is an Enhanced MR image
MR Acquisition Type	(0018,0023)	from Original
Slice Thickness	(0018,0050)	calculated
Repetition Time	(0018,0080)	from Original
Echo Time	(0018,0081)	from Original
Inversion Time	(0018,0082)	from Original
Echo Train Length	(0018,0091)	from Original
Device Serial Number	(0018,1000)	from Original
Software Versions	(0018,1020)	from Original
Protocol Name	(0018,1030)	from Original
Trigger Time	(0018,1060)	from Original
Date of last Calibration	(0018,1200)	from Original
Time of last Calibration	(0018,1201)	from Original
Patient Position	(0018,5100)	from Original
Series Instance UID	(0020,000E)	<new UID>
Series Number	(0020,0011)	
Instance Number	(0020,0013)	n-m (n, m >0)

Attribute Name	Tag	Value
		0 for reference image
Patient Orientation	(0020,0020)	<removed>
Image Position (Patient)	(0020,0032)	calculated during reconstruction
Image Orientation (Patient)	(0020,0037)	calculated during reconstruction
Frame of Reference UID	(0020,0052)	<new UID>
Laterality	(0020,0060)	from Original
Position Reference Indicator	(0020,1040)	
Image Comments	(0020,4000)	
Samples per Pixel	(0028,0002)	from Original
Photometric Interpretation	(0028,0004)	from Original
Rows	(0028,0010)	256 or 512
Columns	(0028,0011)	256 or 512
Pixel Spacing	(0028,0030)	calculated during reconstruction
Bits Allocated	(0028,0100)	from Original
Bits Stored	(0028,0101)	from Original
High Bit	(0028,0102)	from Original
Pixel Representation	(0028,0103)	from Original
Burned In Annotation	(0028,0301)	from Original
Window Center	(0028,1050)	as set
Window Width	(0028,1051)	as set
VOI LUT Function	(0028,1056)	from Original or may be set by application
Lossy Image Compression	(0028,2110)	from Original
VOI LUT Sequence	(0028,3010)	from Original
Requested Procedure Description	(0032,1060)	from Original
Study Comments	(0032,4000)	from Original
Special Needs	(0038,0050)	from Original
Patient State	(0038,0500)	from Original
Performed Procedure Step Start Date	(0040,0244)	from Original
Performed Procedure Step Start Time	(0040,0245)	from Original
Performed Procedure Step ID	(0040,0253)	from Original
Performed Procedure Step Description	(0040,0254)	from Original

Attribute Name	Tag	Value
Performed Protocol Code Sequence	(0040,0260)	from Original
Request Attributes Sequence	(0040,0275)	from Original
>Scheduled Procedure Step Description	(0040,0007)	from Original
>Scheduled Procedure Step ID	(0040,0009)	from Original
>Requested Procedure ID	(0040,1001)	from Original
>Reason For The Requested Procedure	(0040,1002)	from Original
Comments on the Performed Procedure Step	(0040,0280)	from Original
Confidentiality Constraint on Patient Data Description	(0040,3001)	from Original
Pixel Data	(7FE0,0010)	
>Requested Procedure ID	(0040,1001)	from Original
>Reason For The Requested Procedure	(0040,1002)	from Original
Comments on the Performed Procedure Step	(0040,0280)	from Original
Confidentiality Constraint on Patient Data Description	(0040,3001)	from Original
Pixel Data	(7FE0,0010)	

9.1.5 Segmentation Standard Extended SOP Class

9.1.5.1 Segmentation Results

Table 94: Segmentation Results from 3D Application

Attribute Name	Tag	Value
<i>Attributes according to 9.1.1.1 Supported attributes on Patient level</i>		
<i>Attributes according to 9.1.1.2 Supported attributes on Study level</i>		
Specific Character Set	(0008,0005)	from WS Configuration
Image Type	(0008,0008)	DERIVED\PRIMARY
Instance Creation Date	(0008,0012)	<yyyymmdd>
Instance Creation Time	(0008,0013)	<hhmmss.ffffff>
SOP Class UID	(0008,0016)	1.2.840.10008.5.1.4.1.1.66.4
SOP Instance UID	(0008,0018)	
Series Date	(0008,0021)	<yyyymmdd>
Acquisition Date	(0008,0022)	from Original (0008,0021), if available

Attribute Name	Tag	Value
Content Date	(0008,0023)	<yyyymmdd>
Series Time	(0008,0031)	<hhmmss.ffffff>
Acquisition Time	(0008,0032)	from Original (0008,0031), if available
Content Time	(0008,0033)	<hhmmss.ffffff>
Modality	(0008,0060)	SEG
Manufacturer	(0008,0070)	"Siemens"
Institution Name	(0008,0080)	from WS Configuration
Institution Address	(0008,0081)	from WS Configuration
Station Name	(0008,1010)	from WS Configuration
Series Description	(0008,103E)	same as Protocol Name
Performing Physician's Name	(0008,1050)	not set, unless input via "Correct"
Operators' name	(0008,1070)	from Original, unless set via "Correct"
Manufacturer's Model Name	(0008,1090)	from WS Configuration
Referenced Series Sequence	(0008,1115)	used, if this instance references instances in this study.
>Referenced Instance Sequence	(0008,114A)	
>Series Instance UID	(0020,000E)	
Studies Containing Other Referenced Instances Sequence	(0008,1200)	used, if this instance references instances in other studies.
>Referenced Series Sequence	(0008,1115)	
>>Referenced Instance Sequence	(0008,114A)	
>>Series Instance UID	(0020,000E)	
>Study Instance UID	(0020,000D)	
Source Image Sequence	(0008,2112)	Reference to the volume/slice object(s) used to generate this segmentation result
Derivation Code Sequence	(0008,9215)	refers to "Segmentation"
Device Serial Number	(0018,1000)	from WS Configuration
Software Versions	(0018,1020)	from WS Configuration
Protocol Name	(0018,1030)	Information on Segmentation
Series Instance UID	(0020,000E)	<new UID>
Series Number	(0020,0011)	from Original
Instance Number	(0020,0013)	
Patient Orientation	(0020,0020)	from Original
Image Comments	(0020,4000)	
Samples per Pixel	(0028,0002)	1
Photometric Interpretation	(0028,0004)	MONOCHROME2
Number of Frames	(0028,0008)	
Rows	(0028,0010)	

Attribute Name	Tag	Value
Columns	(0028,0011)	
Bits Allocated	(0028,0100)	1
Bits Stored	(0028,0101)	1
High Bit	(0028,0102)	0
Pixel Representation	(0028,0103)	0
Burned In Annotation	(0028,0301)	NO
Lossy Image Compression	(0028,2110)	00
Representative Frame Number	(0028,6010)	
Request Attributes Sequence	(0040,0275)	from Original
>item contents as provided		from Original
Segmentation Type	(0062,0001)	BINARY
Segment Sequence	(0062,0002)	
>Anatomic Region Sequence	(0008,2218)	
>Segmented Property Category Code Sequence	(0062,0003)	
>Segment Number	(0062,0004)	
>Segment Label	(0062,0005)	
>Segment Description	(0062,0005)	(optional)
>Segment Algorithm Type	(0062,0008)	
>Segment Algorithm Name	(0062,0009)	One of 'Stroke Segmentation', 'Left Atrium Segmentation', 'Model Based Left Atrium Segmentation', 'Hybrid Model Based Left Atrium Segmentation', 'Aortic Root Segmentation' if Segment Algorithm Type is not MANUAL.
>Recommended Display Grayscale Value	(0062,000C)	
>Recommended Display CIELab Value	(0062,000D)	
>Segmented Property Type Code Sequence	(0062,000F)	
Private Creator	(0063,00xx)	"SIEMENS SMS-AX Segmentation Extensions"
<i>Attributes according to 9.2 Data Dictionary of Private Attributes</i>		
Content Label	(0070,0080)	
Content Description	(0070,0081)	Contains identifier to identify a related segmentation mesh result stored in a Surface Segmentation Object with same identifier
Content Creator's Name	(0070,0084)	<zero length>
Icon Image Sequence	(0088,0200)	optional
Shared Functional Groups Sequence	(5200,9229)	
>Segmentation Identification Sequence	(0062,000A)	1 item
>>Referenced Segment Number	(0062,000B)	
Per-frame Functional Groups Sequence	(5200,9230)	1 item for each frame
>Derivation Image Sequence	(0008,9124)	

Attribute Name	Tag	Value
>>Source Image Sequence	(0008,2112)	
>>>Referenced SOP Class UID	(0008,1150)	
>>>Referenced SOP Instance UID	(0008,1155)	
>>>Purpose of Reference Code Sequence	(0040,A170)	(121322, DCM, "Source Image for Image Processing Operation")
>>Derivation Code Sequence	(0008,9215)	(113076, DCM, "Segmentation")
>Frame Content Sequence	(0020,9111)	1 item
>>Stack ID	(0020,9056)	
>>In-Stack Position Number	(0020,9057)	
>>Dimension Index Values	(0020,9157)	1\2
Pixel Data	(7FE0,0010)	

9.1.6 Surface Segmentation Standard Extended SOP Class

9.1.6.1 General 3D Graphic Result Storage

Table 95: General 3D Graphic Results Storage

Attribute Name	Tag	Value
<i>Attributes according to 9.1.1.1 Supported attributes on Patient level</i>		
<i>Attributes according to 9.1.1.2 Supported attributes on Study level</i>		
Specific Character Set	(0008,0005)	from WS Configuration
Instance Creation Date	(0008,0012)	<yyyymmdd>
Instance Creation Time	(0008,0013)	<hhmmss.ffffff>
SOP Class UID	(0008,0016)	1.2.840.10008.5.1.4.1.1.66.5
SOP Instance UID	(0008,0018)	
Series Date	(0008,0021)	<yyyymmdd>
Content Date	(0008,0023)	<yyyymmdd>
Series Time	(0008,0031)	<hhmmss.ffffff>
Content Time	(0008,0033)	<hhmmss>
Modality	(0008,0060)	SEG
Manufacturer	(0008,0070)	"Siemens"
Institution Name	(0008,0080)	from WS Configuration
Institution Address	(0008,0081)	from WS Configuration
Station Name	(0008,1010)	from WS Configuration
Series Description	(0008,103E)	same as Protocol Name
Performing Physician's Name	(0008,1050)	not set, unless input via "Correct"
Operators' name	(0008,1070)	from Original, unless set via "Correct"
Manufacturer's Model Name	(0008,1090)	

Attribute Name	Tag	Value
Referenced Series Sequence	(0008,1115)	used, if this instance references instances in this study.
>Referenced Instance Sequence	(0008,114A)	
>Series Instance UID	(0020,000E)	
Studies Containing Other Referenced Instances Sequence	(0008,1200)	used, if this instance references instances in other studies.
>Referenced Series Sequence	(0008,1115)	
>>Referenced Instance Sequence	(0008,114A)	
>>Series Instance UID	(0020,000E)	
>Study Instance UID	(0020,000D)	
Device Serial Number	(0018,1000)	from WS Configuration
Software Versions	(0018,1020)	from WS Configuration
Protocol Name	(0018,1030)	Information on Surface Segmentation
Series Instance UID	(0020,000E)	<new UID>
Series Number	(0020,0011)	950
Instance Number	(0020,0013)	
Frame of Reference UID	(0020,0052)	Copied from object to which the Surface Segmentation result applies or new UID. Note: In case of 2 volumes with 2 different FoR UIDs stored in same Series the related SSOs are also stored together in same series with FoR of the volume the first SSO is related to.
Laterality	(0020,0060)	n.a. or <zero length>
Position Reference Indicator	(0020,1040)	if applicable, copied from object to which the Surface Segmentation result applies.
Request Attributes Sequence	(0040,0275)	from Original
>item contents as provided		from Original
Segment Sequence	(0062,0002)	
>Anatomic Region Sequence	(0008,2218)	
>Segmented Property Category Code Sequence	(0062,0003)	One of (T-D0050, SRT, "Tissue"), (T-D000A, SRT, "Anatomical Structure"), (A-00004, SRT, "Physical Object"), (M-01000, SRT, "Morphologically Altered Structure"), (R-42019, SRT, "Function") or private coded term.
>Segment Number	(0062,0004)	
>Segment Label	(0062,0005)	
>Segment Description	(0062,0006)	(optional)
>Segment Algorithm Type	(0062,0008)	

Attribute Name	Tag	Value
>Recommended Display Grayscale Value	(0062,000C)	
>Recommended Display CIELab Value	(0062,000D)	
>Segmented Property Type Code Sequence	(0062,000F)	
>Surface Count	(0066,002A)	number of Surfaces comprising this segment.
>Referenced Surface Sequence	(0066,002B)	
>>Referenced Surface Number	(0062,002C)	
>>>Segment Surface Generation Algorithm Identification Sequence	(0062,002D)	
>>>>Algorithm Family Code Sequence	(0062,002F)	
>>>>Algorithm Version	(0066,0031)	
>>>>Algorithm Name	(0066,0036)	
>>>Segment Surface Generation Algorithm Identification Sequence	(0066,002D)	
>>>>Algorithm Family Code Sequence	(0066,002F)	
>>>>Algorithm Name	(0066,0036)	Identifies workflow/application
>>>>Algorithm Version	(0066,0031)	
>>Segmented Surface Source Instance Sequence	(0066,002E)	reference to volume that was viewed while generating this surface segment.
>>>>Referenced SOP Class UID	(0008,1150)	
>>>>Referenced SOP Instance UID	(0008,1155)	
Number of Surfaces	(0066,0001)	
Surface Sequence	(0066,0002)	
>Recommended Display Grayscale Value	(0062,000C)	
>Recommended Display CIELab Value	(0062,000D)	
>Surface Number	(0066,0003)	
>Surface Comments	(0066,0004)	
>Surface Processing	(0066,0009)	typically set to NO
>Recommended Presentation Opacity	(0066,000C)	0.0 specifies 100% transparency and 1.0 a 100% opaqueness.
>Recommended Presentation Type	(0066,000D)	DICOM defined values: SURFACE WIREFRAME POINTS Private terms: CONTOUR (only contour of a wireframe) NONE
>Finite Volume	(0066,000E)	
>Manifold	(0066,0010)	
>Surface Points Sequence	(0066,0011)	
>>Number of Surface Points	(0066,0015)	

Attribute Name	Tag	Value
>>Point Coordinates Data	(0066,0016)	
>Surface Points Normals Sequence	(0066,0012)	<zero length>
>Surface Mesh Primitives Sequence	(0066,0013)	
>>Triangle Point Index List	(0066,0023)	
>>Edge Point Index List	(0066,0024)	typically not used
>>Vertex Points Index List	(0066,0025)	
>>Triangle Strip Sequence	(0066,0026)	typically not used
>>Triangle Fan Sequence	(0066,0027)	typically not used
>>Line Sequence	(0066,0028)	
>>>Primitive Point Index List	(0066,0029)	
>>Facet Sequence	(0066,0034)	typically not used
>Recommended Point Radius	(0066,0037)	
>Recommended Line Thickness	(0066,0038)	
Private Creator	(0067,00xx)	"SIEMENS SMS-AX Surface Segmentation Extensions"
<i>Attributes according to 9.2 Data Dictionary of Private Attributes</i>		
Content Label	(0070,0080)	
Content Description	(0070,0081)	
Content Creator's Name	(0070,0084)	<zero length>

9.2 Data Dictionary of Private Attributes

The following Table 96: Private Data Element Dictionary lists all private attributes created by ARTIS one which may be included in the generated instances.

Table 96: Private Data Element Dictionary

Tag	Private Owner Code	Name	VR	VM
(0019,xx00)	SIEMENS SMS-AX IAE	Bookmark XML Structure	OB	1
(0019,xx02)	SIEMENS AX DYNACT	private transformation matrix	DS	16
(0019,xx03)	SIEMENS AX DYNACT	calibration coordinate system ID	US	1-n
(0019,xx10)	SIEMENS AX DYNACT	reconstruction joblist	UT	1
(0021,xx54)	SIEMENS SMS-AX ACQ 1.0	Rotation Angle	SS	1
(0021,xx56)	SIEMENS SMS-AX ACQ 1.0	Table Coordinates	SS	3
(0021,xx57)	SIEMENS SMS-AX ACQ 1.0	Iso Center Table Position	SS	1
(0021,xx5B)	SIEMENS SMS-AX ACQ 1.0	Table Coordinates System	FL	12
(0021,xx81)	SIEMENS SMS-AX ACQ 1.0	Table Tilt	SS	1
(0021,xx82)	SIEMENS SMS-AX ACQ 1.0	Table Rotation	SS	1

Tag	Private Owner Code	Name	VR	VM
(0021,xx83)	SIEMENS SMS-AX ACQ 1.0	Table Cradle Tilt	SS	1
(0029,xx40)	SIEMENS MEDCOM HEADER	Application Header Sequence	SQ	1
(0029,xx41)	SIEMENS MEDCOM HEADER	Application Header Type	CS	1
(0029,xx42)	SIEMENS MEDCOM HEADER	Application Header ID	LO	1
(0029,xx43)	SIEMENS MEDCOM HEADER	Application Header Version	LO	1
(0029,xx44)	SIEMENS MEDCOM HEADER	Application Header Info	OB	1
(0063,xx42)	SIEMENS SMS-AX Segmentation Extensions	Object GUID	LO	1
(0063,xx48)	SIEMENS SMS-AX Segmentation Extensions	Private Segmentation Sequence	SQ	1
(0067,xx01)	SIEMENS SMS-AX Surface Segmentation Extensions	Object IAE Display	CS	1
(0067,xx02)	SIEMENS SMS-AX Surface Segmentation Extensions	Object Live Display	CS	1
(0067,xx03)	SIEMENS SMS-AX Surface Segmentation Extensions	Object Labeling	CS	1
(0067,xx04)	SIEMENS SMS-AX Surface Segmentation Extensions	SSO Version Number	US	1
(0067,xx05)	SIEMENS SMS-AX Surface Segmentation Extensions	EP Point Ablated	CS	1
(0067,xx09)	SIEMENS SMS-AX Surface Segmentation Extensions	Show Length	CS	1
(0067,xx10)	SIEMENS SMS-AX Surface Segmentation Extensions	Polyline Shape	CS	1
(0067,xx11)	SIEMENS SMS-AX Surface Segmentation Extensions	Polyline Style	CS	1
(0067,xx13)	SIEMENS SMS-AX Surface Segmentation Extensions	Clipping	CS	1
(0067,xx14)	SIEMENS SMS-AX Surface Segmentation Extensions	Show Volume	CS	1
(0067,xx27)	SIEMENS SMS-AX Surface Segmentation Extensions	Object Volume Assignment	CS	1
(0067,xx35)	SIEMENS SMS-AX Surface Segmentation Extensions	Group Show	CS	1
(0067,xx36)	SIEMENS SMS-AX Surface Segmentation Extensions	Group IAE Display	CS	1
(0067,xx37)	SIEMENS SMS-AX Surface Segmentation Extensions	Group Live Display	CS	1
(0067,xx38)	SIEMENS SMS-AX Surface Segmentation Extensions	Group Volume Assignment	CS	1
(0067,xx39)	SIEMENS SMS-AX Surface Segmentation Extensions	Object Version Number	US	1

Tag	Private Owner Code	Name	VR	VM
(0067,xx40)	SIEMENS SMS-AX Surface Segmentation Extensions	SSO Owner	LO	1
(0067,xx42)	SIEMENS SMS-AX Surface Segmentation Extensions	Object GUID	LO	1
(0067,xx43)	SIEMENS SMS-AX Surface Segmentation Extensions	Group GUID	LO	1
(0067,xx44)	SIEMENS SMS-AX Surface Segmentation Extensions	SSO GUID	LO	1
(0067,xx47)	SIEMENS SMS-AX Surface Segmentation Extensions	Group Sequence	SQ	1
(0067,xx48)	SIEMENS SMS-AX Surface Segmentation Extensions	Private Surface Segmentation Sequence	SQ	1
(0067,xx49)	SIEMENS SMS-AX Surface Segmentation Extensions	Group Name	LO	1
(0067,xx51)	SIEMENS SMS-AX Surface Segmentation Extensions	Referenced Group GUID	LO	1
(0067,xx53)	SIEMENS SMS-AX Surface Segmentation Extensions	Private Surface Mesh Sequence	SQ	1
(0067,xx54)	SIEMENS SMS-AX Surface Segmentation Extensions	Surface Show	CS	1
(0067,xx56)	SIEMENS SMS-AX Surface Segmentation Extensions	Surface Mean Diameter List	OF	1
(0067,xx57)	SIEMENS SMS-AX Surface Segmentation Extensions	Primary Angle	DS	1
(0067,xx58)	SIEMENS SMS-AX Surface Segmentation Extensions	Secondary Angle	DS	1
(0067,xx59)	SIEMENS SMS-AX Surface Segmentation Extensions	Centerline ID List	LT	1
(0067,xx60)	SIEMENS SMS-AX Surface Segmentation Extensions	Landmark ID List	LT	1
(0067,xx61)	SIEMENS SMS-AX Surface Segmentation Extensions	Surface Text Label	LO	1
(0067,xx62)	SIEMENS SMS-AX Surface Segmentation Extensions	Centerline Visualization Type	CS	1
(0067,xx64)	SIEMENS SMS-AX Surface Segmentation Extensions	MPR Views	UT	1
(0067,xx65)	SIEMENS SMS-AX Surface Segmentation Extensions	Fixed Line Thickness	CS	1

Note: The following Private Owner Code contains double-spaces in the name definitions : SIEMENS SMS-AX<spc><spc>ACQ 1.0

9.3 Standard Extended/Specialized/Private SOP Classes

9.3.1 Standard Extended Segmentation

Any Segmentation SOP Instances created by ARTIS one can be standard extended by adding the following *syngo* private module attributes.

Table 97 - Private Modules for other created SOP Class

IE	Module	Reference	Usage	Note
Image	Private Surface Segmentation	9.3.1.1	U	Private Segmentation information

U = User Option

9.3.1.1 Private Segmentation

The table in this section contains private IOD Attributes that describe the Private Segmentation information:

Table 98 – Private Segmentation Attributes

Attribute Name	Tag	Owner	Type	Notes
SSO GUID	(0063,xx42)	SIEMENS SMS-AX Segmentation Extensions	3	Global ID for the Segmentation object.

9.3.2 Standard Extended Surface Segmentation

Any Surface Segmentation SOP Instances created by ARTIS one can be standard extended by adding the following *syngo* private module attributes.

Table 99 - Private Modules for other created SOP Class

IE	Module	Reference	Usage	Note
Surface	Private Surface Segmentation	9.3.2.1	U	Private Surface Segmentation information

U = User Option

9.3.2.1 Private Surface Segmentation

The table in this section contains private IOD Attributes that describe the Private Surface Segmentation information:

Table 100 – Private Segmentation Attributes

Attribute Name	Tag	Owner	Type	Notes
SSO Version Number	(0067,xx04)	SIEMENS SMS-AX Surface Segmentation Extensions	3	The version is an increasing number.
SSO Owner	(0067,xx40)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Defines component that created the SSO.
SSO GUID	(0067,xx44)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Global ID for the SSO.
Group Sequence	(0067,xx47)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Shall contain Group related information. Contains at least 1 item

Attribute Name	Tag	Owner	Type	Notes
>Recommended Display CIELab Value	(0062,000D)	n.a.	3	Triplet value to define how this Group shall be rendered on a color display. The units are in PCSValues and the value encoding is CIELab.
>Recommended Presentation Opacity	(0066,000C)	n.a.	3	Defines the opacity of the Group in percent. Float value between 0.0 ("0% opaqueness") and 1.0 ("100% opaqueness").
>Group Show	(0067,xx35)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Defines if the Group is hidden or not. Defined Terms: ON OFF
>Group IAE Display	(0067,xx36)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Defines if the Group is shown on the IAE image area. Defined Terms: NONE ON OFF
>Group Live Display	(0067,xx37)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Defines if the Group is shown on the Live image area. Defined Terms: NONE ON OFF
>Group Volume Assignment	(0067,xx38)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Defines if the Group is shown on the registered volume(s). Defined Terms: REGISTERED PLANNING
>Group GUID	(0067,xx43)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Global ID for the Group
>Group Name	(0067,xx49)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Name of the group.
Private Surface Segmentation Sequence	(0067,xx48)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Sequence which contains private extensions for the Surface Segmentation Module. One Item for each item in the Segment Sequence.
>Object Type	(0067,xx00)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Defines the type of the Object. Defined Terms: POLYLINE MARKER NEEDLE EP ABLATION PT SEGMENTATION VESSEL VESSEL LANDMARK VERTEBRA CENTER EMPTY_OBJ

Attribute Name	Tag	Owner	Type	Notes
				Note: "EMPTY_OBJ" is used in a (dummy) object version in case all the containing (graphical) objects of this SSO have been deleted by the user.
>Object IAE Display	(0067,xx01)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Defines if the Object is shown on the IAE image area. Defined Terms: NONE ON OFF
>Object Live Display	(0067,xx02)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Defines if the Object is shown on the Live image area. Defined Terms: NONE ON OFF
>Object Labeling	(0067,xx03)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Defines whether the Object labels are shown. Defined Terms: ON OFF
>EP Point Ablated	(0067,xx05)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Defines whether the EP Point is ablated or not. Defined Terms: ABLATED NOT ABLATED
>Show Length	(0067,xx09)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Defines whether the display of the length value is shown. Defined Terms: ON OFF
>Polyline Shape	(0067,xx10)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Defines the shape of a polyline. Defined Terms: LINEAR CURVED".
>Polyline Style	(0067,xx11)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Defines the style of a polyline. Defined Terms : OPEN CLOSED
>Clipping	(0067,xx13)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Defines whether clipping affects the Object or not. Defined Terms: ON OFF
>Show Volume	(0067,xx14)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Defines whether the display of the volume value is shown. Defined Terms: ON OFF

Attribute Name	Tag	Owner	Type	Notes
>Object Volume Assignment	(0067,xx27)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Defines if the Object is shown on the registered volume(s). Defined Terms: REGISTERED PLANNING NONE
>Object Version Number	(0067,xx39)	SIEMENS SMS-AX Surface Segmentation Extensions	3	The Object version is an increasing number.
>Object GUID	(0067,xx42)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Global ID for the Object
>Referenced Group GUID	(0067,xx51)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Value copied from GUID in the Group GUID (0067,xx43) attribute in the Group Sequence (0067,0047).
>Primary Angle	(0067,xx57)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Primary C-arm angle
>Secondary Angle	(0067,xx58)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Secondary C-arm angle
>Segment Algorithm Name	(0062,0009)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Name of the algorithm that was used to generate the Surface. Defined Terms: Stroke Segmentation Left Atrium Segmentation Model Based Left Atrium Segmentation Hybrid Model Based Left Atrium Segmentation Aortic Root Segmentation Coronary Vessel Aorta Vessel Vessel Tree Definition Vessel Tree Detection Vessel Feeder Detection
>Recommended Display CIELab Value	(0062,000D)	n.a.	3	Triplet value to define how this segment shall be rendered on a color display.
>Recommended Presentation Opacity	(0066,000C)	n.a.	3	Single unsigned value to define how the maximum pixel value of this segment shall be rendered on a grayscale display.
>Recommended Point Radius	(0066,0037)	n.a.	3	Specifies the radius of the vertex points defined in the Vertex Point Index List (0066,0025) with which it is recommended that the point be rendered.
>Recommended Line Thickness	(0066,0038)	n.a.	3	Specifies the thickness of each edge or line defined in the Edge Point Index List (0066,0024) or Line Sequence (0066,0028) with which it is recommended that the line be rendered.
Private Surface Mesh Sequence	(0067,xx53)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Sequence which contains private extensions for the Surface Mesh Module.

Attribute Name	Tag	Owner	Type	Notes
				One Item for each item in the Surface Sequence.
>Surface Show	(0067,xx54)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Defines if the Surface is shown or not. Defined Terms: NONE ON OFF
>Surface Mean Diameter List	(0067,xx56)	SIEMENS SMS-AX Surface Segmentation Extensions	3	List of mean diameters in mm.
>Centerline ID List	(0067,xx59)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Vessel object : 2 values (CenterlineSegID\ParentID)
>Landmark ID List	(0067,xx60)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Vessel Landmarks object: 2 values (LandmarkID\VesselSegmentID)
>Surface Text Label	(0067,xx61)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Text label
>Centerline Visualization Type	(0067,xx62)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Defines how a Centerline is visualized. Defined Terms: NONE NORMAL COLOR CODED RULER
>MPR Views	(0067,xx64)	SIEMENS SMS-AX Surface Segmentation Extensions	3	XML structure
>Fixed Line Thickness	(0067,xx65)	SIEMENS SMS-AX Surface Segmentation Extensions	3	Defines a fixed line thickness. Defined Terms: SMALL MEDIUM LARGE

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