DICOM Conformance Statement

ARTIS VE50

Product Name
ARTIS icono floor
ARTIS icono ceiling
ARTIS icono biplane
ARTIS icono.explore floor
ARTIS pheno
ARTIS genio floor

June 2025

SIEMENS Healthineers

DICOM Conformance Statement Overview

ARTIS VE50 is an Imaging Modality. It supports Storage and Transfer of images utilizing the DICOM "Storage Service Class", the display of data and retrieval of images from DICOM Archives utilizing the DICOM "Query/Retrieve Service Class". Workflow Management is supported by querying worklists from RIS and returning information about the procedure performed. Furthermore, the import from and export to DICOM CD/DVD media is supported.

ARTIS VE50 conforms to the DICOM Standard and supports the network Services as described in Table 1: Network Services and the media Services as described in Table 2: Media Services.

Table 1: Network Services

SOP Classes	SOP Class UID	User of Service (SCU)	Provider of Service (SCP)	
Verification				
Verification	1.2.840.10008.1.1	Yes	Yes	
SOP Classes	**SOP Class UID**	**User of Service (SCU)**	**Provider of Service (SCP)**	
		Send	**Store**	**Display**
SOP Classes created by ARTIS VE50				
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Yes	Yes	Yes
X-Ray Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.67	Yes	Yes	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	Yes	No
SOP Classes managed by ARTIS VE50				
Digital X-Ray Image Storage- For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Yes	Yes	No
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	Yes	No
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Yes	Yes	No
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	Yes	No
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	Yes	No
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	Yes	Yes	No
Enhanced MR Color Image Storage	1.2.840.10008.5.1.4.1.1.4.3	Yes	Yes	No
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes	Yes	No
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	Yes	Yes	No
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Yes	Yes	No

SOP Classes	SOP Class UID	User of Service (SCU)	Provider of Service (SCP)	
Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1	Yes	Yes	No
X-Ray 3D Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.13.1.1	Yes	Yes	No
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Yes	Yes	No
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1	Yes	Yes	No
Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.4	Yes	Yes	No
Surface Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.5	Yes	Yes	No
Basic Text SR Storage	1.2.840.10008.5.1.4.1.1.88.11	Yes	Yes	No
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	Yes	Yes	No
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33	Yes	Yes	No
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	Yes	Yes	No
Transfer (Private SOP Class)				
Syngo Non-Image Storage	1.3.12.2.1107.5.9.1	Yes	Yes	
Storage Commitment				
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1	Yes	Yes	
Worklist Management				
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	Yes	No	
Modality Performed Procedure Step SOP Class	1.2.840.10008.3.1.2.3.3	Yes	No	
Query/Retrieve				
Patient Root Q/R Information Model - FIND	1.2.840.10008.5.1.4.1.2.1.1	No	Yes	
Patient Root Q/R - Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2	No	Yes	
Study Root Q/R - Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Yes	Yes	
Study Root Q/R - Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Yes	Yes	
Patient/Study Only Q/R - Information Model FIND	1.2.840.10008.5.1.4.1.2.3.1	No	Yes	
Patient/Study Only Q/R - Information Model MOVE	1.2.840.10008.5.1.4.1.2.3.2	No	Yes	

SOP Classes	SOP Class UID	User of Service (SCU)	Provider of Service (SCP)
Print Management			
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Yes	No
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	Yes	No
Basic Film Sessions SOP Class	1.2.840.10008.5.1.1.1	Yes	No
Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Yes	No
Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4	Yes	No
Basic Color Image Box SOP Class	1.2.840.10008.5.1.1.4.1	Yes	No
Printer SOP Class	1.2.840.10008.5.1.1.16	Yes	No
Print Job SOP Class	1.2.840.10008.5.1.1.14	Yes	No
Presentation LUT SOP Class	1.2.840.10008.5.1.1.23	Yes	No

Table 2: Media Services

Media Storage Application Profile	Write Files (FSC)	Update Files (FSU)	Read Files (FSR)
Compact Disk - Recordable			
STD-GEN-CD	Yes	No	Yes
AUG-GEN-CD	Yes	No	Yes
DVD			
AUG-GEN-DVD	Yes	No	Yes
AUG- GEN-DVD-J2K	Yes	No	Yes
STD-GEN-DVD	Yes	No	Yes
STD-GEN-DVD-J2K	Yes	No	Yes
USB			
AUG- GEN-USB-J2K	Yes	Yes	Yes
STD-GEN-USB-J2K	Yes	Yes	Yes
Above mentioned details are applicable for ARTIS VE50 created SOP Classes including "Media Storage Directory Storage 1.2.840.10008.1.3.10".			

Table 3: Implementation Identifying Information

Name	Value
Application Context Name	1.2.840.10008.3.1.1.1
Implementation Class UID	1.3.12.2.1107.5.4.5
Implementation Version Name	“SHC_ARTIS_VE50”

3 Introduction

3.1 Revision History

Document Version	Date	Product	Product Version	Change
10999010-ESK-001-00	01/2019	ARTIS icono®	VE20A	created
10999010-ESK-001-01	10/2019	ARTIS icono	VE20A	first release of ARTIS icono line
10999010-ESK-001-02	02/2020	ARTIS icono / pheno®	VE20B	document layout update
10999010-ESK-001-03	12/2021	ARTIS icono / pheno	VE21A	add new private tags
10999010-ESK-001-04	02/2023	ARTIS icono / pheno	VE30A	version based on new template add Storage Commitment as SCP remove support of Overlay in (60xx,xxxx) add chapter for sorting information add chapter for transfer processing
11546885-ESK-001-00	04/2024	ARTIS icono / pheno	VE40A	Derivation Description (0008,2111), Image Type value for Rotational acquisition and MPPS N-CREATE-RQ attributes are updated according to the software changes. MPPS N-SET-RQ for the PPS status 'IN PROGRESS' is not supported to send anymore.
11546898-ESK-001-00	06/2025	ARTIS icono / pheno / genio	VE50A	RDSR Codes are updated to the latest. "Manufacturer (0008,0070), Manufacturer's Model Name (0008,1090), Secondary Capture Device Manufacturer (0018,1016), Secondary Capture Device Manufacturer's Model Name (0018,1018)" are updated. Referenced Request Sequence (0040,A370) and its corresponding nested attributes are added to SR Document Series Module. New private attributes "Advanced I-Noise Flag (0021,XX33)", "Overlay Device Presentation (0019,XX37)" and "Overlay Vessel Presentation (0019,XX38)" are added to XA Image. Security Profile section is updated, and other minor changes.

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 this product and other DICOM products. The Conformance Statement should be read and understood in conjunction with the DICOM Standard [1]. 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 VE50 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
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
HIS	Hospital Information System
n. a.	not applicable
NEMA	National Electrical Manufacturers Association
O	Optional Key Attribute
PDU	DICOM Protocol Data Unit
R	Required Key Attribute
RIS	Radiology Information System
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

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

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

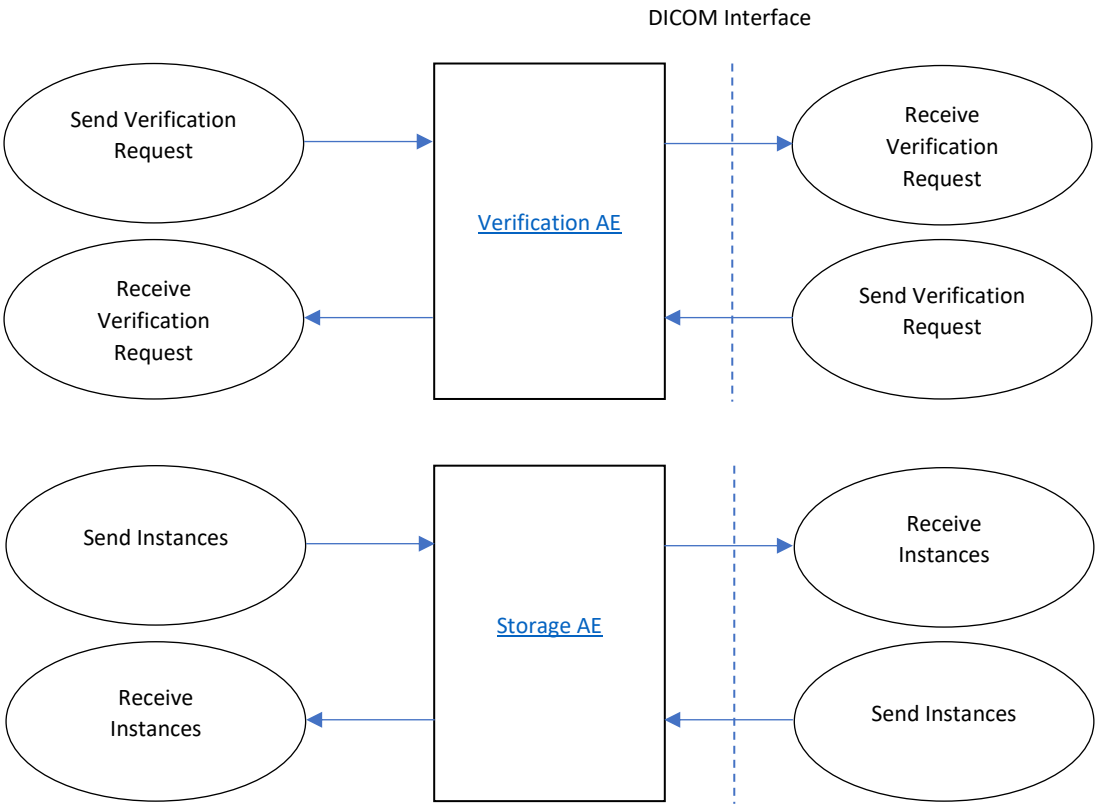
4 Networking

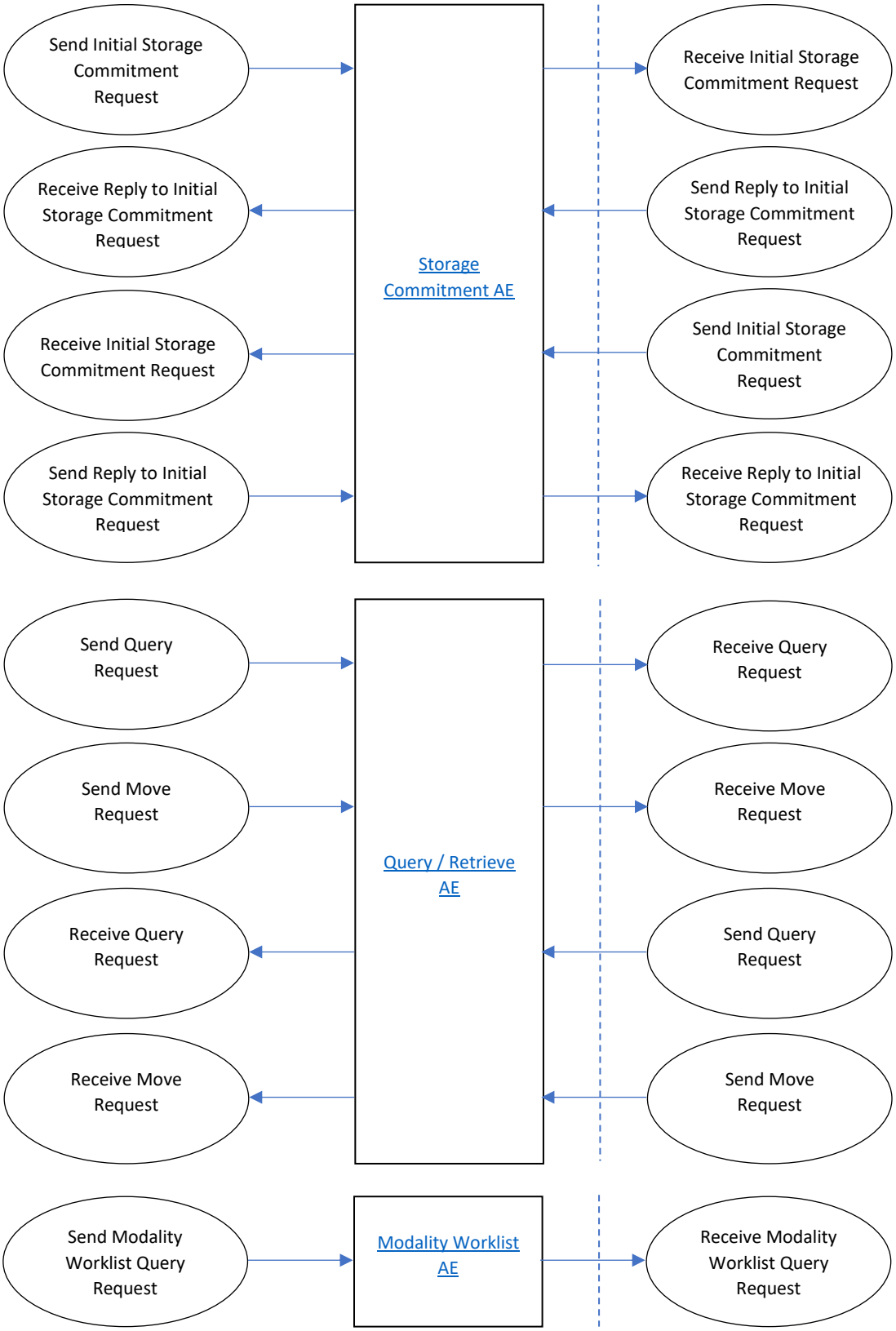
4.1 Implementation Model

ARTIS VE50 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 VE50 can query remote nodes, retrieve and store selected instances from that node. Using the Modality Worklist Service, the ARTIS VE50 can query a HIS/RIS for scheduled procedures. Performed Procedure Step status and other procedure data can be returned to the HIS/RIS using the Modality Performed Procedure Step (MPPS) Service. Furthermore, printing of color and grayscale images is supported.

4.1.1 Application Data Flow

The following figures provide a functional overview of the ARTIS VE50 Application Entities (AE). Please do note that it is based on the default configuration and may differ depending on configuration at the customer site.




Send Initial Storage Commitment Request
Receive Reply to Initial Storage Commitment Request
Receive Initial Storage Commitment Request
Send Reply to Initial Storage Commitment Request
Storage Commitment AE
Receive Initial Storage Commitment Request
Send Reply to Initial Storage Commitment Request
Send Initial Storage Commitment Request
Receive Reply to Initial Storage Commitment Request
Send Query Request
Send Move Request
Receive Query Request
Receive Move Request
Query / Retrieve AE
Receive Query Request
Receive Move Request
Send Query Request
Send Move Request
Send Modality Worklist Query Request
Modality Worklist AE
Receive Modality Worklist Query Request

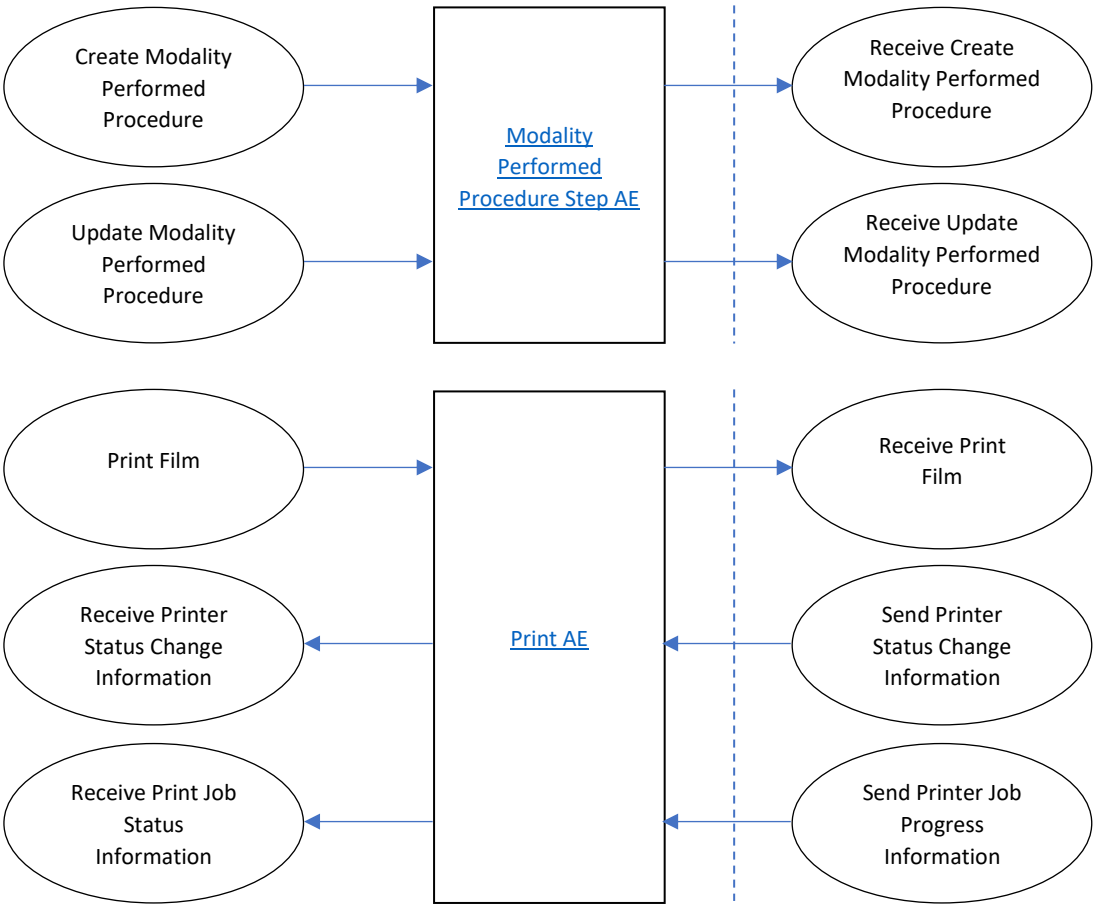


Figure 1: ARTIS VE50 DICOM Data Flow diagram

4.1.2 Functional Definitions of Application Entities

The SCP components of the Application Entities of the ARTIS VE50 operate as background server processes. They exist as soon as the system is powered up and wait for association requests. Upon accepting an association with a negotiated Presentation Context, they start to receive and process the requests described in the following sections.

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

4.1.2.1 Functional Definitions of Verification AE

The ARTIS VE50 supports the Verification Service as an SCP and SCU. As an SCU, Verification can be activated from the Administrator Portal during system configuration by sending a C-ECHO-RQ.

As an SCP of the Verification Service the ARTIS VE50 processes and responds to incoming verification requests using the C-ECHO-RSP.

4.1.2.2 Functional Definition of Storage AE

The ARTIS VE50 Storage SCU is invoked either directly by the user, by an auto-archive trigger or internally by the Query/Retrieve Application Entity that is responsible for processing retrieve requests. The job consists of data describing the composite objects selected for Storage and the destination Application Entity Title. An association is negotiated with the destination Application Entity and the image data is transferred using the C-STORE-RQ. The transfer status is reported to the initiator of the Storage request.

The Storage SCP component of the ARTIS VE50 starts to receive the Composite Objects and imports them into the database after accepting an association with a negotiated Presentation Context. The system responds to the Storage Request immediately after reception of the Data.

4.1.2.3 Functional Definition of the Storage Commitment AE

If configured, the ARTIS VE50 can serve as an SCU for the DICOM Storage Commitment Service. Upon successful completion of a Storage SCU job, the system uses the N-ACTION-RQ to request Storage Commitment from a remote DICOM Storage Commitment SCP. This can either be the same as the Storage destination or a different system depending on the system configuration. Storage Commitment Requests are sent after a configurable delay after storing the objects. The ARTIS VE50 can receive the N-EVENT-REPORT-RQ on the same or a different association.

ARTIS VE50 can also serve as an SCP for the DICOM Storage Commitment Service.

4.1.2.4 Functional Definition of Query/Retrieve AE

The ARTIS VE50 supports DICOM Query/Retrieve as an SCU: The user can initiate a query to a remote node using the C-FIND-RQ. After matching the specified keys, the remote Query/Retrieve SCP uses the C-FIND-RSP to return the results of its search, which will be displayed to the user. Depending on user action the ARTIS VE50 Query/Retrieve DICOM SCU sends a C-MOVE-RQ to initiate a C-STORE sub-operation on the SCP to start an instance transfer from remote Storage SCU (running on Query/Retrieve SCP) to the system's Storage SCP.

The ARTIS VE50 supports the following query models:

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

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

The ARTIS VE50 DICOM Query/Retrieve SCP accepts C-FIND-RQ, queries the local database based on the provided matching keys and returns the matches in the C-FIND-RSPs. Depending on further request from the remote Query/Retrieve SCU, the ARTIS VE50 responds to C-MOVE-RQs by initiating a C-STORE sub-operation to send image objects to the Storage SCP of the querying system.

4.1.2.5 Functional Definition of Modality Worklist AE

The ARTIS VE50 Modality Worklist SCU issues DICOM Modality Worklist requests using C-FIND-RQs. The results in the C-FIND-RSPs are stored in internal database. The provided Patient and Procedure information is used for patient registration prior to starting an exam.

4.1.2.6 Functional Definition of Modality Performed Procedure Step SCU AE

The ARTIS VE50 MPPS SCU uses the N-CREATE-RQ to inform an Information System that a procedure step is IN PROGRESS.

The ARTIS VE50 MPPS SCU uses the N-SET-RQ to inform the Information System about the finalization of the Procedure Step, using either a status of COMPLETED or DISCONTINUED.

4.1.2.7 Functional Definition of Print AE

The Print SCU of the ARTIS VE50 is invoked by the user interface. Whenever a film-sheet is ready to print, the related data is used to supply the Information to the SOP Classes of the Print Management Service Class. A queue is maintained in order to

intermediately store several film-sheets in case of resource problems on printer. The SCU will only supply and require the mandatory SOP Classes of the Print Management Service Class.

4.1.3 Sequencing of Activities

This section describes the sequencing of the DICOM Communication Activities performed by the ARTIS VE50 Entities using a UML sequence diagram. The Entities are depicted as vertical bars. The arrows show the messages exchanged.

4.1.3.1 System Configuration

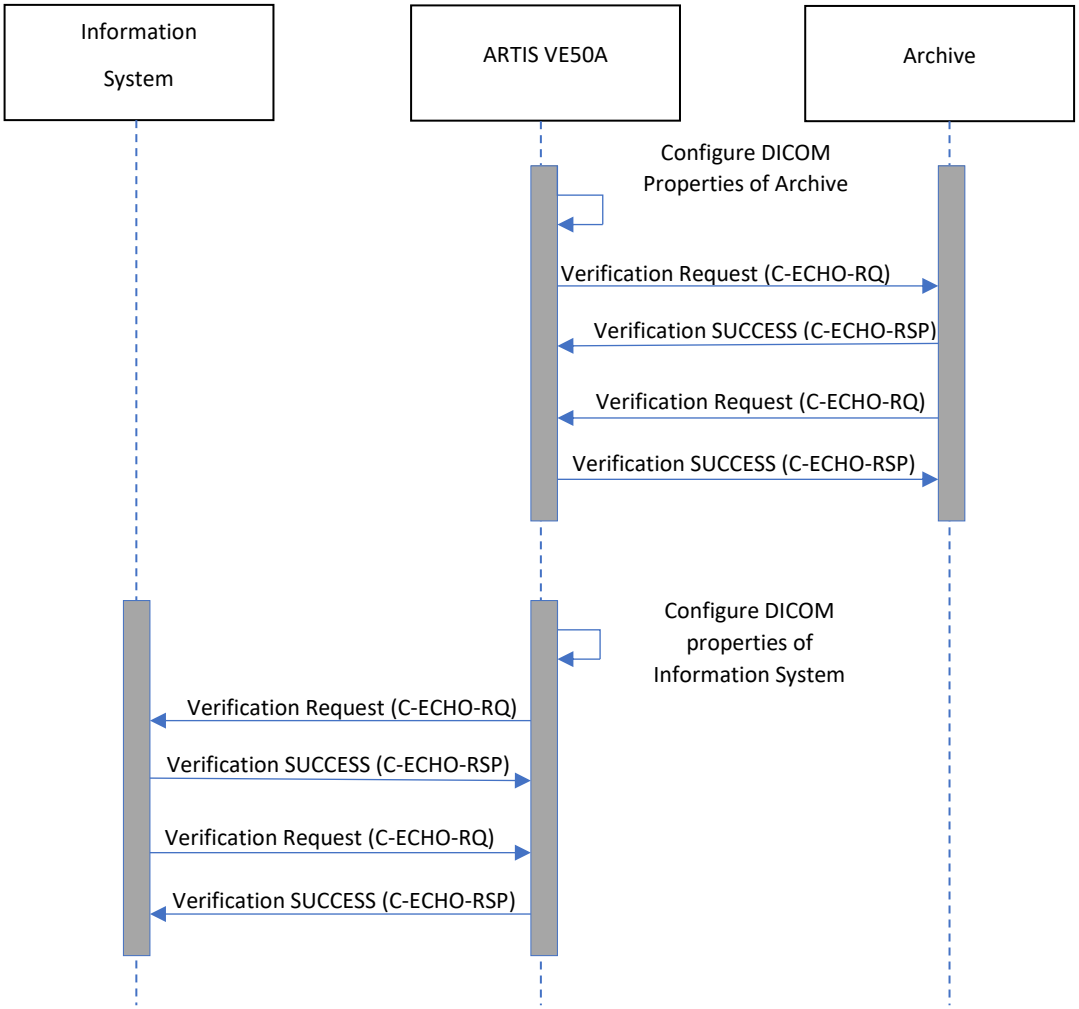


Figure 2: Sequence Diagram - System Configuration Workflow

4.1.3.2 Acquisition Workflow

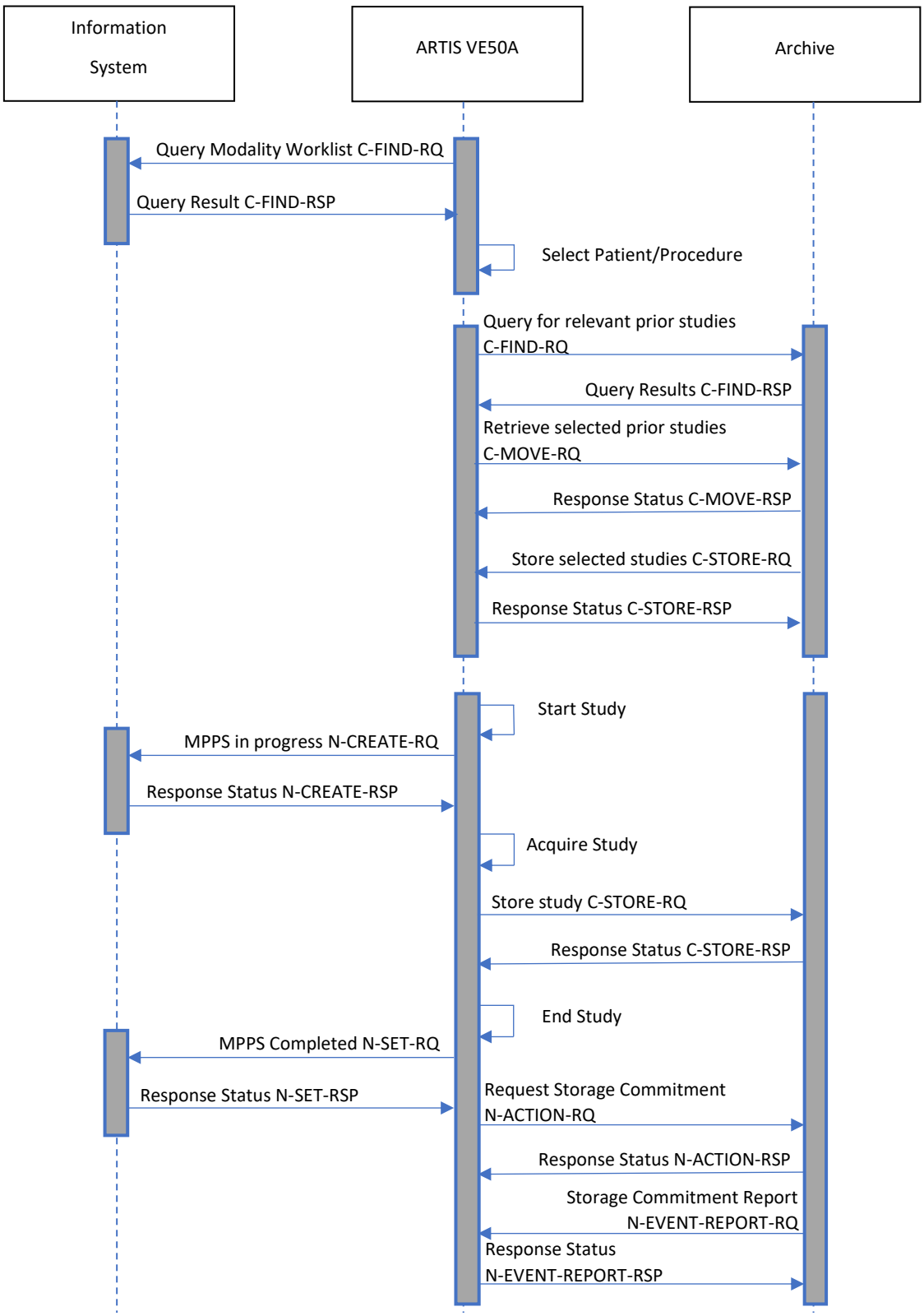


Figure 3: Sequence Diagram - Acquisition workflow

4.1.3.3 Printing Workflow

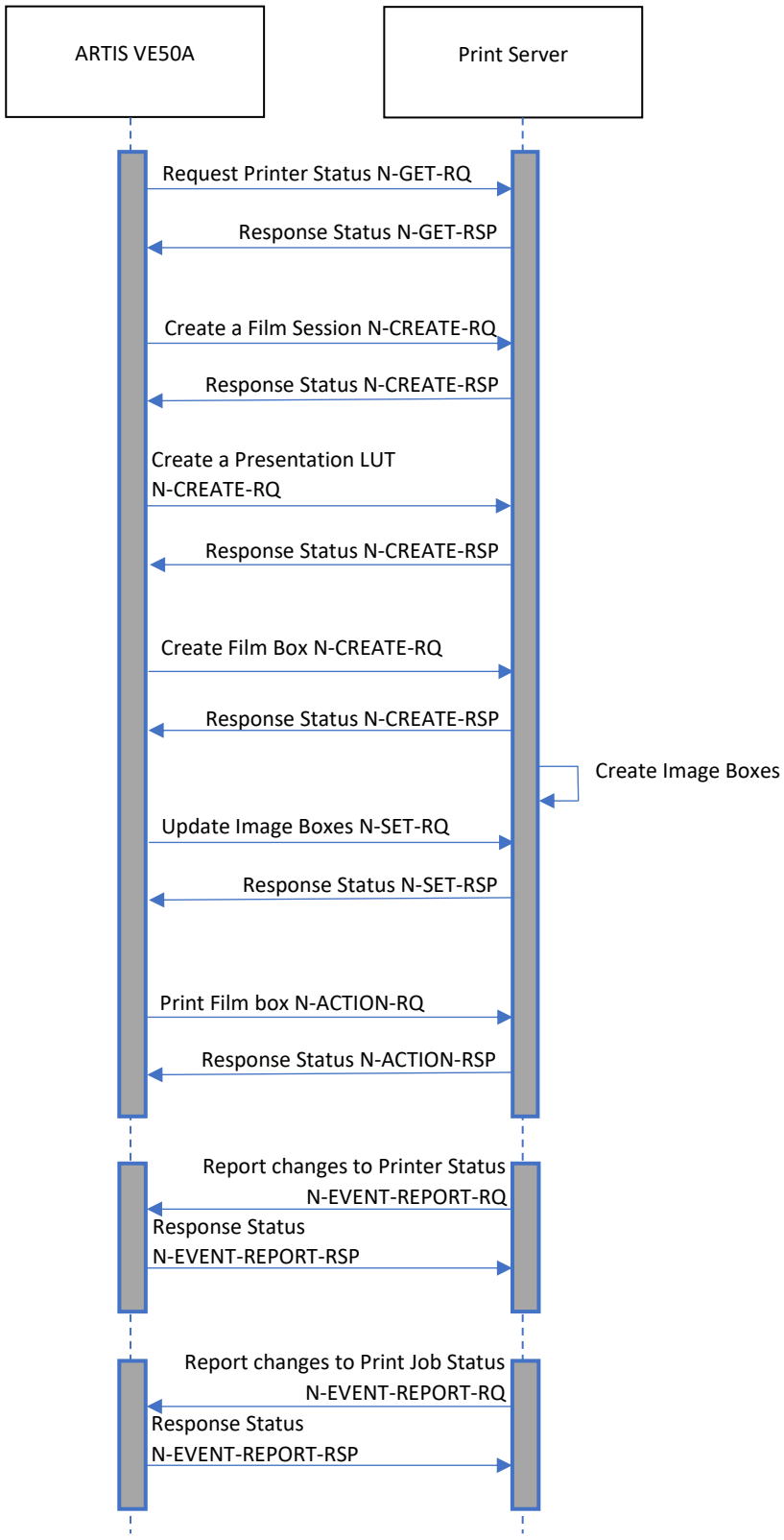


Figure 4: Printing

4.2 AE Specifications

This section outlines the specifications for each of the Application Entities that are part of the ARTIS VE50.

4.2.1 Verification AE Specification

4.2.1.1 SOP Classes

The Verification AE of the ARTIS VE50 provides standard conformance to the Verification SOP Class listed in Table 1: Network Services section "Verification" in the "Conformance Statement Overview".

4.2.1.2 Association Policy

The ARTIS VE50 Admin Portal attempts to open an Association for Verification Request whenever the Verification function is activated.

Table 4: Association Policies

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

4.2.1.2.1 Asynchronous Nature

The ARTIS VE50 supports asynchronous communication (multiple outstanding transactions over a single association). On the SCU side the Window size proposed is infinite. On the SCP side any size is supported.

Table 5: Asynchronous Nature as an Association Initiator

Maximum number of outstanding asynchronous transactions	10

4.2.1.2.2 Implementation Identifying Information

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

[1] Default, the value is configurable

4.2.1.3 Association Initiation Policy

4.2.1.3.1 Activity “Send Verification Request”

4.2.1.3.1.1 Description and Sequencing of Activities

The ARTIS VE50 serves as an SCU of the Verification Service Class. A C-ECHO-RQ is initiated by the Administrator Portal whenever “Verification” is requested. If an association to a remote Application Entity is successfully established, Verification with the configured AET is requested via the open association. If the C-ECHO-RSP from the remote Application contains a status other than “Success” this will be indicated to the user and the association is closed.

4.2.1.3.1.2 Proposed Presentation Contexts

Table 6: Presentation Context Table “Verification” below lists the supported presentation contexts for verification requests.

Table 6: Presentation Context Table “Verification”

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	**UID**	**Name List**	**UID List**		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Verification	1.2.840.10008.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None

4.2.1.3.1.3 SOP specific Conformance for SOP classes

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

4.2.1.4 Association Acceptance Policy

4.2.1.4.1 Activity “Receive Verification Request”

4.2.1.4.1.1 Description and Sequencing of Activities

The ARTIS VE50 serves as an SCP of the Verification Service Class. If the Verification SCP accepts an association, it will respond to C-ECHO-RQ. If the Called AE Title does not match any pre-configured AE Title shared by SCP, the association will be rejected.

4.2.1.4.1.2 Accepted Presentation Contexts

The ARTIS VE50 DICOM application will accept Presentation Contexts as shown in the following table:

Table 7: Presentation Context Table "Verification"

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	**UID**	**Name List**	**UID List**		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Verification	1.2.840.10008.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
Verification	1.2.840.10008.1.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None

4.2.1.4.1.3 SOP specific Conformance – Verification SCP

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

4.2.2 Storage AE Specification

4.2.2.1 SOP Classes

The Storage AE provides Standard Conformance to the SOP Classes listed in "Table 1: Network Services" section "SOP Classes Created by the ARTIS VE50" and "SOP Classes Managed by the ARTIS VE50" in the "Conformance Statement Overview".

4.2.2.2 Association Policy

Table 8: Association Policies

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

The ARTIS VE50 contains a limitation of 512 kB for the maximum PDU size. By default, the PDU size is set to 32kB.

The maximum number of simultaneous receiving associations (SCP) is set to 12.

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

[1] Default, the value is configurable

4.2.2.2.1 Asynchronous Nature

The ARTIS VE50 supports asynchronous communication (multiple outstanding transactions over a single association). On the SCU side the Window size proposed is infinite. On the SCP Side any non-infinite maximum size will be accepted.

Table 9: Asynchronous Nature as an Association Initiator

Maximum number of outstanding asynchronous transactions	10

4.2.2.2.2 Implementation Identifying Information

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

4.2.2.3 Association Initiation Policy

4.2.2.3.1 Activity "Send Instances"

4.2.2.3.1.1 Description and Sequencing of Activities

The ARTIS VE50 serves as an SCU of the Storage Service Class. The Storage SCU is triggered by the transfer job queue or by an external retrieve request. An association request is sent to the destination AE. Upon successful negotiation of a Presentation Context, the transfer is started. Objects will be transferred sequentially on the same open association.

4.2.2.3.1.2 Proposed Presentation Contexts

For all Image Objects listed in Table 1: Network Services in the Conformance Statement Overview the Transfer Syntaxes marked with “Yes” in the Image Objects Column of the table below are supported.

For all Non-Image Objects listed in Table 1: Network Services in the Conformance Statement Overview the Transfer Syntaxes marked with “Yes” in the Non-Image Objects Column of the table below are supported.

For a distinction between Image and Non-Image Objects please refer to the DICOM Standard PS3.3 Section A.1.4 “Overview of the Composite IOD Module Content [1]”.

Table 10: Proposed Presentation Contexts for Storage

UID value	Transfer Syntax	Image Objects	Non-Image Objects
1.2.840.10008.1.2	Implicit VR Little Endian	Yes	Yes
1.2.840.10008.1.2.1	Explicit VR Little Endian	Yes	Yes
1.2.840.10008.1.2.2	Explicit VR Big Endian	Yes	Yes
1.2.840.10008.1.2.4.50	JPEG Baseline (Process 1) lossy compressed	Yes	No
1.2.840.10008.1.2.4.51	JPEG Extended (Process 2 & 4) lossy compressed	Yes	No
1.2.840.10008.1.2.4.57	JPEG Lossless, Non-Hierarchical (Process 14)	Yes	No
1.2.840.10008.1.2.4.70	JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14) lossless compressed	Yes	No
1.2.840.10008.1.2.4.90	JPEG 2000 Image Compression (Lossless Only) compressed	Yes	No
1.2.840.10008.1.2.4.91	JPEG 2000 Image Compression	Yes	No
1.2.840.10008.1.2.5	RLE Lossless compressed	Yes	No

Depending on the configuration, the Storage SCU will choose a compressed or uncompressed Transfer Syntax among those accepted by the SCP. The Transfer Syntax chosen is the preferred one among the compressed and uncompressed ones. The preference order is the order of occurrence in the configuration. For each node it is possible to select Transfer Syntaxes, which can be used, and Transfer Syntaxes, which are excluded. The configuration can even be extended, based on the combination of SOP Classes and supported Transfer Syntaxes.

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

- Is an image and not already compressed
- Photometric Interpretation (0028,0004) is either MONOCHROME1, MONOCHROME2, RGB, YBR_FULL
- Bits Allocated (0028,0100) equal to ‘16 or ‘8’
- Bits Stored (0028,0101) equal to ‘12’ or ‘8’
- High Bit (0028,0102) equal to Bits Stored (0028,0101) – 1
- Pixel Representation (0028,0103) equal to ‘0’

An instance will be JPEG lossy compressed during transfer only if the following criteria is fulfilled:

- Is an image
- Photometric Interpretation (0028,0004) is either MONOCHROME1, MONOCHROME2 or RGB, YBR_FULL, YBR_FULL_244
- Bits Allocated (0028,0100) equal to ‘16’ or ‘8’
- Bits Stored (0028,0101) equal to ‘12’ or ‘8’
- High Bit (0028,0102) equal to Bits Stored (0028,0101) – 1
- Pixel Representation (0028,0103) equal to ‘0’
- Only lossy transfer syntaxes are supported (Implicit Little Endian is not supported) at the remote side

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

- Is an image and not already compressed
- Photometric Interpretation (0028,0004) is either MONOCHROME, RGB, YBR_FULL or YBR_FULL_422
- Bits Allocated (0028,0100) equal to ‘16’ or ‘8’

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

- Is an image and not already compressed
- Photometric Interpretation (0028,0004) is MONOCHROME, RGB, YBR_FULL or RGB
- Bits Allocated (0028,0100) ‘8’ or ‘16’ for MONOCHROME, ‘24’ for other interpretations

An instance will be JPEG 2000 lossy compressed during transfer only if the following criteria is fulfilled:

- Is an image
- Photometric Interpretation (0028,0004) is MONOCHROME, YBR_FULL or RGB
- Bits Stored (0028,0101) equal to ‘12’ or ‘8’
- Only lossy transfer syntaxes are supported (Implicit Little Endian is not supported) at the remote side

There is no extended negotiation as an SCU.

4.2.2.3.1.3 SOP Specific Conformance for SOP Classes

The ARTIS VE50 does not add or change private attributes by default, even in case objects are compressed or the image header is updated according to IHE [2] Patient Information Reconciliation Profile.

The behavior of ARTIS VE50 when encountering status codes in a C-STORE-RSP is summarized in Table 11

Table 11: DICOM Command Response Status Handling Behavior

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

Table 12 below indicates the behavior if exceptions occur:

Table 12: DICOM Command Communication Failure Behavior

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

4.2.2.3.1.4 Correction and Rearrangement

When a Study is moved to a different:

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

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

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

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

1. Image Position (0020,0032)
2. Image Orientation (0020,0037)
3. Patient Orientation (0020,0020)
4. Data Collection Center (Patient) (0018,9313) (CT only)
5. Reconstruction Target Center (Patient) (0018,9318) (CT only)
6. Positioner Primary Angle (0018,1510) (XA only)
7. Positioner Secondary Angle (0018,1511) (XA only)

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

When the Patient Birth Date (0010,0030) or the Study Date (0008,0020) is corrected, the system recalculates the Patient Age (0010,1010).

A new item containing attributes that were removed or replaced by other values is added to the Original Attribute Sequence (0400,0561).

4.2.2.4 Association Acceptance Policy

4.2.2.4.1 Activity "Receive Instances"

4.2.2.4.1.1 Description and Sequencing of Activities

The ARTIS VE50 serves as an SCP of the Storage Service Class. The Storage SCP accepts incoming C-Store-RQ from any configured AE Title, receives supported objects transmitted on that association and stores them in the local database.

4.2.2.4.1.2 Accepted Presentation Contexts

For all supported Transfer Objects (see "Table 1: Network Services" section "SOP Classes Created by the ARTIS VE50" and "SOP Classes Managed by the ARTIS VE50" in the "Conformance Statement Overview".) the Transfer Syntaxes are described in Table 10.

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

There is no Extended Negotiation as an SCP.

4.2.2.4.1.3 SOP-specific Conformance for Storage SOP classes

The ARTIS VE50 conforms to the Full Storage Class at Level 2.

In case of a successful C-STORE operation, the image has successfully been received in the negotiated transfer syntax.

The Storage AE of the ARTIS VE50 returns the status "success" when the data is received, and a minimal image header validation has been performed.

The following header attributes must be available and filled:

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

Table 13 below list the status codes that the ARTIS VE50 can return:

Table 13: Storage C-STORE-RSP Status

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

Restriction: Depending on response configuration successful operation does not guarantee Storage on disk and Storage of header data in the database.

4.2.2.4.1.4 Other SOP specific behavior

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

4.2.3 Storage Commitment AE Specification

4.2.3.1 SOP Classes

The Storage Commitment AE of the ARTIS VE50 provides standard conformance to the SOP Class listed in "Table 1: Network Services" section "Storage Commitment" in the "Conformance Statement Overview" Association Policy

Table 14: Association Policies

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

The ARTIS VE50 contains a limitation of 512 kB for the maximum PDU size. By default, the PDU size is set to 32kB.

The maximum number of simultaneous receiving associations (SCP) is set to 12.

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

4.2.3.1.1 Asynchronous Nature

The ARTIS VE50 supports asynchronous communication (multiple outstanding transactions over a single association). On the SCU side the Window size proposed is infinite. On the SCP Side any non-infinite maximum size will be accepted.

Table 15: Asynchronous Nature as an Association Initiator

Maximum number of outstanding asynchronous transactions	10

4.2.3.1.2 Implementation Identifying Information

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

4.2.3.2 Association Initiation Policy

4.2.3.2.1 Activity "Send Initial Storage Commitment Request"

4.2.3.2.1.1 Description and Sequencing of Activities

The ARTIS VE50 serves as an SCU of the Storage Commitment Service Class. After successful transfer (C-STORE) of Imaging Objects to a configured Archive, the Storage Commitment SCU initiates an N-ACTION-RQ, if Storage Commitment is configured. Storage Commitment is supported for all Storage SOP Classes listed in Table 1: Network Services. Sections SOP Classes created/managed by ARTIS VE50. This request will be sent on a different association than the Storage Request.

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

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

The ARTIS VE50 does not support the Storage Media File-Set ID and UID attributes.

The ARTIS VE50 will accept the N-EVENT-REPORT-RQ on the same association if sent immediately after the N-ACTION-RSP. However, it will not wait for it. The association is closed after three seconds.

[1] Default, the value is configurable

4.2.3.2.1.2 Proposed Presentation Contexts

The ARTIS VE50 DICOM application supports the Presentation Contexts listed in the following table for the Storage Commitment Service Class.

Table 16: Proposed Presentation Contexts for Storage Commitment

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

4.2.3.2.1.3 SOP specific Conformance for SOP classes

The behavior of ARTIS VE50 when encountering status codes in an N-ACTION-RSP is summarized in Table 17:

Table 17: DICOM Command Response Status Handling Behavior

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

Table 18 below indicates the behavior if exceptions occur:

Table 18: DICOM Command Communication Failure Behavior

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

4.2.3.2.2 Activity "Send Reply to Initial Storage Commitment Request"

4.2.3.2.2.1 Description and Sequencing of Activities

After successfully receiving an N-ACTION-RQ the ARTIS VE50 communicates the status of the Storage Commitment Request using the N-EVENT-REPORT-RQ primitive using reverse role negotiations.

The ARTIS VE50 does not support the Storage Media File-Set ID and UID attributes.

4.2.3.2.2.2 Proposed Presentation Contexts

The ARTIS VE50 DICOM application supports the presentation contexts listed in the following table for the Storage Commitment Service Class.

Table 19: Proposed Presentation Contexts for Storage Commitment

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

4.2.3.2.2.3 SOP specific Conformance for SOP classes

The behavior of ARTIS VE50 sending status codes N-ACTION-RSP is summarized in Table 20: DICOM Command Response Status Handling Behavior

Table 20: DICOM Command Response Status Handling Behavior

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

Table 21 below indicates the behavior if exceptions occur:

Table 21: DICOM Command Communication Failure Behavior

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

4.2.3.2.2.3.1 Storage Commitment Failure Conditions

Table 22 lists conditions upon which an error code is sent in the Failure Reason (0008,1197) Attribute in the Failed SOP Sequence (0008,1198) of the N-EVENT-REPORT-RQ.

Table 22: Storage Commitment Failure Conditions

Status Code	Description	Conditions
0110	Processing failure: A general failure in processing the operation was encountered.	This error code is sent on any error, which might occur on processing the incoming request.

4.2.3.3 Association Acceptance Policy

The ARTIS VE50 provides the very basic Storage Commitment functions, which the users can build on. This means, that the technical parameter of this functionality largely depends on the application built on it, including but not limited to following:

Persistence of Storage

The information received for Storage Commitment are kept as long as they are not explicitly deleted by the user.

Capacity

The capacity available for Storage Commitment operations depends only on the hardware used by the application built on ARTIS VE50. In the same way, the user of ARTIS VE50 is responsible for managing the Storage capacity (for example to implement limitations). ARTIS VE50 does not manage the Storage capacity.

Volatility

Once the data received for Storage Commitment is processed, it is saved in the Storage of the ARTIS VE50. The Storage is permanent. To remove any data from the Storage, an explicit delete operation must be carried out by the user of the ARTIS VE50.

The data saved can be retrieved using the Query/Retrieve mechanism of DICOM.

4.2.3.3.1 Activity “Receive Reply to Initial Storage Commitment Request”

4.2.3.3.1.1 Description and Sequencing of Activities

The ARTIS VE50 supports the reverse role negotiation of the Storage Commitment Service Class as the SCU. It accepts incoming N-EVENT-REPORT-RQ, if they do not arrive on the same association as the N-ACTION-RQ.

The ARTIS VE50 has a configurable expiration timeout for the TransactionUID. By default, the TransactionUID is 60 minutes.

4.2.3.3.1.2 Accepted Presentation Contexts

The ARTIS VE50 DICOM application supports the presentation contexts listed in the following table for the Storage Commitment Service Class.

Table 23: Presentation Context Table "Storage Commitment"

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

4.2.3.3.1.3 SOP-specific Conformance for Storage Commitment SOP classes

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

4.2.3.3.1.3.1 Storage Commitment Failure Conditions

Table 24 lists conditions upon which an error code is sent in the Failure Reason (0008,1197) Attribute in the Failed SOP Sequence (0008,1198) of the N-EVENT-REPORT-RQ.

Table 24: Storage Commitment Failure Behavior

Status Code	Description	Behavior
0110	Processing failure: A general failure in processing the operation was encountered.	A resend of the failed object is performed for a configurable number of times. The corresponding object(s) will be marked as "Archived failed" in case the error persists.
0122	No such object instance: One or more of the elements in the Referenced SOP Instance Sequence was not available.	
0119	Class / Instance conflict: The SOP Class of an element in the Referenced SOP Instance Sequence did not correspond to the SOP Class registered for this SOP Instance at the SCP.	
0122	Referenced SOP Class not supported: Storage Commitment has been requested for a SOP Instance with a SOP Class that is not supported by the SCP	
0131	Duplicate transaction UID: The Transaction UID of the Storage Commitment Request is already in use.	

Status Code	Description	Behavior
0213	Resource limitation: The SCP does not currently have enough resources to store the requested SOP Instance(s).	

4.2.3.3.2 Activity "Receive Initial Storage Commitment Request"

4.2.3.3.2.1 Description and Sequencing of Activities

When receiving an initial Storage Commitment request (N-ACTION-RQ) the ARTIS VE50 will accept it with an N-ACTION-RSP and trigger a check in the database for the required instances.

Information about success or failure of Storage Commitment will be signaled via the N-EVENT-REPORT primitive.

The SCU is responsible for creating a unique Transaction UID. The SCP will not check whether the UID is already in use or not.

4.2.3.3.2.2 Accepted Presentation Contexts

The ARTIS VE50 DICOM application supports the presentation contexts listed in the following table for the Storage Commitment Service Class.

Table 25: Acceptable Presentation Contexts for Activity "Receive Commitment Request"

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

4.2.3.3.2.3 SOP-specific Conformance for Storage Commitment SOP classes

There are only 2 different return status codes for the commitment request itself. They indicate only whether the request was successfully received or not.

Table 26: DICOM Command Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	Image received correctly (success notification is done after receiving, before indexing and storing)
Failure	Unable to Process	Cxxx	Error during instance reception
Failure	Data set does not match SOP Class	A9xx	The data set does not conform to the SOP Class contained in the resource.

4.2.4 Query/Retrieve AE Specification

4.2.4.1 SOP Classes

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

4.2.4.2 Association Policy

Table 27: Association Policies

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

The ARTIS VE50 contains a limitation of 512 kB for the maximum PDU size. By default, the PDU size is set to 32kB.

The maximum number of simultaneous receiving associations (SCP) is set to 12.

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

4.2.4.2.1 Asynchronous Nature

The ARTIS VE50 supports asynchronous communication (multiple outstanding transactions over a single association). On the SCU side the Window size proposed is infinite. On the SCP Side any non-infinite maximum size will be accepted.

Table 28: Asynchronous Nature as an Association Initiator

Maximum number of outstanding asynchronous transactions	10

4.2.4.2.2 Implementation Identifying Information

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

[1] Default, the value is configurable

4.2.4.3 Association Initiation Policy

4.2.4.3.1 Activity "Send Query Request" for Instances

4.2.4.3.1.1 Description and Sequencing of Activities

The ARTIS VE50 serves as an SCU for the following SOP Classes

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

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

4.2.4.3.1.2 Proposed Presentation Contexts

The ARTIS VE50 will propose Presentation Contexts as shown in the following table:

Table 29: Proposed Presentation Contexts for Query

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

Table 30: Extended Negotiation as an SCU

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

4.2.4.3.1.3 SOP Specific Conformance Statement to Query SOP classes

The ARTIS VE50 checks for the following status codes in the Query SCP's C-FIND-RSP:

Table 31: DICOM Command Response Status Handling Behavior

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

Table 32 below indicates the behavior if exceptions occur:

Table 32: DICOM Command Communication Failure Behavior

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

The ARTIS VE50 supports the following query levels:

- Study
- Series

Matching Keys on Instance Level is not supported by the ARTIS VE50 as SCU.

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

Table 33: Attributes supported for Study/Series Query – SCU

Attribute Name	Tag	Type	User input	UI
Study Level				
Patient's Name	(0010,0010)	O	enter value	Yes
Patient ID	(0010,0020)	O	enter value	Yes
Issuer of Patient ID	(0010,0021)	O	enter value	Yes
Patient's Birth Date	(0010,0030)	O	enter value	Yes
Patient's Birth Time	(0010,0032)	O	enter value	Yes
Patient's Sex	(0010,0040)	O	enter value	Yes

Attribute Name	Tag	Type	User input	UI
Accession Number	(0008,0050)	O	enter value	Yes
Study ID	(0020,0010)	O	enter value	Yes
Study Instance UID	(0020,000D)	U	enter value	Yes
Study Date	(0008,0020)	O	enter value	Yes
Study Time	(0008,0030)	O	enter value	Yes
Referring Physician' s Name	(0008,0090)	O	enter value	Yes
Study Description	(0008,1030)	O	enter value	Yes
Number of Study related Instances	(0020,1208)	O	-	Yes
Modalities in Study	(0008,0061)	O	enter value	Yes
Number of Study Related Series	(0020,1206)	O	-	Yes
Specific Character Set	(0008,0005)	O	-	No
Series Level				
Modality	(0008,0060)	O	enter value	Yes
Series Date	(0008,0021)	O	enter value	Yes
Series Time	(0008,0031)	O	enter value	Yes
Number of Series related Instances	(0020,1209)	O	-	Yes
Series Number	(0020,0011)	O	enter value	Yes
Series Description	(0008,103E)	O	enter value	Yes
Request Attributes Sequence \ Requested Procedure ID	(0040,0275) \ (0040,1001)	O	enter value	Yes
Request Attributes Sequence \ Scheduled Procedure Step ID	(0040,0275) \ (0040,0009)	O	enter value	Yes
Performed Procedure Step Start Date	(0040,0244)	O	enter value	Yes
Performed Procedure Step Start Time	(0040,0245)	O	enter value	Yes
Series Instance UID	(0020,000E)	U	-	Yes
Specific Character Set	(0008,0005)	O	-	No

Legend:

- U – Unique Key Attribute
- R – Required Key Attribute
- O – Optional Key Attribute

4.2.4.3.2 Activity "Send Move Request"

4.2.4.3.2.1 Description and Sequencing of Activities

The ARTIS VE50 serves as an SCU for the following SOP Classes

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

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

4.2.4.3.2.2 Proposed Presentation Contexts

The ARTIS VE50 proposes Presentation Contexts shown in the following table:

Table 34: Proposed Presentation Contexts for Retrieve and Activity "Send Move Request"

Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	**UID**	**Name List**	**UID List**		
Study Root Query/Retrieve Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

4.2.4.3.2.3 SOP Specific Conformance Statement for Move SCU Classes

The behavior of ARTIS VE50 when encountering status codes in a C-MOVE-RSP is summarized in Table 35

Table 35: DICOM Command Response Status Handling Behavior

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

Table 36 below indicates the behavior if exceptions occur:

Table 36: DICOM Command Communication Failure Behavior

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

4.2.4.4 Association Acceptance Policy

The ARTIS VE50 provides standard conformance as an SCP of the C-FIND and C-MOVE SOP Classes.

Latency

The ARTIS VE50 handles the Query/Retrieve equally using the *first came first served* principle. Latency can occur if the hardware capacity is not sufficient for serving all incoming requests immediately. Both factors, that can lead to latency (hardware capacity and number of incoming request) must be managed by the user of the ARTIS VE50.

The ARTIS VE50 does not support Storage Media File-Set ID and UID attributes in the N-ACTION message.

4.2.4.4.1 Activity "Receive Query Request"

4.2.4.4.1.1 Description and Sequencing of Activities

The ARTIS VE50 serves as an SCP for the following SOP Classes

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

Using the attributes specified by the user as Query Keys (in accordance with the query model) the Query SCP accepts a C-FIND-RQ and provides the responses for the requesting node.

4.2.4.4.1.2 Accepted Presentation Contexts

The ARTIS VE50 DICOM application supports the presentation contexts listed in the following table for the Query/Retrieve Service Class:

Table 37: Acceptable Presentation Contexts for "Receive Query Request"

Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Patient Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	Yes
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
Study Root Query/ Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	Yes
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

Patient/Study Only Query/ Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.3.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

Table 38: Extended Negotiation as an SCP

Name	UID	Extended Negotiation
Patient Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.1.1	Relational Query will be negotiated as defined in DICOM PS3.4
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Relational Query will be negotiated as defined in DICOM PS3.4

4.2.4.4.1.3 SOP-specific Conformance for Query/Retrieve SOP classes

The ARTIS VE50 provides one of the following status codes in the C-FIND-RSP:

Table 39: DICOM Command Response Status Handling Behavior

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

The ARTIS VE50 supports the following query levels:

- Study
- Series

Matching Keys on Instance Level is not supported by the ARTIS VE50 as SCP.

The following table lists the various attributes at Study and Series level, which can be used for hierarchical queries as well as return values for display

Table 40: Attributes supported for Study/Series Query – SCP

Attribute Name	Tag	Type
Study Level		
Patient's Name	(0010,0010)	O
Patient ID	(0010,0020)	O
Issuer of Patient ID	(0010,0021)	O
Patient's Birth Date	(0010,0030)	O
Patient's Birth Time	(0010,0032)	O
Patient's Sex	(0010,0040)	O
Accession Number	(0008,0050)	O
Study ID	(0020,0010)	O
Study Instance UID	(0020,000D)	U
Study Date	(0008,0020)	O
Study Time	(0008,0030)	O
Referring Physician' s Name	(0008,0090)	O
Study Description	(0008,1030)	O
Number of Study related Instances	(0020,1208)	O
Modalities in Study	(0008,0061)	O
Number of Study Related Series	(0020,1206)	O
Series Level		
Modality	(0008,0060)	O
Series Date	(0008,0021)	O
Series Time	(0008,0031)	O
Number of Series related Instances	(0020,1209)	O
Series Number	(0020,0011)	O
Series Description	(0008,103E)	O
Request Attributes Sequence \ Requested Procedure ID	(0040,0275) \ (0040,1001)	O
Request Attributes Sequence \ Scheduled Procedure Step ID	(0040,0275) \ (0040,0009)	O
Performed Procedure Step Start Date	(0040,0244)	O
Performed Procedure Step Start Time	(0040,0245)	O
Series Instance UID	(0020,000E)	U

Legend:

- U – Unique Key Attribute
- R – Required Key Attribute
- O – Optional Key Attribute

4.2.4.4.2 Activity "Receive Move Request"

4.2.4.4.2.1 Description and Sequencing of Activities

The ARTIS VE50 serves as an SCP for the following SOP Classes

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

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

4.2.4.4.2.2 Accepted Presentation Contexts

The ARTIS VE50 accepts Presentation Contexts shown in the following table:

Table 41: Proposed Presentation Contexts for Retrieve and Activity "MOVE SCP"

Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	**UID**	**Name List**	**UID List**		
Patient Root Query/Retrieve Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
Study Root Query/Retrieve Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
Patient/Study Root Query/Retrieve Model – MOVE	1.2.840.10008.5.1.4.1.2.3.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

4.2.4.4.2.3 SOP-specific Conformance for MOVE SOP classes

The behavior of ARTIS VE50 when encountering status codes in a C-MOVE-RSP is summarized in Table 42

Table 42: DICOM Command Response Status Handling Behavior

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

4.2.5 Modality Worklist AE Specification

4.2.5.1 SOP Classes

The Modality Worklist AE provides Standard Conformance to the SOP Classes listed in "Table 1: Network Services", section "Worklist Management (Modality Worklist Information Model – FIND)" in the "Conformance Statement Overview".

4.2.5.2 Association Policy

Table 43: Association Policies

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

The ARTIS VE50 contains a limitation of 512 kB for the maximum PDU size. By default, the PDU size is set to 32kB.

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

4.2.5.2.1 Asynchronous Nature

The ARTIS VE50 supports asynchronous communication (multiple outstanding transactions over a single association). On the SCU side the Window size proposed is infinite. On the SCP Side any non-infinite maximum size will be accepted.

Table 44: Asynchronous Nature as an Association Initiator

Maximum number of outstanding asynchronous transactions	10

4.2.5.2.2 Implementation Identifying Information

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

[1] Default, the value is configurable

4.2.5.3 Association Initiation Policy

4.2.5.3.1 Activity "Send Modality Worklist Query Request"

4.2.5.3.1.1 Description and Sequencing of Activities

The ARTIS VE50 serves as an SCU of the Modality Worklist Service. It performs worklist queries by issuing a C-FIND-RQ at regular intervals. In addition, a worklist request can be triggered manually.

4.2.5.3.1.2 Proposed Presentation Contexts

The ARTIS VE50 will propose Presentation Contexts as shown in the following table:

Table 45: Proposed Presentation Contexts for Worklist

Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	**UID**	**Name List**	**UID List**		
Modality Worklist- FIND	1.2.840.10008.5.1.4.31	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

4.2.5.3.1.3 SOP Specific Conformance for SOP Classes

Search Key Attributes of the Worklist C-FIND

The ARTIS VE50 Modality Worklist SCU supports "broad worklist queries" with all required search keys. The following tables describe the "broad query" search keys that the SCU supports. The individual query values are configurable in Service UI.

Table 46: Broad Query search keys

Attribute Name	Tag	Matching Key Type	Query Value
Scheduled Procedure Step			
Scheduled Procedure Step Sequence	(0040,0100)	R	
>Modality	(0008,0060)	R	
>Scheduled Station AE Title	(0040,0001)	R	
>Scheduled Procedure Step Start Date	(0040,0002)	R	Range from UI [1]
>Scheduled Station Name	(0040,0010)	O	
>Scheduled Procedure Step Location	(0040,0011)	O	
>Scheduled Procedure Step Status	(0040,0020)	O	
>Scheduled Performing Physician's Name	(0040,0006)	O	configurable service UI

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

Attribute Name	Tag	Matching Key Type	Query Value
Requested Procedure Description	(0032,1060)	O	
Requested Procedure Priority	(0040,1003)	O	
Patient Transport Arrangements	(0040,1004)	O	
Requested Procedure Comments	(0040,1400)	O	
Requested Procedure Code Sequence	(0032,1064)	O	
>Code Value	(0008,0100)	O	
Requesting Physician	(0032,1032)	O	
Referring Physicians Name	(0008,0090)	O	
Current Patient Location	(0038,0300)	O	
Pregnancy Status	(0010, 21C0)	O	
Medical Alerts	(0010,2000)	O	
Allergies	(0010,2110)	O	

Legend:

- U – Unique Key Attribute
- R – Required Key Attribute
- O – Optional Key Attribute

Return Key Attributes of the Modality Worklist C-FIND

The ARTIS VE50 Modality Worklist SCU supports worklist queries with return key attributes of all types. The following tables describe the return keys that the SCU supports.

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

Table 47: Modality Worklist C-Find Return Keys

Attribute Name	Tag	Return Key Type	UI	Notes
SOP Common				
Specific Character Set	(0008,0005)	1C	No	“Specific Character Set” is only set when characters from extended character sets are used in matching keys
Scheduled Procedure Step				
Scheduled Procedure Step Sequence	(0040,0100)	1	No	
>Modality	(0008,0060)	1	Yes	
>Scheduled Station AE Title	(0040,0001)	1	No	“Scheduled Station AE Title” is taken as default for “Performed Station AE Title”
>Scheduled Procedure Step Start Date	(0040,0002)	1	Yes	
>Scheduled Procedure Step Start Time	(0040,0003)	1	Yes	
>Scheduled Procedure Step End Date	(0040,0004)	3	No	

Attribute Name	Tag	Return Key Type	UI	Notes
>Scheduled Procedure Step End Time	(0040,0005)	3	No	
>Scheduled Performing Physician's Name	(0040,0006)	1	Yes	"Scheduled Performing Physician's Name" is taken as default for "Performing Physician's Name"
>Scheduled Procedure Step Description	(0040,0007)	1C	Yes	"Scheduled Procedure Step Description" is taken as default for "Performed Procedure Step Description"
>Scheduled Protocol Code Sequence	(0040,0008)	1C	No	Uses universal sequence match "Scheduled Protocol Code Sequence" is taken as default for "Performed Protocol Code Sequence"
>>Code Value	(0008,0100)	1C	No	
>>Coding Scheme Designator	(0008,0102)	1C	No	
>>Coding Scheme Version	(0008,0103)	3	No	
>>Code Meaning	(0008,0104)	3	No	
>>Mapping Resource	(0008,0105)	3	No	
>>Context Group Version	(0008,0106)	3	No	
>>Context Group Local Version	(0008,0107)	3	No	
>>Context Group Extension Flag	(0008,010B)	3	No	
>>Context Group Extension Creator UID	(0008,010D)	3	No	
>>Context Identifier	(0008,010F)	3	No	
>Scheduled Procedure Step ID	(0040,0009)	1	Yes	"Scheduled Procedure Step ID" is taken as default for "Performed Procedure Step ID"
>Scheduled Station Name	(0040,0010)	2	Yes	
>Scheduled Procedure Step Location	(0040,0011)	2	No	"Scheduled Procedure Step Location" is taken as default for "Performed Location"
>Scheduled Procedure Step Status	(0040,0020)	3	No	
>Comments on the Scheduled Procedure Step	(0040,0400)	3	No	
Requested Procedure				
Study Date	(0008,0020)	3	No	
Referenced Study Sequence	(0008,1110)	2	No	
>Referenced SOP Class UID	(0008,1150)	1C	No	
>Referenced SOP Instance UID	(0008,1155)	1C	No	
Study Instance UID	(0020,000D)	1	No	
Requested Procedure Description	(0032,1060)	1C	Yes	

Attribute Name	Tag	Return Key Type	UI	Notes
Requested Procedure Code Sequence	(0032,1064)	1C	No	"Requested Procedure Code Sequence" is taken as default for "Procedure Code Sequence"
>Code Value	(0008,0100)	1C	No	
>Coding Scheme Designator	(0008,0102)	1C	No	
>Coding Scheme Version	(0008,0103)	3	No	
>Code Meaning	(0008,0104)	3	No	
>>Mapping Resource	(0008,0105)	3	No	
>>Context Group Version	(0008,0106)	3	No	
>>Context Group Local Version	(0008,0107)	3	No	
>>Context Group Extension Flag	(0008,010B)	3	No	
>>Context Group Extension Creator UID	(0008,010D)	3	No	
>>Context Identifier	(0008,010F)	3	No	
Requested Procedure ID	(0040,1001)	1	Yes	"Requested Procedure ID" is taken as default for "Study ID"
Reason for the Requested Procedure	(0040,1002)	3	No	
Requested Procedure Priority	(0040,1003)	2	Yes	
Patient Transport Arrangements	(0040,1004)	2	No	
Confidentiality Code	(0040,1008)	3	No	
Reporting Priority	(0040,1009)	3	Yes	
Names of intended Recipients of Results	(0040,1010)	3	No	
Requested Procedure Comments	(0040,1400)	3	No	
Imaging Service Request				
Accession Number	(0008,0050)	2	Yes	
Referring Physician's Name	(0008,0090)	2	Yes	
Requesting Physician	(0032,1032)	2	Yes	
Requesting Service	(0032,1033)	3	No	
Issuing Date of Imaging Service Request	(0040,2004)	3	No	
Issuing Time of Imaging Service Request	(0040,2005)	3	No	
Placer Order Number / Imaging Service Request	(0040,2016)	3	No	Old tag (0040,2006) is retired and not used.
Filler Order Number / Imaging Service Request	(0040,2017)	3	No	Old tag (0040,2007) is retired and not used.
Order entered by …	(0040,2008)	3	No	
Order Enterer's location	(0040,2009)	3	No	

Attribute Name	Tag	Return Key Type	UI	Notes
Order Callback Phone Number	(0040,2010)	3	No	
Imaging Service Request Comments	(0040,2400)	3	No	
Visit Identification				
Admission ID	(0038,0010)	2	Yes	
Issuer of Admission ID	(0038,0011)	3	No	
Institution Name	(0008,0080)	3	No	
Institution Address	(0008,0081)	3	No	
Visit Status				
Current Patient Location	(0038,0300)	2	Yes	
Visit Admission				
Admitting Diagnosis Description	(0008,1080)	3	Yes	
Admitting Date	(0038,0020)	3	No	
Patient Identification				
Patient's Name	(0010,0010)	1	Yes	
Patient ID	(0010,0020)	1	Yes	
Issuer of Patient ID	(0010,0021)	3	No	
Other Patient IDs	(0010,1000)	3	Yes	
Other Patient Names	(0010,1001)	3	Yes	
Patient's Birth Name	(0010,1005)	3	No	
Patient Demographic				
Patient's Birth Date	(0010,0030)	2	Yes	
Patient's Birth Time	(0010,0032)	3	No	
Patient's Sex	(0010,0040)	2	Yes	
Patient's Insurance Plan Code Sequence	(0010,0050)	3	No	Uses universal sequence match
Patient's Age	(0010,1010)	3	No	
Patient's Size	(0010,1020)	3	Yes	
Patient's Weight	(0010,1030)	2	Yes	
Patient's Address	(0010,1040)	3	Yes	
Military Rank	(0010,1080)	3	Yes	
Branch of Service	(0010,1081)	3	No	
Ethnic Group	(0010,2160)	3	Yes	
Patient Comments	(0010,4000)	3	Yes	
Patient Medical				
Medical Alerts	(0010,2000)	2	Yes	
Allergies	(0010,2110)	2	Yes	

Attribute Name	Tag	Return Key Type	UI	Notes
Pregnancy Status	(0010,21C0)	2	Yes	
Smoking Status	(0010,21A0)	3	Yes	
Last Menstrual Date	(0010,21D0)	3	Yes	
Additional Patient History	(0010,21B0)	3	Yes	
Special Needs	(0038,0050)	2	Yes	

The behavior of the ARTIS VE50 when encountering status codes in a C-FIND-RSP is summarized in Table 48.

Table 48: DICOM Command Response Status Handling Behavior

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

Table 49 below indicates the behavior if exceptions occur:

Table 49: DICOM Command Communication Failure Behavior

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

4.2.5.4 Association Acceptance Policy

The ARTIS VE50 does not provide the functionality of an SCP of the Modality Worklist – Find SOP Class.

4.2.6 Modality Performed Procedure Step AE Specification

4.2.6.1 SOP Classes

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

4.2.6.2 Association Policy

Table 50: Association Policies

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

The ARTIS VE50 contains a limitation of 512 kB for the maximum PDU size. By default, the PDU size is set to 32kB.

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

4.2.6.2.1 Asynchronous Nature

The ARTIS VE50 supports asynchronous communication (multiple outstanding transactions over a single association). On the SCU side the Window size proposed is infinite. On the SCP Side any non-infinite maximum size will be accepted.

Table 51: Asynchronous Nature as an Association Initiator

Maximum number of outstanding asynchronous transactions	10

4.2.6.2.2 Implementation Identifying Information

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

4.2.6.3 Association Initiation Policy

4.2.6.3.1 Activity "Create Modality Performed Procedure Step"

4.2.6.3.1.1 Description and Sequencing of Activities

The ARTIS VE50 serves as an SCU of the Modality Performed Procedure Step SOP Class. It sends N-CREATE-RQ to inform the Information System that a Procedure Step has been started.

4.2.6.3.1.2 Accepted Presentation Contexts

The ARTIS VE50 proposes Presentation Contexts as shown in the following table:

Table 52: Acceptable Presentation Contexts Activity "Create MPPS"

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

[1] Default, the value is configurable

4.2.6.3.1.3 SOP specific Conformance for MPPS SOP class Table 40

The behavior of ARTIS VE50 when encountering status codes in an N-CREATE-RSP is summarized in Table 53:

Table 53: MPPS N-CREATE-RSP Status Handling Behavior

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

Table 54 shows the attributes supported in the MPPS N-CREATE-RQ message.

The following tables use a number of abbreviations. The abbreviations used in the “Presence” column are

- VNAP: Value is Not Always Present. Attribute is sent zero length if no value is present.
- ANAP: Attribute Not Always Present.
- ALWAYS: Attribute and Value are always present.
- EMPTY: Attribute is sent zero length.

The abbreviations used in the “Source” Column are

- MWL: The attribute value is copied from Modality Worklist.
- USER: The attribute value is entered by the user.
- AUTO: The attribute value is generated by the system.
- CONFIG: The attribute value is obtained by configuration

Table 54: Attributes supported in MPPS N-CREATE-RQ

Attribute	Tag	Source	Value	Presence	Comments
Specific Character Set	(0008,0005)	MWL/CONFIG		ANAP	
Performed Procedure Step Relationship					
Scheduled Step Attributes Sequence	(0040,0270)			ALWAYS	
>Study Instance UID	(0020,000D)	MWL/AUTO	From Modality Worklist or generated by device	ALWAYS	
>Referenced Study Sequence	(0008,1110)	MWL	From Modality Worklist	VNAP	
>>Referenced SOP Class UID	(0008,1150)	MWL	From Modality Worklist	ALWAYS	
>>Referenced SOP Instance UID	(0008,1155)	MWL	From Modality Worklist	ALWAYS	
>Accession Number	(0008,0050)	MWL/USER	From Modality Worklist or user input	VNAP	
>Placer Order Number / Imaging Service Request	(0040,2016)	MWL	From Modality Worklist	ANAP	

Attribute	Tag	Source	Value	Presence	Comments
>Filler Order Number / Imaging Service Request	(0040,2017)	MWL	From Modality Worklist	ANAP	
>Requested Procedure ID	(0040,1001)	MWL	From Modality Worklist	VNAP	
>Requested Procedure Description	(0032,1060)	MWL	From Modality Worklist	VNAP	
>Scheduled Procedure Step ID	(0040,0009)	MWL	From Modality Worklist	VNAP	
>Scheduled Procedure Step Description	(0040,0007)	MWL	From Modality Worklist	VNAP	
>Scheduled Protocol Code Sequence	(0040,0008)	AUTO		EMPTY	
>Requested Procedure ID	(0040,1001)	MWL	From Modality Worklist	VNAP	
Patient's Name	(0010,0010)	MWL/USER	From Modality Worklist or user input	ALWAYS	
Patient ID	(0010,0020)	MWL/USER	From Modality Worklist or user input	ALWAYS	
Issuer of Patient ID	(0010,0021)	MWL	From Modality Worklist	VNAP	
Patient's Birth Date	(0010,0030)	MWL/USER	From Modality Worklist or user input	ALWAYS	
Patient's Sex	(0010,0040)	MWL/USER	From Modality Worklist or user input	ALWAYS	
Referenced Patient Sequence	(0008,1120)	AUTO		EMPTY	
Performed Procedure Step Information					
Performed Procedure Step ID	(0040,0253)	AUTO	Generated by device	ALWAYS	
Performed Station AE Title	(0040,0241)	CONFIG	Local AE Title	ALWAYS	
Performed Station Name	(0040,0242)	CONFIG		EMPTY	
Performed Location	(0040,0243)	CONFIG		EMPTY	
Performed Procedure Step Start Date	(0040,0244)	AUTO		ALWAYS	
Performed Procedure Step Start Time	(0040,0245)	AUTO		ALWAYS	

Attribute	Tag	Source	Value	Presence	Comments
Performed Procedure Step Status	(0040,0252)	AUTO	“IN PROGRESS”	ALWAYS	
Performed Procedure Step Description	(0040,0254)	MWL	From Modality Worklist	VNAP	
Performed Procedure Type Description	(0040,0255)	AUTO		EMPTY	
Procedure Code Sequence	(0008,1032)	MWL	From Modality Worklist	VNAP	
>Code Value	(0008,0100)	MWL	From Modality Worklist	ALWAYS	
>Coding Scheme Designator	(0008,0102)	MWL	From Modality Worklist	ALWAYS	
>Code Meaning	(0008,0104)	MWL	From Modality Worklist	ALWAYS	
Performed Procedure Step End Date	(0040,0250)	AUTO		EMPTY	
Performed Procedure Step End Time	(0040,0251)	AUTO		EMPTY	
Performed Procedure Step Discontinuation Reason Code Sequence	(0040,0281)	AUTO		EMPTY	
Image Acquisition Results					
Modality	(0008,0060)	AUTO	“XA”	ALWAYS	
Study ID	(0020,0010)	MWL/USER/AUTO	Requested Procedure ID from Worklist or User Input or generated by device	ALWAYS	
Performed Protocol Code Sequence	(0040,0260)	AUTO		EMPTY	
Performed Series Sequence	(0040,0340)	AUTO		EMPTY	
Billing and Material Management					
Film Consumption Sequence	(0040,0321)	AUTO		EMPTY	
Billing Supplies And Devices Sequence	(0040,0324)	AUTO		EMPTY	
Radiation Dose					

Attribute	Tag	Source	Value	Presence	Comments
Anatomic Structure Space Or Region Sequence	(0008,2229)	AUTO		EMPTY	
Total Time Of Fluoroscopy	(0040,0300)	AUTO	Fixed Value '0'	ALWAYS	
Total Number Of Exposures	(0040,0301)	AUTO	Fixed Value '0'	ALWAYS	
Entrance Dose In mGy	(0040,8302)	AUTO	Fixed Value '0'	ALWAYS	
Image and Fluoroscopy Area Dose Product	(0018,115E)	AUTO	Fixed Value '0'	ALWAYS	
Exposure Dose Sequence	(0040,030E)	AUTO		EMPTY	

4.2.6.3.2 Activity "Update Modality Performed Procedure Step"

4.2.6.3.2.1 Description and Sequencing of Activities

When the procedure step has been finished, the ARTIS VE50 sends N-SET-RQ to inform the Information System about the finalization of the procedure step (COMPLETED or DISCONTINUED).

The following tables use a number of abbreviations. The abbreviations used in the "Presence" column are

- VNAP: Value is Not Always Present. Attribute is sent zero length if no value is present.
- ANAP: Attribute Not Always Present.
- ALWAYS: Attribute and Value are always present.
- EMPTY: Attribute is sent zero length.

The abbreviations used in the "Source" Column are

- MWL: The attribute value is copied from Modality Worklist.
- USER: The attribute value is entered by the user.
- AUTO: The attribute value is generated by the system.
- CONFIG: The attribute value is obtained by configuration

Table 55 shows the attributes supported in the N-SET-RQ message.

Table 55: Attributes supported in MPPS N-SET-RQ

Attribute	Tag	Source	Value	Presence	Comments
Specific Character Set	(0008,0005)	MWL/CONFIG		ANAP	
Performed Procedure Step Information					
Performed Procedure Step Status	(0040,0252)	AUTO	"COMPLETED", "DISCONTINUED"	ALWAYS	

Attribute	Tag	Source	Value	Presence	Comments
Performed Procedure Step Description	(0040,0254)	MWL		VNAP	
Performed Procedure Type Description	(0040,0255)	AUTO		EMPTY	
Procedure Code Sequence	(0008,1032)	MWL	From Modality Worklist	VNAP	
>Code Value	(0008,0100)	MWL	From Modality Worklist	ALWAYS	
>Coding Scheme Designator	(0008,0102)	MWL	From Modality Worklist	ALWAYS	
>Code Meaning	(0008,0104)	MWL	From Modality Worklist	ALWAYS	
Performed Procedure Step End Date	(0040,0250)	AUTO		ANAP	Set for status “COMPLETED” and “DISCONTINUED”
Performed Procedure Step End Time	(0040,0251)	AUTO		ANAP	Set for status “COMPLETED” and “DISCONTINUED”
Performed Procedure Step Discontinuation Reason Code Sequence	(0040,0281)	AUTO	One item when procedure was discontinued	VNAP	
>Code Value	(0008,0100)	USER	See Table 56 for possible discontinuation reasons	ALWAYS	
>Coding Scheme Designator	(0008,0102)	USER	“DCM”	ALWAYS	
>Code Meaning	(0008,0104)	USER	See Table 56 for possible discontinuation reasons	ALWAYS	
Image Acquisition Results					
Performed Protocol Code Sequence	(0040,0260)	AUTO		EMPTY	
Performed Series Sequence	(0040,0340)	AUTO	One item for each stored series up to now	ALWAYS	
>Performing Physician Name	(0008,1050)	MWL/USER	From Modality Worklist or user input	VNAP	
>Protocol Name	(0018,1030)	AUTO	Name of Acquisition Program	ALWAYS	
> Operators’ Name	(0008,1070)	USER		VNAP	
>Series Instance UID	(0020,000E)	AUTO		ALWAYS	

Attribute	Tag	Source	Value	Presence	Comments
>Series Description	(0008,103E)	AUTO		ALWAYS	
>Retrieve AE Title	(0008,0054)	AUTO		EMPTY	
>Referenced Image Sequence	(0008,1140)	AUTO	Reference to stored image	VNAP	
>> Referenced SOP Class UID	(0008,1150)	AUTO		ALWAYS	
>> Referenced SOP Instance UID	(0008,1155)	AUTO		ALWAYS	
>Referenced Non-Image Composite SOP Instance Sequence	(0040,0220)	AUTO		EMPTY	
Billing and Material Management					
Film Consumption Sequence	(0040,0321)	AUTO		EMPTY	
Billing Supplies And Devices Sequence	(0040,0324)	AUTO		EMPTY	
Radiation Dose					
Anatomic Structure Space Or Region Sequence	(0008,2229)	AUTO		EMPTY	
Total Time Of Fluoroscopy	(0040,0300)	AUTO		ALWAYS	
Total Number Of Exposures	(0040,0301)	AUTO		ALWAYS	
Entrance Dose In mGy	(0040,8302)	AUTO	Dose applied up to now, related to reference point	ALWAYS	
Image and Fluoroscopy Area Dose Product	(0018,115E)	AUTO	Accumulated Dose Aera Product up to now	ALWAYS	
Exposure Dose Sequence	(0040,030E)	AUTO	One item for each performed irradiation event	ALWAYS	
>Radiation Mode	(0018,115A)	AUTO	“PULSED”	ALWAYS	
>KVP	(0018,0060)	AUTO		ALWAYS	
>X-Ray Tube Current in µA	(0018,8151)	AUTO		ALWAYS	
>Exposure Time	(0018,1150)	AUTO		ALWAYS	
>Comments On Radiation Dose	(0040,0310)	AUTO	Additional info about time, focus, mode and plane	ALWAYS	
>Distance Source To Detector	(0018,1110)	AUTO		ALWAYS	

Attribute	Tag	Source	Value	Presence	Comments
>Image And Fluoroscopy Area Dose Product	(0018,115E)	AUTO	Dose Aera Product for this event	ALWAYS	
>Entrance Dose In mGy	(0040,8302)	AUTO	Dose applied for this event, related to reference point	ALWAYS	
>Protocol Name	(0018,1030)	AUTO	Name of Acquisition Program	ALWAYS	

Table 56 shows the Discontinuation Reasons supported.

Table 56: Modality PPS Discontinuation Reasons supported

Code Value	Code Meaning
110500	Doctor cancelled procedure
110501	Equipment failure
110502	Incorrect procedure ordered
110503	Patient allergic to media/contrast
110504	Patient died
110505	Patient refused to continue procedure
110506	Patient taken for treatment or surgery
110507	Patient did not arrive
110508	Patient pregnant
110509	Change of procedure for correct charging
110510	Duplicate order
110511	Nursing unit cancel
110512	Incorrect side ordered
110513	Discontinued for unspecified reason
110514	Incorrect worklist entry selected
110515	Patient condition prevented continuing
110516	Equipment change
110500	Doctor cancelled procedure

4.2.6.3.2.2 Proposed Presentation Contexts

The ARTIS VE50 proposes Presentation Contexts as shown in the following table:

Table 57: Acceptable Presentation Contexts Activity "Update MPPS"

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

4.2.6.3.2.3 SOP specific Conformance for MPPS SOP class

The behavior of ARTIS VE50 when encountering status codes in an N-SET-RSP is summarized in Table 58:

Table 58: MPPS N-SET-RSP Status Handling Behavior

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

4.2.6.4 Association Acceptance Policy

The ARTIS VE50 does not provide the functionality of an SCP of the Modality Performed Procedure Step SOP Class.

4.2.7 Print AE Specification

4.2.7.1 SOP Classes

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

4.2.7.2 Association Policy

Table 59: Association Policies

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

The ARTIS VE50 contains a limitation of 512 kB for the maximum PDU size. By default, the PDU size is set to 32kB.

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

[1] Default, the value is configurable

4.2.7.2.1 Asynchronous Nature

The ARTIS VE50 supports asynchronous communication (multiple outstanding transactions over a single association). On the SCU side the Window size proposed is infinite. On the SCP Side any non-infinite maximum size will be accepted.

Table 60: Asynchronous Nature as an Association Initiator

Maximum number of outstanding asynchronous transactions	10

4.2.7.3 Association Initiation Policy

4.2.7.3.1 Activity "Print Film"

4.2.7.3.1.1 Description and Sequencing of Activities

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

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

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

4.2.7.3.1.2 Proposed Presentation Context

The ARTIS VE50 proposes Presentation Contexts as shown in the following table:

Table 61: Presentation Contexts for the Activity "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	1.2.840.10008.1.2	SCU	None
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Film Sessions SOP Class	1.2.840.10008.5.1.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Color Image Box SOP Class	1.2.840.10008.5.1.1.4.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Printer SOP Class	1.2.840.10008.5.1.1.16	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Print Job SOP Class	1.2.840.10008.5.1.1.14	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Presentation LUT SOP Class	1.2.840.10008.5.1.1.23	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

4.2.7.3.1.3 SOP Specific Conformance

The ARTIS VE50 Print SCU conforms to the DICOM Basic Grayscale Print Management Meta SOP Class and the Basic Color Print Management Meta SOP Class.

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

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

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

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

The ARTIS VE50 Print Management SCU supports the following DIMSE Service elements for the Basic Film Session SOP Class as SCU:

- N-CREATE
- N-DELETE

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

Table 62: Attributes for the N-CREATE-RQ of the Basic Film Session

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

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

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

Table 63: N-CREATE-RSP Status Handling Behavior for the Basic Film Session

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

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

Basic Film Box SOP Class

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

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

The ARTIS VE50 Print Management SCU supports the following DIMSE Service elements for the Basic Film Box SOP Class as SCU:

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

The Basic Film Box SOP Class N-CREATE-RQ message uses the attributes listed below. The actual values for each attribute depend on DICOM printer configuration within the ARTIS VE50 DICOM Print Management SCU:

Table 64: Attributes for the N-CREATE-RQ of the Basic Film Session

Attribute Name	Tag	Usage SCU	Supported Values
Image Display Format	(2010,0010)	M	STANDARD\1,1
Referenced Film Session Sequence	(2010,0500)	M	
> Referenced SOP Class UID	(0008,1150)	M	1.2.840.10008.5.1.1.1
> Referenced SOP Instance UID	(0008,1155)	M	
Film Orientation	(2010,0040)	M	PORTRAIT, LANDSCAPE
Film Size ID	(2010,0050)	M	8INX10IN, 10INX12IN, 10INX14IN, 11INX14IN, 14INX14IN, 14INX17IN, 24CMX24CM, 24CMX30CM
Magnification Type	(2010,0060)	M	BILINEAR, CUBIC, NONE, REPLICATE
Border Density	(2010,0100)	U	BLACK, WHITE
Max Density	(2010,0130)	U	0 < Value
Min Density	(2010,0120)	U	0 < Value < 50
Required if Presentation LUT is present			
Reflective Ambient Light	(2010,0160)	U	0 < Value
Illumination	(2010,015E)	U	0 < Value
Referenced Presentation LUT Sequence	(2050,0500)	U	

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

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

When all Image Boxes (including parameters) for the film-sheet have been set, the ARTIS VE50 print manager will issue an N-ACTION-RQ message with the SOP Instance UID of the Basic Film Box and the Action Type ID of 1.

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

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

Table 65: N-CREATE-RSP Status Handling Behavior for Basic Film Box

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

Table 66: N-ACTION-RSP Status Handling Behavior for Basic Film Box

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

Basic Grayscale Image Box SOP Class

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

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

Table 67: Attributes for N-SET-RQ of Basic Grayscale Image Box

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

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

Table 68: N-SET-RSP Status Handling Behavior for the Basic Grayscale Image Box SOP Class

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

Basic Color Image Box SOP Class

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

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

Table 69: Attributes for N-SET-RQ of Basic Color Image Box

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

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

Table 70: N-SET-RSP Status Handling Behavior for the Color Grayscale Image Box

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

	Image size or Combined Print Image size is larger than the Image Box size. Image or Combined Print Image has been decimated to fit.	B60A	Print job continues and warning is logged
Success	Image successfully stored in Image Box	0000	Print job continues

Presentation LUT SOP Class

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

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

The ARTIS VE50 Print Management SCU supports the following DIMSE Service elements for the Basic Film Session SOP Class as SCU:

- N-CREATE
- N-DELETE

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

Table 71: Attributes for N-CREATE-RQ of Presentation LUT SOP Class

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

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

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

Table 72: N-**CREATE-RSP Status Handling Behavior for the Presentation LUT SOP Class**

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

Printer SOP Class

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

When used synchronously the ARTIS VE50 Print SCU uses the N-GET-RQ to request information about the printer status. It uses the attributes listed in the table below.

Table 73: Attributes for N-GET-RQ of the Printer SOP Class

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

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

Table 74: DICOM Command Communication Failure Behavior

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

4.2.7.4 Association Acceptance Policy

4.2.7.4.1 Activity "Receive Printer Status Change Information"

4.2.7.4.1.1 Description and Sequencing of Activities

The ARTIS VE50 supports the reverse role negotiation of the Printer SOP Class. Receiving the N-EVENT-REPORT-RQ from a printer the ARTIS VE50 is asynchronously informed about changes of the printer status.

4.2.7.4.1.2 Accepted Presentation Context

The ARTIS VE50 accepts Presentation Contexts as shown in the following table:

Table 75: Presentation Contexts for the Activity "Print Film"

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

4.2.7.4.1.3 SOP Specific Conformance

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

Table 76: Attributes for the N-EVENT-REPORT-RQ of the Printer SOP Class

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

4.2.7.4.2 Activity "Receive Print Job Status Information"

4.2.7.4.2.1 Description and Sequencing of Activities

The ARTIS VE50 supports the reverse role negotiation of the Print Job SOP Class. Receiving the N-EVENT-REPORT-RQ from a printer the ARTIS VE50 is asynchronously informed about the status of a print job for monitoring its progress.

4.2.7.4.2.2 Accepted Presentation Context

The ARTIS VE50 accepts Presentation Contexts as shown in the following table:

Table 77: Presentation Contexts for the Activity "Print Management"

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

4.2.7.4.2.3 SOP Specific Conformance

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

Table 78: Attributes for the N-EVENT-REPORT-RQ of the Print Job SOP Class

Event-type Name	Event	Attributes	Tag	Usage SCU
Pending	1	Execution Status Info	(2100,0030)	U
		Print Job ID	(2100,0010)	-- (Print Queue Management SOP Class not supported)
		Film Session Label	(2000,0050)	U
		Printer Name	(2110,0030)	U
Printing	2	Execution Status Info	(2100,0030)	U
		Print Job ID	(2100,0010)	-- (Print Queue Management SOP Class not supported)
		Film Session Label	(2000,0050)	U
		Printer Name	(2110,0030)	U
Done	3	Execution Status Info	(2100,0030)	U
		Print Job ID	(2100,0010)	-- (Print Queue Management SOP Class not supported)
		Film Session Label	(2000,0050)	U
		Printer Name	(2110,0030)	U
Failure	4	Execution Status Info	(2100,0030)	U
		Print Job ID	(2100,0010)	-- (Print Queue Management SOP Class not supported)
		Film Session Label	(2000,0050)	U
		Printer Name	(2110,0030)	U

4.3 Network Interfaces

4.3.1 Physical Network Interface

The ARTIS VE50 provides DICOM 3.0 TCP/IP network communication support as defined in Part 8 of the DICOM Standard. The network communication is independent from the physical medium over which TCP/IP executes; it inherits this from the Windows OS system upon which it executes.

4.3.2 Additional Protocols

None

4.3.3 IPv4 and IPv6 Support

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

4.4 Configuration

4.4.1 AE Title/Presentation Address Mapping

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

4.4.1.1 Local AE Titles

The ARTIS VE50 allows to configure AE Titles, Ports and Services in any wished way. Default delivery is that all Services are using the same AE title and only one port number. In case the connected systems cannot handle this default, the customer Service engineer is able to configure for each Service its own AE title and Port number.

Table 79: AE Titles

Parameter	Configurable	Default Value
Default AE title	Yes	hostname in uppercase characters; limited to 16 characters
Default Basic Port	Yes	104
Default Secure Port	Yes	2762

4.4.1.2 Remote AE Title/Presentation Address Mapping

4.4.1.2.1 Remote Association Initiators

All relevant remote applications that may setup DICOM associations towards ARTIS VE50 need to be configured in ARTIS VE50, before the association can be established. This behavior is configurable, but it is recommended, not to change this behavior.

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

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

Remote Application Entities can be configured without restarting the process.

4.4.1.2.2 Remote Association Acceptors

For remote applications that shall be able to accept DICOM associations from ARTIS VE50, the following information needs to be available:

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

The remote system will be indicated in the UI of ARTIS VE50 with a logical name, which is also entered when configuring the node in the administration UI.

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

Remote Application Entities can be configured without restarting the process.

4.4.1.3 Secure DICOM Communication

The system supports configuring the DICOM communication to use secure channel (TLS) between ARTIS VE50 and configured remote nodes. As a security measure the certificate thumbprint or certificate trust chain of the remote nodes shall be added (pinned) to the ARTIS VE50 system to authorize the incoming connection.

Detailed instructions how to set up secure DICOM communication are available in the Administrator Online Help.

Note: The default DICOM port will change to 2762.

If the certificate of remote node contains Enhanced Key Usage (Extended Key Usage) field, then:

- If the remote node acts as DICOM SCP it shall contain Server Authentication (1.3.6.1.5.5.7.3.1)
- If the remote node acts as a DICOM SCU it shall contain Client Authentication (1.3.6.1.5.5.7.3.2)

Otherwise ARTIS VE50 will not accept the certificate.

4.4.2 Parameters

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

Table 80: Parameter List

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

5 Media Interchange

5.1 Implementation Model

5.1.1 Application Data Flow Diagram

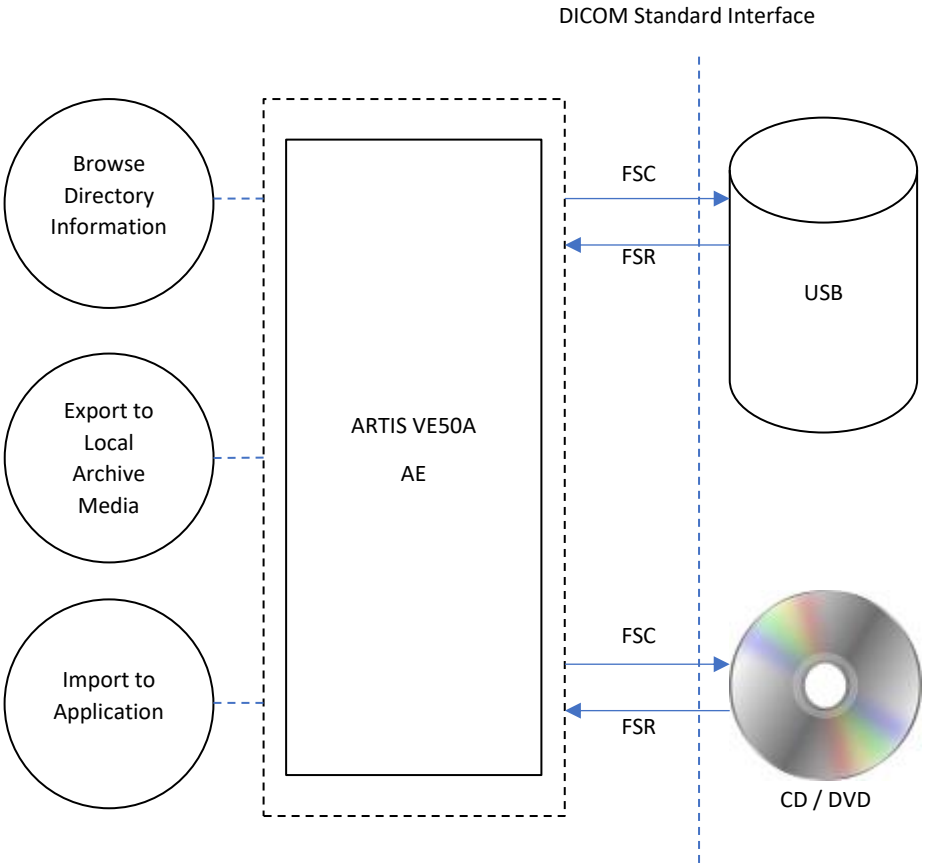


Figure 5: Media Interchange Application Data Flow Diagram

The ARTIS VE50 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: Network Services are supported for the Import/Export functionality.

5.1.2 Functional definitions of AEs

The ARTIS VE50 application is capable of

- provide browsing windows for Import from and Export to the File System
- 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 VE50 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, DVD-J2K profile is used.

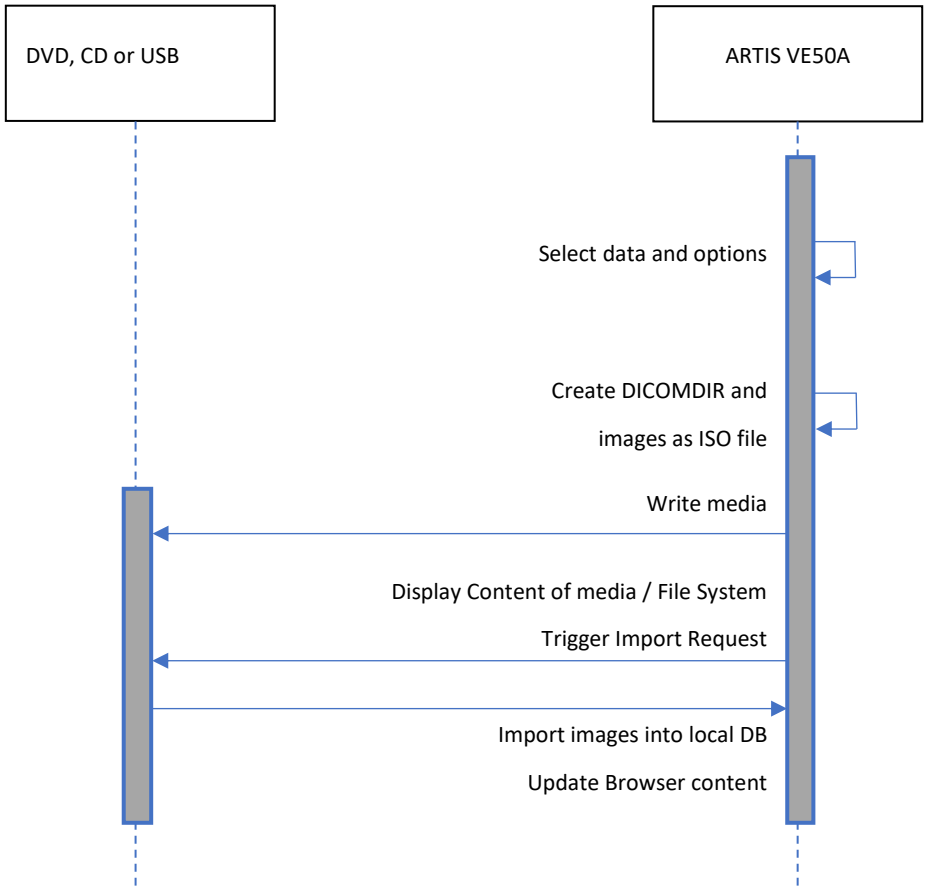


Figure 6: Sequence diagram – Media creation

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 81: Implementation Class/Version Name - Media Interchange

File Meta Information Version	0001
Implementation Class UID	1.3.12.2.1107.5.4.5
Implementation Version Name	“SHC_ARTIS_VE50”

5.2 AE Specifications

5.2.1 Media Storage AE – Specification

The ARTIS VE50 provides conformance to the following Application Profiles as an FSC as well as an FSR. The FSU role is only supported on a non-optical Storage device (e. g. USB stick).

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

Table 82: Media - Application Profiles and Real World Activities

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

5.2.1.1 Real World Activities

5.2.1.1.1 Activity “Browse Directory Information”

The ARTIS VE50 acts as FSR using the interchange option when requested to read the media directory.

The ARTIS VE50 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 Activity “Import into Application”

The ARTIS VE50 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, which are valid for the application profile supported and supported by ARTIS VE50 can be retrieved from media.

5.2.1.1.3 Activity “Export to local Archive Media”

The ARTIS VE50 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 VE50 has not already processed the generated ISO file.

The ARTIS VE50 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 VE50 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 VE50 provides Standard Conformance to the SOP Classes listed in "Table 1: Network Services" section "SOP Classes Created by the ARTIS VE50" and "SOP Classes Managed by the ARTIS VE50" in the "Conformance Statement Overview".

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

Table 83: Transfer Syntaxes for STD-GEN-DVD-J2K and STD-GEN-USB-J2K

UID value	Transfer Syntax	Image Objects	Non-Image Objects
1.2.840.10008.1.2.1	Explicit VR Little Endian	Yes	Yes
1.2.840.10008.1.2.4.50	JPEG Baseline (Process 1) lossy compressed	Yes	No
1.2.840.10008.1.2.4.51	JPEG Extended (Process 2 & 4) lossy compressed	Yes	No
1.2.840.10008.1.2.4.70	JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14) lossless compressed	Yes	No
1.2.840.10008.1.2.4.90	JPEG 2000 Image Compression (Lossless Only) compressed	Yes	No
1.2.840.10008.1.2.4.91	JPEG 2000 Image Compression lossy compressed	Yes	No
1.2.840.10008.1.2.5	RLE Lossless compressed	Yes	No

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

5.2.2 Augmented Application Profiles

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

Table 84: Private SOP Classes and Transfer Syntaxes for Augmented Media Profiles

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

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

5.3 Media Configuration

None

6 Support of Extended Character Sets

The ARTIS VE50 DICOM application supports the following character sets as defined in the four tables below:

Table 85: Single-Byte Character Sets without Code Extension

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

Table 86: 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

Table 87: 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 88: 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
Korean	ISO 2022 IR 149	ISO 2022	ESC 02/04 02/09 04/03	ISO-IR 149	KS X 1001: Hangul and Hanja

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

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

- Convert each illegal character to '?'

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 VE50 supports Kanji characters in the byte zones after 74 (79, 7A, 7B and 7C).

7 Attribute confidentiality profiles

7.1 Data Minimization

The ARTIS VE50 application can minimize the data exported to Media. Three different levels of data minimization are supported:

- High Privacy
- Reduced Privacy
- Low Privacy

The user needs to select the appropriate data minimization level during export.

Handling public attributes during data minimization:

- Attributes listed in Table 89: Application Level Confidentiality Profile attributes (standard tags) will be affected by the data minimization as specified for the different levels. Attributes not listed in the table are not PII / PHI relevant and will not be affected by the data minimization.

Handling private attributes during data minimization:

- Hight Privacy: private attributes are not included
- Reduced Privacy: private attributes are not included. Retains longitudinal temporal information with full dates and retains patient characteristic (for example: age, size, weight, pregnancy status…). By combining indirect patient identifiers (as age, size, weight and examination date) with external information, the patient can be re-identifiable.
- Low Privacy: all private attributes are included.

In the following table for attributes marked with:

- 'Yes' - affected by data minimization
- 'No' - not affected by data minimization

Table 89: Application Level Confidentiality Profile attributes (standard tags)

DICOM Tag	Attribute Name	High Privacy	Reduced Privacy	Low Privacy
(0000,1000)	Affected SOP Instance UID	Yes	Yes	No
(0000,1001)	Requested SOP Instance UID	Yes	Yes	No
(0002,0003)	Media Storage SOP Instance UID	Yes	Yes	No
(0004,1511)	Referenced SOP Instance UID in File	Yes	Yes	No
(0008,0014)	Instance Creator UID	Yes	Yes	No
(0008,0015)	Instance Coercion DateTime	Yes	No	No
(0008,0018)	SOP Instance UID	Yes	Yes	No
(0008,0020)	Study Date	Yes	No	No
(0008,0021)	Series Date	Yes	No	No
(0008,0022)	Acquisition Date	Yes	No	No
(0008,0023)	Content Date	Yes	No	No
(0008,0024)	Overlay Date	Yes	No	No
(0008,0025)	Curve Date	Yes	No	No
(0008,002A)	Acquisition DateTime	Yes	No	No
(0008,0030)	Study Time	Yes	No	No
(0008,0031)	Series Time	Yes	No	No

DICOM Tag	Attribute Name	High Privacy	Reduced Privacy	Low Privacy
(0008,0032)	Acquisition Time	Yes	No	No
(0008,0033)	Content Time	Yes	No	No
(0008,0034)	Overlay Time	Yes	No	No
(0008,0035)	Curve Time	Yes	No	No
(0008,0050)	Accession Number	Yes	Yes	No
(0008,0058)	Failed SOP Instance UID List	Yes	Yes	No
(0008,0080)	Institution Name	Yes	Yes	No
(0008,0081)	Institution Address	Yes	Yes	No
(0008,0082)	Institution Code Sequence	Yes	Yes	No
(0008,0090)	Referring Physician's Name	Yes	Yes	Yes
(0008,0092)	Referring Physician's Address	Yes	Yes	Yes
(0008,0094)	Referring Physician's Telephone Numbers	Yes	Yes	Yes
(0008,0096)	Referring Physician's Identification Sequence	Yes	Yes	No
(0008,010D)	Context Group Extension Creator UID	Yes	Yes	No
(0008,0201)	Time zone Offset From UTC	Yes	No	No
(0008,1010)	Station Name	Yes	Yes	Yes
(0008,1030)	Study Description	Yes	Yes	No
(0008,103E)	Series Description	Yes	Yes	No
(0008,1040)	Institutional Department Name	Yes	Yes	No
(0008,1048)	Physician(s) of Record	Yes	Yes	Yes
(0008,1049)	Physician(s) of Record Identification Sequence	Yes	Yes	No
(0008,1050)	Performing Physicians' Name	Yes	Yes	Yes
(0008,1052)	Performing Physicians' Identification Sequence	Yes	Yes	No
(0008,1060)	Name of Physician(s) Reading Study	Yes	Yes	Yes
(0008,1062)	Physician Reading Study Identification Sequence	Yes	Yes	No
(0008,1070)	Operators' Name	Yes	Yes	Yes
(0008,1072)	Operators' Identification Sequence	Yes	Yes	No
(0008,1080)	Admitting Diagnoses Description	Yes	Yes	No
(0008,1084)	Admitting Diagnoses Code Sequence	Yes	Yes	No
(0008,1110)	Referenced Study Sequence	Yes	No	No
(0008,1111)	Referenced Performed Procedure Step Sequence	Yes	No	No
(0008,1120)	Referenced Patient Sequence	Yes	Yes	No
(0008,1140)	Referenced Image Sequence	Yes	No	No
(0008,1155)	Referenced SOP Instance UID	Yes	Yes	No
(0008,1195)	Transaction UID	Yes	Yes	No
(0008,2111)	Derivation Description	Yes	No	No

DICOM Tag	Attribute Name	High Privacy	Reduced Privacy	Low Privacy
(0008,2112)	Source Image Sequence	Yes	No	No
(0008,3010)	Irradiation Event UID	Yes	Yes	No
(0008,4000)	Identifying Comments	Yes	Yes	No
(0008,9123)	Creator Version UID	Yes	Yes	No
(0010,0010)	Patient's Name	Yes	Yes	Yes
(0010,0020)	Patient ID	Yes	Yes	Yes
(0010,0021)	Issuer of Patient ID	Yes	Yes	No
(0010,0030)	Patient's Birth Date	Yes	Yes	Yes
(0010,0032)	Patient's Birth Time	Yes	Yes	No
(0010,0040)	Patient's Sex	Yes	No	No
(0010,0050)	Patient's Insurance Plan Code Sequence	Yes	Yes	Yes
(0010,0101)	Patient's Primary Language Code Sequence	Yes	Yes	Yes
(0010,0102)	Patient's Primary Language Modifier Code Sequence	Yes	Yes	Yes
(0010,1000)	Other Patient IDs	Yes	Yes	Yes
(0010,1001)	Other Patient Names	Yes	Yes	Yes
(0010,1002)	Other Patient IDs Sequence	Yes	Yes	Yes
(0010,1005)	Patient's Birth Name	Yes	Yes	Yes
(0010,1010)	Patient's Age	Yes	No	No
(0010,1020)	Patient's Size	Yes	No	No
(0010,1030)	Patient's Weight	Yes	No	No
(0010,1040)	Patient Address	Yes	Yes	Yes
(0010,1050)	Insurance Plan Identification	Yes	Yes	No
(0010,1060)	Patient's Mother's Birth Name	Yes	Yes	Yes
(0010,1080)	Military Rank	Yes	Yes	No
(0010,1081)	Branch of Service	Yes	Yes	No
(0010,1090)	Medical Record Locator	Yes	Yes	No
(0010,1100)	Referenced Patient Photo Sequence	Yes	Yes	No
(0010,2000)	Medical Alerts	Yes	Yes	No
(0010,2110)	Allergies	Yes	Yes	No
(0010,2150)	Country of Residence	Yes	Yes	No
(0010,2152)	Region of Residence	Yes	Yes	No
(0010,2154)	Patient's Telephone Number	Yes	Yes	Yes
(0010,2160)	Ethnic Group	Yes	No	No
(0010,2180)	Occupation	Yes	Yes	No
(0010,21A0)	Smoking Status	Yes	No	No
(0010,21B0)	Additional Patient's History	Yes	Yes	Yes

DICOM Tag	Attribute Name	High Privacy	Reduced Privacy	Low Privacy
(0010,21C0)	Pregnancy Status	Yes	No	No
(0010,21D0)	Last Menstrual Date	Yes	No	No
(0010,21F0)	Patient's Religious Preference	Yes	Yes	No
(0010,2203)	Patient Sex Neutered	Yes	No	No
(0010,2297)	Responsible Person	Yes	Yes	No
(0010,2299)	Responsible Organization	Yes	Yes	No
(0010,4000)	Patient Comments	Yes	Yes	Yes
(0018,0010)	Contrast Bolus Agent	Yes	Yes	No
(0018,1000)	Device Serial Number	Yes	Yes	No
(0018,1002)	Device UID	Yes	Yes	No
(0018,1004)	Plate ID	Yes	Yes	No
(0018,1005)	Generator ID	Yes	Yes	No
(0018,1007)	Cassette ID	Yes	Yes	No
(0018,1008)	Gantry ID	Yes	Yes	No
(0018,1030)	Protocol Name	Yes	Yes	No
(0018,1400)	Acquisition Device Processing Description	Yes	Yes	No
(0018,2042)	Target UID	Yes	Yes	No
(0018,4000)	Acquisition Comments	Yes	Yes	No
(0018,700A)	Detector ID	Yes	Yes	No
(0018,9424)	Acquisition Protocol Description	Yes	Yes	No
(0018,9516)	Start Acquisition DateTime	Yes	No	No
(0018,9517)	End Acquisition DateTime	Yes	No	No
(0018,A003)	Contribution Description	Yes	Yes	No
(0020,000D)	Study Instance UID	Yes	Yes	No
(0020,000E)	Series Instance UID	Yes	Yes	No
(0020,0010)	Study ID	Yes	Yes	No
(0020,0052)	Frame of Reference UID	Yes	Yes	No
(0020,0200)	Synchronization Frame of Reference UID	Yes	Yes	No
(0020,3401)	Modifying Device ID	Yes	Yes	No
(0020,3404)	Modifying Device Manufacturer	Yes	Yes	No
(0020,3406)	Modified Image Description	Yes	Yes	No
(0020,4000)	Image Comments	Yes	Yes	No
(0020,9158)	Frame Comments	Yes	Yes	No
(0020,9161)	Concatenation UID	Yes	Yes	No
(0020,9164)	Dimension Organization UID	Yes	No	No
(0028,1199)	Palette Color Lookup Table UID	Yes	Yes	No

DICOM Tag	Attribute Name	High Privacy	Reduced Privacy	Low Privacy
(0028,1214)	Large Palette Color Lookup Table UID	Yes	Yes	No
(0028,4000)	Image Presentation Comments	Yes	Yes	No
(0032,0012)	Study ID Issuer	Yes	Yes	No
(0032,1020)	Scheduled Study Location	Yes	Yes	No
(0032,1021)	Scheduled Study Location AE Title	Yes	Yes	No
(0032,1030)	Reason for Study	Yes	Yes	No
(0032,1032)	Requesting Physician	Yes	Yes	No
(0032,1033)	Requesting Service	Yes	Yes	No
(0032,1060)	Requested Procedure Description	Yes	Yes	No
(0032,1070)	Requested Contrast Agent	Yes	Yes	No
(0032,4000)	Study Comments	Yes	Yes	No
(0038,0004)	Referenced Patient Alias Sequence	Yes	Yes	No
(0038,0010)	Admission ID	Yes	Yes	No
(0038,0011)	Issuer of Admission ID	Yes	Yes	No
(0038,001E)	Scheduled Patient Institution Residence	Yes	Yes	No
(0038,0020)	Admitting Date	Yes	No	No
(0038,0021)	Admitting Time	Yes	No	No
(0038,0040)	Discharge Diagnosis Description	Yes	Yes	No
(0038,0050)	Special Needs	Yes	Yes	No
(0038,0060)	Service Episode ID	Yes	Yes	No
(0038,0061)	Issuer of Service Episode ID	Yes	Yes	No
(0038,0062)	Service Episode Description	Yes	Yes	No
(0038,0300)	Current Patient Location	Yes	Yes	No
(0038,0400)	Patient’s Institution Residence	Yes	Yes	No
(0038,0500)	Patient State	Yes	Yes	No
(0038,4000)	Visit Comments	Yes	Yes	No
(0040,0001)	Scheduled Station AE Title	Yes	Yes	No
(0040,0002)	Scheduled Procedure Step Start Date	Yes	No	No
(0040,0003)	Scheduled Procedure Step Start Time	Yes	No	No
(0040,0004)	Scheduled Procedure Step End Date	Yes	No	No
(0040,0005)	Scheduled Procedure Step End Time	Yes	No	No
(0040,0006)	Scheduled Performing Physician Name	Yes	Yes	No
(0040,0007)	Scheduled Procedure Step Description	Yes	Yes	No
(0040,000B)	Scheduled Performing Physician Identification Sequence	Yes	Yes	No
(0040,0010)	Scheduled Station Name	Yes	Yes	No
(0040,0011)	Scheduled Procedure Step Location	Yes	Yes	No

DICOM Tag	Attribute Name	High Privacy	Reduced Privacy	Low Privacy
(0040,0012)	Pre-Medication	Yes	Yes	No
(0040,0241)	Performed Station AE Title	Yes	Yes	No
(0040,0242)	Performed Station Name	Yes	Yes	No
(0040,0243)	Performed Location	Yes	Yes	No
(0040,0244)	Performed Procedure Step Start Date	Yes	No	No
(0040,0245)	Performed Procedure Step Start Time	Yes	No	No
(0040,0250)	Performed Procedure Step End Date	Yes	No	No
(0040,0251)	Performed Procedure Step End Time	Yes	No	No
(0040,0253)	Performed Procedure Step ID	Yes	Yes	No
(0040,0254)	Performed Procedure Step Description	Yes	Yes	No
(0040,0275)	Request Attributes Sequence	Yes	Yes	No
(0040,0280)	Comments on Performed Procedure Step	Yes	Yes	No
(0040,0555)	Acquisition Context Sequence	Yes	Yes	No
(0040,1001)	Requested Procedure ID	Yes	Yes	No
(0040,1004)	Patient Transport Arrangements	Yes	Yes	No
(0040,1005)	Requested Procedure Location	Yes	Yes	No
(0040,1010)	Names of Intended Recipient of Results	Yes	Yes	No
(0040,1011)	Intended Recipients of Results Identification Sequence	Yes	Yes	No
(0040,1101)	Person Identification Code Sequence	Yes	Yes	No
(0040,1102)	Person Address	Yes	Yes	No
(0040,1103)	Person Telephone Numbers	Yes	Yes	No
(0040,1400)	Requested Procedure Comments	Yes	Yes	No
(0040,2001)	Reason for Imaging Service Request	Yes	Yes	No
(0040,2008)	Order Entered By	Yes	Yes	No
(0040,2009)	Order Enterer Location	Yes	Yes	No
(0040,2010)	Order Callback Phone Number	Yes	Yes	No
(0040,2016)	Placer Order Number of Imaging Service Request	Yes	Yes	No
(0040,2017)	Filler Order Number of Imaging Service Request	Yes	Yes	No
(0040,2400)	Imaging Service Request Comments	Yes	Yes	No
(0040,3001)	Confidentiality Constraint on Patient Data Description	Yes	Yes	No
(0040,4005)	Scheduled Procedure Step Start DateTime	Yes	No	No
(0040,4010)	Scheduled Procedure Step Modification DateTime	Yes	No	No
(0040,4011)	Expected Completion Date Time	Yes	No	No
(0040,4023)	Referenced General Purpose Scheduled Procedure Step Transaction UID	Yes	No	No

DICOM Tag	Attribute Name	High Privacy	Reduced Privacy	Low Privacy
(0040,4025)	Scheduled Station Name Code Sequence	Yes	Yes	No
(0040,4027)	Scheduled Station Geographic Location Code Sequence	Yes	Yes	No
(0040,4028)	Performed Station Name Code Sequence	Yes	Yes	No
(0040,4030)	Performed Station Geographic Location Code Sequence	Yes	Yes	No
(0040,4034)	Scheduled Human Performers Sequence	Yes	Yes	No
(0040,4035)	Actual Human Performers Sequence	Yes	Yes	No
(0040,4036)	Human Performers Organization	Yes	Yes	No
(0040,4037)	Human Performers Name	Yes	Yes	No
(0040,4050)	Performed Procedure Step Start DateTime	Yes	No	No
(0040,4051)	Performed Procedure Step End DateTime	Yes	No	No
(0040,4052)	Procedure Step Cancellation DateTime	Yes	No	No
(0040,A027)	Verifying Organization	Yes	Yes	No
(0040,A073)	Verifying Observer Sequence	Yes	Yes	No
(0040,A075)	Verifying Observer Name	Yes	Yes	No
(0040,A078)	Author Observer Sequence	Yes	Yes	No
(0040,A07A)	Participant Sequence	Yes	Yes	No
(0040,A07C)	Custodial Organization Sequence	Yes	Yes	No
(0040,A088)	Verifying Observer Identification Code Sequence	Yes	Yes	No
(0040,A123)	Person Name	Yes	Yes	No
(0040,A124)	UID	Yes	Yes	No
(0040,A171)	Observation UID	Yes	Yes	No
(0040,A172)	Referenced Observation UID (Trial)	Yes	Yes	No
(0040,A192)	Observation Date (Trial)	Yes	No	No
(0040,A193)	Observation Time (Trial)	Yes	No	No
(0040,A307)	Current Observer (Trial)	Yes	Yes	No
(0040,A352)	Verbal Source (Trial)	Yes	Yes	No
(0040,A353)	Address (Trial)	Yes	Yes	No
(0040,A354)	Telephone Number (Trial)	Yes	Yes	Yes
(0040,A358)	Verbal Source Identifier Code Sequence (Trial)	Yes	Yes	No
(0040,A402)	Observation Subject UID (Trial)	Yes	Yes	No
(0040,A730)	Content Sequence	Yes	Yes	No
(0040,DB0C)	Template Extension Organization UID	Yes	Yes	No
(0040,DB0D)	Template Extension Creator UID	Yes	Yes	No
(0070,0001)	Graphic Annotation Sequence	Yes	Yes	No
(0070,0084)	Content Creator’s Name	Yes	Yes	No

DICOM Tag	Attribute Name	High Privacy	Reduced Privacy	Low Privacy
(0070,0086)	Content Creator's Identification Code Sequence	Yes	Yes	No
(0070,031A)	Fiducial UID	Yes	Yes	No
(0088,0140)	Storage Media Fileset UID	Yes	Yes	No
(0088,0200)	Icon Image Sequence	Yes	Yes	No
(0088,0904)	Topic Title	Yes	Yes	No
(0088,0906)	Topic Subject	Yes	Yes	No
(0088,0910)	Topic Author	Yes	Yes	No
(0088,0912)	Topic Keywords	Yes	Yes	No
(0400,0100)	Digital Signature UID	Yes	Yes	No
(0400,0402)	Referenced Digital Signature Sequence	Yes	Yes	No
(0400,0403)	Referenced SOP Instance MAC Sequence	Yes	Yes	No
(0400,0404)	MAC	Yes	Yes	No
(0400,0550)	Modified Attributes Sequence	Yes	Yes	No
(0400,0561)	Original Attributes Sequence	Yes	Yes	Yes
(2030,0020)	Text String	Yes	Yes	No
(3006,0024)	Referenced Frame of Reference UID	Yes	No	No
(3006,00C2)	Related Frame of Reference UID	Yes	No	No
(3008,0105)	Source Serial Number	Yes	No	No
(300A,0013)	Dose Reference UID	Yes	No	No
(300E,0008)	Reviewer Name	Yes	Yes	No
(4000,0010)	Arbitrary	Yes	Yes	No
(4000,4000)	Text Comments	Yes	Yes	No
(4008,0042)	Results ID Issuer	Yes	Yes	No
(4008,0102)	Interpretation Recorder	Yes	Yes	No
(4008,010A)	Interpretation Transcriber	Yes	Yes	No
(4008,010B)	Interpretation Text	Yes	Yes	No
(4008,010C)	Interpretation Author	Yes	Yes	No
(4008,0111)	Interpretation Approver Sequence	Yes	Yes	No
(4008,0114)	Physician Approving Interpretation	Yes	Yes	No
(4008,0115)	Interpretation Diagnosis Description	Yes	Yes	No
(4008,0118)	Results Distribution List Sequence	Yes	Yes	No
(4008,0119)	Distribution Name	Yes	Yes	No
(4008,011A)	Distribution Address	Yes	Yes	No
(4008,0202)	Interpretation ID Issuer	Yes	Yes	No
(4008,0300)	Impressions	Yes	Yes	No
(4008,4000)	Results Comments	Yes	Yes	No

DICOM Tag	Attribute Name	High Privacy	Reduced Privacy	Low Privacy
(50xx,xxxx)	Curve Data	Yes	Yes	No
(60xx,0100)	Overlay Bits Allocated	Yes	Yes	No
(60xx,0102)	Overlay Bit Position	Yes	Yes	No
(60xx,3000)	Overlay Data	Yes	Yes	No
(60xx,4000)	Overlay Comments	Yes	Yes	No
(FFFA,FFFA)	Digital Signatures Sequence	Yes	Yes	Yes
(FFFC,FFFC)	Data Set Trailing Padding	Yes	Yes	Yes

8 Security

8.1 Security Profiles

8.1.1 Time Synchronization Profiles

Time Synchronization Profiles: The ARTIS VE50 acts as an NTP Client in the Maintain Time Transaction.

8.1.2 BCP 195 RFC 8996, 9325 TLS Secure Transport Connection Profile

BCP 195 RFC 8996, 9325 TLS Secure Transport Connection Profile supports TLS version 1.2 protocol with the following features:

Table 90: Secure Transport Connection Profiles

Supported TLS Feature	Mechanism
Key Exchange Algorithm	ECDHE, DHE, RSA
Signature Algorithm	ECDSA, RSA
Hash Algorithm / Data Integrity	SHA
Cipher suites	TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384 TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384 TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256 TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256 TLS_DHE_RSA_WITH_AES_256_GCM_SHA384 TLS_DHE_RSA_WITH_AES_128_GCM_SHA256 TLS_ECDHE_ECDSA_WITH_AES_256_CBC_SHA384 TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA256 TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA384 TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA256 TLS_RSA_WITH_AES_256_GCM_SHA384 TLS_RSA_WITH_AES_128_GCM_SHA256 TLS_RSA_WITH_AES_256_CBC_SHA256 TLS_RSA_WITH_AES_128_CBC_SHA256

The default secure DICOM port is 2762 (can be reconfigured).

Please note, that in case a secure connection is established, the selection of the cipher suite depends on the settings of the Operating System. Since ARTIS is always provided together with the Operating System Microsoft Windows, the selection of the cipher suite happens automatically, based on the TLS 1.2 Version.

8.2 Association Level Security

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

8.3 Application Level Security

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

9 Annexes

9.1 IOD Contents

9.1.1 Created SOP Instances

The following tables use a number of abbreviations. The abbreviations used in the “Presence” column are

- VNAP: Value is Not Always Present. Attribute is sent zero length if no value is present.
- ANAP: Attribute Not Always Present.
- ALWAYS: Attribute and Value are always present.
- EMPTY: Attribute is sent zero length.

The abbreviations used in the “Source” Column are

- MWL: The attribute value is copied from Modality Worklist.
- USER: The attribute value is entered by the user.
- AUTO: The attribute value is generated by the system.
- CONFIG: The attribute value is obtained by configuration

9.1.1.1 X-Ray Angiographic Image IOD – Acquired and Derived Images

The ARTIS VE50 system creates images during acquisition and with post processing applications. These will be encoded as XA Standard 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:

Table 91: IOD of Created XA SOP Instances – Acquired and Derived Images

IE	Module	Reference	Presence of Module
Patient	Patient Module	Table 95	ALWAYS
Study	General Study Module	Table 96	ALWAYS
	Patient Study	Table 97	ALWAYS
Series	General Series	Table 98	ALWAYS
Equipment	General Equipment	Table 99	ALWAYS
Image	General Image	Table 100	ALWAYS
	Image Pixel	Table 101	ALWAYS
	Contrast/Bolus	Table 103	Only if contrast agent is configured in protocol
	Cine	Table 104	Only if multi-frame
	Multi-frame	Table 105	Only if multi-frame
	Frame Pointers	Table 106	Only if multi-frame
	Mask	Table 107	Only if DSA and sent unprocessed
	Display Shutter	Table 108	Only if sent unprocessed
	X-Ray Image	Table 109	ALWAYS
	X-Ray Acquisition	Table 110	ALWAYS

IE	Module	Reference	Presence of Module
	X-Ray Collimator	Table 112	Only if sent unprocessed
	XA Positioner	Table 113	ALWAYS
	DX Detector	Table 115	ALWAYS
	Modality LUT	Table 116	Only if DSA and sent unprocessed
	VOI LUT	Table 117	ALWAYS
	SOP Common	Table 102	ALWAYS
	Spatial Transformation	Table 118	Private extension, only if Spatial Transformation applied
	Curve	Table 119	Private extension, only if ECG data is recorded
	Private Viewing	Table 126	ALWAYS
	Private Acquisition	Table 128	ALWAYS
	Private Angio Quantification	Table 129	ALWAYS
	Private Original Image Info	Table 130	ALWAYS
	Private OOG Overlay Module	Table 131	Only if annotation / measurement applied and sent unprocessed
	Private Edge Enhancement	Table 132	Only for original image sent unprocessed
	Private Data Padding	Table 133	Only if data padding is needed

9.1.1.2 X-Ray Angiographic Image IOD – Exam Protocol as XA Image

The ARTIS VE50 system creates 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.

Note: Patient demographic data is burned into pixel data for these objects.

Table 92: IOD of Created XA SOP Instances – Exam Protocol as XA Image

IE	Module	Reference	Presence of Module
Patient	Patient Module	Table 95	ALWAYS
Study	General Study Module	Table 96	ALWAYS
	Patient Study	Table 97	ALWAYS
Series	General Series	Table 98	ALWAYS
Equipment	General Equipment	Table 99	ALWAYS
Image	General Image	Table 100	ALWAYS
	Image Pixel	Table 101	ALWAYS
	Cine	Table 104	Only if multi-frame
	Multi-frame	Table 105	Only if multi-frame
	Frame Pointers	Table 106	Only if multi-frame
	X-Ray Image	Table 109	ALWAYS
	X-Ray Acquisition – Exam Protocol	Table 111	ALWAYS
	XA Positioner - Exam Protocol	Table 114	ALWAYS
	VOI LUT	Table 117	ALWAYS
	SOP Common	Table 102	ALWAYS
	Private Basic Viewing	Table 127	ALWAYS

9.1.1.3 Secondary Capture Image IOD

The ARTIS VE50 system creates images with the optional application iFlow. These will be colored images encoded as Secondary Capture SOP Class. Please see the following table for a complete overview of supplied Type 1/2/3 Standard and additional Private Attributes

Table 93: IOD of Created Secondary Capture SOP Instances

IE	Module	Reference	Presence of Module
Patient	Patient Module	Table 95	ALWAYS
Study	General Study Module	Table 96	ALWAYS
	Patient Study	Table 97	ALWAYS
Series	General Series	Table 98	ALWAYS
Equipment	General Equipment	Table 99	ALWAYS
	SC Equipment	Table 120	ALWAYS
Image	General Image	Table 100	ALWAYS
	Image Pixel	Table 101	ALWAYS
	SC Image	Table 121	ALWAYS
	SOP Common	Table 102	ALWAYS
	Contrast/Bolus	Table 103	Private extension Data from original image
	X-Ray Image	Table 109	Private extension Data from original image
	X-Ray Acquisition	Table 110	Private extension Data from original image
	Spatial Transformation	Table 118	Private extension Data from original image
	Private Viewing	Table 126	Data from original image
	Private Acquisition	Table 128	Data from original image
	Private Angio Quantification	Table 129	Data from original image
	Private Original Image Info	Table 130	Data from original image
	Private Edge Enhancement	Table 132	Data from original image

9.1.1.4 X-Ray Radiation Dose SR IOD

The ARTIS VE50 system creates an X-Ray Radiation Dose SR for each Procedure Step performed on the system.

Table 94: IOD of Created X-Ray Radiation Dose SR SOP Instances

IE	Module	Reference	Presence of Module
Patient	Patient Module	Table 95	ALWAYS
Study	General Study Module	Table 96	ALWAYS
	Patient Study	Table 97	ALWAYS
Series	SR Document Series	Table 122	ALWAYS
Equipment	General Equipment	Table 99	ALWAYS
	Enhanced General Equipment	Table 123	ALWAYS
Document	SR Document General	Table 124	ALWAYS
	SR Document Content	Table 125	ALWAYS
	SOP Common	Table 102	ALWAYS
	Private Dose SR Data	Table 134	ALWAYS

9.1.1.5 Common Modules

Table 95: Patient Module

Attribute	Tag	Source	Value	Presence	Comments
Patient's Name	(0010,0010)	MWL/USER	From Modality Worklist or user input	ALWAYS	
Patient ID	(0010,0020)	MWL/USER	From Modality Worklist or user input	ALWAYS	
Issuer of Patient ID	(0010,0021)	MWL	From Modality Worklist	ANAP	
Patient's Birth Date	(0010,0030)	MWL/USER	From Modality Worklist or user input	ALWAYS	
Patient's Sex	(0010,0040)	MWL/USER	From Modality Worklist or user input	ALWAYS	
Patient's Birth Time	(0010,0032)	MWL	From Modality Worklist	ANAP	
Other Patient IDs	(0010,1000)	MWL/USER	From Modality Worklist or user input	ANAP	
Other Patient Names	(0010,1001)	MWL/USER	From Modality Worklist or user input	ANAP	
Patient's Birth Name	(0010,1005)	MWL	From Modality Worklist	ANAP	
Ethnic Group	(0010,2160)	MWL/USER	From Modality Worklist or user input	ANAP	
Patient Comments	(0010,4000)	MWL/USER	From Modality Worklist or user input	ANAP	
Patient's Address	(0010,1040)	MWL	From Modality Worklist	ANAP	Standard Extended Attribute
Military Rank	(0010,1080)	MWL/USER	From Modality Worklist or user input	ANAP	Standard Extended Attribute
Branch of Service	(0010,1081)	MWL	From Modality Worklist	ANAP	Standard Extended Attribute

Table 96: General Study Module

Attribute	Tag	Source	Value	Presence	Comments
Study Date	(0008,0020)	AUTO	Current date	ALWAYS	
Study Time	(0008,0030)	AUTO	Current time	ALWAYS	
Accession Number	(0008,0050)	MWL/USER	From Modality Worklist or user input	VNAP	

Attribute	Tag	Source	Value	Presence	Comments
Referring Physician's Name	(0008,0090)	MWL/USER	From Modality Worklist or user input	VNAP	
Study Description	(0008,1030)	MWL/USER	From Modality Worklist or user input	VNAP	
Procedure Code Sequence	(0008,1032)	MWL	From Modality Worklist	ANAP	
>Code Value	(0008,0100)	MWL	From Modality Worklist	ALWAYS	
>Coding Scheme Designator	(0008,0102)	MWL	From Modality Worklist	ALWAYS	
>Code Meaning	(0008,0104)	MWL	From Modality Worklist	ALWAYS	
Referenced Study Sequence	(0008,1110)	MWL	From Modality Worklist	ANAP	
>Referenced SOP Class UID	(0008,1150)	MWL	From Modality Worklist	ALWAYS	
>Referenced SOP Instance UID	(0008,1155)	MWL	From Modality Worklist	ALWAYS	
Study Instance UID	(0020,000D)	MWL/AUTO	From Modality Worklist or generated by device	ALWAYS	
Study ID	(0020,0010)	MWL/USER/AUTO	Requested Procedure ID from Worklist or User Input or generated by device	ALWAYS	
Study ID Issuer	(0032,0012)	AUTO	Generated by device	ALWAYS	Standard Extended Attribute
Requesting Physician	(0032,1032)	MWL/USER	From Modality Worklist or user input	ANAP	Standard Extended Attribute
Study Comments	(0032,4000)	USER	Only available if patient registration is performed via Sensis system	ANAP	Standard Extended Attribute

Table 97: Patient Study Module

Attribute	Tag	Source	Value	Presence	Comments
Admitting Diagnoses Description	(0008,1080)	MWL/USER	From Modality Worklist or user input	ANAP	
Patient's Age	(0010,1010)	AUTO	Calculated from provided Birth Date	ALWAYS	
Patient's Size	(0010,1020)	MWL/USER	From Modality Worklist or user input	ANAP	

Attribute	Tag	Source	Value	Presence	Comments
Patient's Weight	(0010,1030)	MWL/USER	From Modality Worklist or user input	ANAP	
Medical Alerts	(0010,2000)	MWL/USER	From Modality Worklist or user input	ANAP	
Allergies	(0010,2110)	MWL/USER	From Modality Worklist or user input	ANAP	
Smoking Status	(0010,21A0)	MWL	From Modality Worklist	ANAP	
Pregnancy Status	(0010,21C0)	MWL/USER	From Modality Worklist or user input	ANAP	
Last Menstrual Date	(0010,21D0)	MWL	From Modality Worklist	ANAP	
Additional Patient History	(0010,21B0)	MWL	From Modality Worklist	ANAP	
Admission ID	(0038,0010)	MWL	From Modality Worklist	ANAP	
Special Needs	(0038,0050)	MWL	From Modality Worklist or user input	ANAP	Standard Extended Attribute
Current Patient Location	(0038,0300)	MWL/USER	From Modality Worklist or user input	ANAP	Standard Extended Attribute

Table 98: General Series Module

Attribute	Tag	Source	Value	Presence	Comments
Modality	(0008,0060)	AUTO	"XA"	ALWAYS	
Series Instance UID	(0020,000E)	AUTO	Generated by device	ALWAYS	
Series Number	(0020,0011)	AUTO	Generated by device	ALWAYS	
Laterality	(0020,0060)	USER	"R", "L"	ANAP	Only with correct UI
Series Date	(0008,0021)	AUTO	Current date	ALWAYS	
Series Time	(0008,0031)	AUTO	Current time	ALWAYS	
Performing Physician's Name	(0008,1050)	MWL/USER	From Modality Worklist or user input	ANAP	
Protocol Name	(0018,1030)	USER	Name of selected acquisition protocol	ANAP	Not set for exam protocol as XA image
Series Description	(0008,103E)	USER	Name of selected acquisition protocol	ALWAYS	May be overwritten by user
Operators' Name	(0008,1070)	USER	User input	ANAP	

Attribute	Tag	Source	Value	Presence	Comments
Referenced Performed Procedure Step	(0008,1111)	AUTO	Generated by device	ALWAYS	
>Referenced SOP Class UID	(0008,1150)	AUTO	Generated by device	ALWAYS	
>Referenced SOP Instance UID	(0008,1155)	AUTO	Generated by device	ALWAYS	
Body Part Examined	(0018,0015)	USER	User input	ANAP	Only with correct UI
Patient Position	(0018,5100)	USER	“HFS”, “HFP”, “HFDR”, “HFDL”, “FFS”, “FFP”, “FFDR”, “FFDL”	ANAP	Not set for exam protocol as XA image
Request Attribute Sequence	(0040,0275)	MWL	From Modality Worklist	ANAP	
>Requested Procedure Description	(0032,1060)	MWL	From Modality Worklist	ANAP	
>Scheduled Procedure Step Description	(0040,0007)	MWL	From Modality Worklist	ANAP	
>Scheduled Procedure Step ID	(0040,0009)	MWL	From Modality Worklist	ANAP	
>Requested Procedure ID	(0040,1001)	MWL	From Modality Worklist	ANAP	
Performed Procedure Step ID	(0040,0253)	AUTO	Generated by device	ALWAYS	
Performed Procedure Step Start Date	(0040,0244)	AUTO	Current date	ALWAYS	
Performed Procedure Step Start Time	(0040,0245)	AUTO	Current time	ALWAYS	
Performed Procedure Step Description	(0040,0254)	MWL/USER	From Modality Worklist or User Input (Study Description)	ANAP	

Table 99: General Equipment Module

Attribute	Tag	Source	Value	Presence	Comments
Manufacturer	(0008,0070)	AUTO	“Siemens Healthineers”	ALWAYS	
Institution Name	(0008,0080)	CONFIG/USER	From configuration or user input	ANAP	
Institution Address	(0008,0081)	CONFIG/USER	From configuration or user input	ANAP	

Attribute	Tag	Source	Value	Presence	Comments
Station Name	(0008,1010)	CONFIG	From configuration	ALWAYS	
Manufacturer's Model Name	(0008,1090)	CONFIG	Equipment-specific Model Name based on "First System Startup" configuration	ALWAYS	
Device Serial Number	(0018,1000)	AUTO	From configuration	ALWAYS	
Software Versions	(0018,1020)	AUTO	From configuration	ALWAYS	

Table 100: General Image Module

Attribute	Tag	Source	Value	Presence	Comments
Instance Number	(0020,0013)	AUTO	Generated by device	ALWAYS	
Patient Orientation	(0020,0020)	AUTO	Generated by device	VNAP	
Content Date	(0008,0023)	AUTO	Current date	ALWAYS	Updated if pixel data is changed during transfer
Content Time	(0008,0033)	AUTO	Current time	ALWAYS	Updated if pixel data is changed during transfer
Image Type	(0008,0008)	AUTO		ALWAYS	Refer to 9.1.2 for used Image Type values
Acquisition Number	(0020,0012)	AUTO	Generated by device	ALWAYS	
Acquisition Date	(0008,0022)	AUTO	Date of x-ray	ALWAYS	
Acquisition Time	(0008,0032)	AUTO	Time of x-ray	ALWAYS	
Images in Acquisition	(0020,1002)	AUTO	Number of objects created with on foot-switch event	ALWAYS	
Image Comments	(0020,4000)	AUTO	"REF", "SM", "Secondary Capture Image" (iFlow)	ANAP	
Burned In Annotation	(0028,0301)	AUTO	"YES" for exam protocol as XA image	ANAP	Only set for exam protocol as XA image
Lossy Image Compression	(0028,2110)	AUTO	00, 01	ALWAYS	Lossless transfer is always preferred if possible
Lossy Image Compression Ratio	(0028,2112)	AUTO	Only for lossy compressed images	ANAP	
Irradiation Event UID	(0008,3010)	AUTO		ALWAYS	

Table 101: Image Pixel Module

Attribute	Tag	Source	Value	Presence	Comments
Samples per Pixel	(0028,0002)	AUTO	1 for XA Image 3 for Secondary Capture Image	ALWAYS	
Photometric Interpretation	(0028,0004)	AUTO	“MONOCHROME2” for XA Image “RGB” for Secondary Capture Image	ALWAYS	
Rows	(0028,0010)	AUTO	Up to 2584	ALWAYS	
Columns	(0028,0011)	AUTO	Up to 2584	ALWAYS	
Bits Allocated	(0028,0100)	AUTO	8, 16	ALWAYS	
Bits Stored	(0028,0101)	AUTO	8, 12, 16	ALWAYS	
High Bit	(0028,0102)	AUTO	7, 11, 15	ALWAYS	
Pixel Representation	(0028,0103)	AUTO	0000H	ALWAYS	
Planar Configuration	(0028,0006)	AUTO	0	ANAP	only for Secondary Capture Image
Pixel Data	(7FE0,0010)	AUTO		ALWAYS	

Table 102: SOP Common Module

Attribute	Tag	Source	Value	Presence	Comments
SOP Class UID	(0008,0016)	AUTO		ALWAYS	
SOP Instance UID	(0008,0018)	AUTO		ALWAYS	
Specific Character Set	(0008,0005)	MWL/CONFIG		ANAP	
Original Attributes Sequence	(0400,0561)	AUTO	Info about corrected data	ANAP	
>Source of Previous Values	(0400,0564)	AUTO		ANAP	
>Attribute Modification DateTime	(0400,0562)	AUTO		ANAP	
>Modifying System	(0400,0563)	AUTO		ANAP	
>Reason for the Attribute Modification	(0400,0565)	AUTO		ANAP	
>Modified Attributes Sequence	(0400,0550)	AUTO		ANAP	
>>Any Attribute from top level Data Set that was modified or removed		AUTO		ANAP	

Attribute	Tag	Source	Value	Presence	Comments
Archive Requested	(0040,A494)	AUTO	“YES”, “NO”	ALWAYS	Standard Extended Attribute

9.1.1.6 X-Ray Angiographic Image Modules

Table 103: Contrast/Bolus Module

Attribute	Tag	Source	Value	Presence	Comments
Contrast/Bolus Agent	(0018,0010)	AUTO	From acquisition protocol: “CARBON DIOXIDE”, “IODINE”, “GADOLINIUM”, “BARIUM”	ALWAYS	
Contrast/Bolus Ingredient	(0018,1048)	AUTO	From acquisition protocol: “CARBON DIOXIDE”, “IODINE”, “GADOLINIUM”, “BARIUM”	ALWAYS	

Table 104: Cine Module

Attribute	Tag	Source	Value	Presence	Comments
Frame Time	(0018,1063)	AUTO		ANAP	Set for derived images and exam protocol as XA image
Frame Time Vector	(0018,1065)	AUTO		ANAP	Set for original images
Start Trim	(0008,2142)	AUTO		ALWAYS	
Stop Trim	(0008,2143)	AUTO		ALWAYS	
Recommended Display Frame Rate	(0008,2144)	AUTO		ALWAYS	
Cine Rate	(0018,0040)	AUTO	Value rounded to integer	ALWAYS	

Table 105: Multi-frame Module

Attribute	Tag	Source	Value	Presence	Comments
Number of Frames	(0028,0008)	AUTO		ALWAYS	
Frame Increment Pointer	(0028,0009)	AUTO	00181063H, 00181065H	ALWAYS	

Table 106: Frame Pointers Module

Attribute	Tag	Source	Value	Presence	Comments
Representative Frame Number	(0028,6010)	AUTO		ALWAYS	

Table 107: Mask Module

Attribute	Tag	Source	Value	Presence	Comments
Mask Subtraction Sequence	(0028,6100)	AUTO		ALWAYS	
>Mask Operation	(0028,6101)	AUTO	“AVG_SUB”	ALWAYS	
>Mask Frame Numbers	(0028,6110)	AUTO/USER		ALWAYS	
>Contrast Frame Averaging	(0028,6112)	USER		ANAP	Only with manual averaging
Recommended Viewing Mode	(0028,1090)	AUTO	“SUB”, “NAT”	ALWAYS	

Table 108: Display Shutter Module

Attribute	Tag	Source	Value	Presence	Comments
Shutter Shape	(0018,1600)	AUTO	“RECTANGULAR”	ALWAYS	
Shutter Left Vertical Edge	(0018,1602)	AUTO/USER		ALWAYS	
Shutter Right Vertical Edge	(0018,1604)	AUTO/USER		ALWAYS	
Shutter Upper Horizontal Edge	(0018,1606)	AUTO/USER		ALWAYS	
Shutter Lower Horizontal Edge	(0018,1608)	AUTO/USER		ALWAYS	

Table 109: X-Ray Image Module

Attribute	Tag	Source	Value	Presence	Comments
Pixel Intensity Relationship	(0028,1040)	AUTO	“DISP”, “LIN”, “LOG”	ALWAYS	
Referenced Image Sequence	(0008,1140)	AUTO	Reference to image of second plane	ANAP	Only for biplane images

Attribute	Tag	Source	Value	Presence	Comments
>Referenced SOP Class UID	(0008,1150)	AUTO		ALWAYS	
>Referenced SOP Instance UID	(0008,1155)	AUTO		ALWAYS	
Derivation Description	(0008,2111)	AUTO		ANAP	Only if Flip / Zoom and Pan were applied during transfer

Table 110: X-Ray Acquisition Module

Attribute	Tag	Source	Value	Presence	Comments
KVP	(0018,0060)	AUTO		ALWAYS	
Radiation Setting	(0018,1155)	AUTO	“SC”, “GR”	ALWAYS	
X-Ray Tube Current	(0018,1151)	AUTO		ALWAYS	
X-Ray Tube Current in µA	(0018,8151)	AUTO		ALWAYS	
Exposure Time	(0018,1150)	AUTO		ALWAYS	
Exposure Time in µS	(0018,8150)	AUTO		ALWAYS	
Exposure in µAs	(0018,1153)	AUTO		ALWAYS	
Grid	(0018,1166)	AUTO	“FOCUSED”, “NONE”	ALWAYS	
Average Pulse Width	(0018,1154)	AUTO		ALWAYS	
Radiation Mode	(0018,115A)	AUTO	“CONTINUOUS”, “PULSED”	ALWAYS	Continuous only in bypass mode
Intensifier Size	(0018,1162)	AUTO		ALWAYS	Diagonal of exposed detector area
Imager Pixel Spacing	(0018,1164)	AUTO		ALWAYS	
Pixel Spacing	(0028,0030)	AUTO		ANAP	Not provided if stand moved during x-ray Updated after manual calibration
Pixel Spacing Calibration Type	(0028,0A02)	AUTO	“GEOMETRY”, “FIDUCIAL”	ANAP	Not provided if stand moved during x-ray Updated after manual calibration

Attribute	Tag	Source	Value	Presence	Comments
Pixel Spacing Calibration Description	(0028,0A04)	AUTO	“Isocenter Calibration”, “Table Object Distance = xxx mm”	ANAP	Not provided if stand moved during x-ray Updated after manual calibration
Focal Spot(s)	(0018,1190)	AUTO		ALWAYS	
Image and Fluoroscopy Area Dose Product	(0018,115E)	AUTO		ALWAYS	
Entrance Dose in mGy	(0040,8302)	AUTO		ALWAYS	Standard Extended Attribute

Table 111: X-Ray Acquisition Module – Exam Protocol

Attribute	Tag	Source	Value	Presence	Comments
KVP	(0018,0060)	AUTO		EMPTY	
Radiation Setting	(0018,1155)	AUTO	“GR”	ALWAYS	
X-Ray Tube Current	(0018,1151)	AUTO		EMPTY	
Exposure Time	(0018,1150)	AUTO		EMPTY	

Table 112: X-Ray Collimator Module

Attribute	Tag	Source	Value	Presence	Comments
Collimator Shape	(0018,1700)	AUTO	“RECTANGULAR”	ALWAYS	
Collimator Left Vertical Edge	(0018,1702)	AUTO		ALWAYS	
Collimator Right Vertical Edge	(0018,1704)	AUTO		ALWAYS	
Collimator Upper Horizontal Edge	(0018,1706)	AUTO		ALWAYS	
Collimator Lower Horizontal Edge	(0018,1708)	AUTO		ALWAYS	

Table 113: XA Positioner Module

Attribute	Tag	Source	Value	Presence	Comments
Distance Source to Patient	(0018,1111)	AUTO		ANAP	Not provided if stand moved

Attribute	Tag	Source	Value	Presence	Comments
					during x-ray. Updated after manual calibration
Distance Source to Detector	(0018,1110)	AUTO		ALWAYS	
Estimated Radiographic Magnification Factor	(0018,1114)	AUTO		ANAP	Not provided if stand moved during x-ray. Updated after manual calibration
Positioner Motion	(0018,1500)	AUTO	“DYNAMIC”, “STATIC”	ALWAYS	
Positioner Primary Angle	(0018,1510)	AUTO		ALWAYS	
Positioner Secondary Angle	(0018,1511)	AUTO		ALWAYS	
Positioner Primary Angle Increment	(0018,1520)	AUTO		ANAP	For rotational images, absolute positioner angles
Positioner Secondary Angle Increment	(0018,1521)	AUTO		ANAP	For rotational images, absolute positioner angles

Table 114: XA Positioner Module – Exam Protocol

Attribute	Tag	Source	Value	Presence	Comments
Positioner Motion	(0018,1500)	AUTO	“STATIC”	ALWAYS	
Positioner Primary Angle	(0018,1510)	AUTO		EMPTY	
Positioner Secondary Angle	(0018,1511)	AUTO		EMPTY	

Table 115: DX Detector Module

Attribute	Tag	Source	Value	Presence	Comments
Detector Description	(0018,7006)	AUTO		ALWAYS	
Detector ID	(0018,700A)	AUTO		ALWAYS	
Detector Binning	(0018,701A)	AUTO	1\1, 2\2, 3\3 or 4\4	ALWAYS	

Attribute	Tag	Source	Value	Presence	Comments
Detector Element Spacing	(0018,7022)	AUTO		ALWAYS	

Table 116: Modality LUT Module

Attribute	Tag	Source	Value	Presence	Comments
Modality LUT Sequence	(0028,3000)	AUTO		ANAP	
>LUT Descriptor	(0028,3002)	AUTO	4096\0\16	ANAP	
>Modality LUT Type	(0028,3004)	AUTO	“US”	ANAP	
>LUT Data	(0028,3006)	AUTO		ANAP	

Table 117: VOI LUT Module

Attribute	Tag	Source	Value	Presence	Comments
Window Center	(0028,1050)	AUTO		ALWAYS	
Window Width	(0028,1051)	AUTO		ALWAYS	
VOI LUT Function	(0028,1056)	AUTO	“LINEAR”, “SIGMOID”	ANAP	Not set for exam protocol as XA image

Table 118: Spatial Transformation Module

Attribute	Tag	Source	Value	Presence	Comments
Image Rotation	(0070,0042)	AUTO/USER	0, 180	ANAP	
Image Horizontal Flip	(0070,0041)	AUTO/USER	“Y”, “N”	ANAP	

Table 119: Curve Module

Attribute	Tag	Source	Value	Presence	Comments
Curve Dimensions	(5000,0005)	AUTO	2	ALWAYS	
Number of Points	(5000,0010)	AUTO		ALWAYS	
Type of Data	(5000,0020)	AUTO	“ECG”	ALWAYS	
Axis Units	(5000,0030)	AUTO	“DPPS\NONE”	ALWAYS	DPPS stands for “digital points per second”

Attribute	Tag	Source	Value	Presence	Comments
Data Value Representation	(5000,0103)	AUTO	0	ALWAYS	
Curve Data Descriptor	(5000,0110)	AUTO	0\1	ALWAYS	
Coordinate Start Value	(5000,0112)	AUTO	0	ALWAYS	
Coordinate Step Value	(5000,0114)	AUTO	400	ALWAYS	Sampling rate
Curve Data	(5000,3000)	AUTO		ALWAYS	

9.1.1.7 Secondary Capture Image Modules

Table 120: SC Equipment Module

Attribute	Tag	Source	Value	Presence	Comments
Conversion Type	(0008,0064)	AUTO	“WSD”	ALWAYS	
Modality	(0008,0060)	AUTO	“XA”	ALWAYS	
Secondary Capture Device ID	(0018,1010)	AUTO	From configuration	ALWAYS	
Secondary Capture Device Manufacturer	(0018,1016)	AUTO	Manufacturer value as given in (0008,0070)	ALWAYS	
Secondary Capture Device Manufacturer’s Model Name	(0018,1018)	AUTO	Model name of the equipment generates the Secondary Capture Image same as (0008,1090). Only for Second Workplace generated SC Image holds the value "ARTIS Second Workplace"	ALWAYS	
Secondary Capture Device Software Versions	(0018,1019)	AUTO	From configuration	ALWAYS	

Table 121: SC Image Module

Attribute	Tag	Source	Value	Presence	Comments
Date of Secondary Capture	(0018,0012)	AUTO		ALWAYS	
Date of Secondary Capture	(0018,0014)	AUTO		ALWAYS	

9.1.1.8 X-Ray Radiation Dose SR Modules

Table 122: SR Document Series Module

Attribute	Tag	Source	Value	Presence	Comments
Modality	(0008,0060)	AUTO	"SR"	ALWAYS	
Series Instance UID	(0020,000E)	AUTO	Generated by device	ALWAYS	
Series Number	(0020,0011)	AUTO	Count of Dose SR object within study, starting with 990	ALWAYS	
Series Date	(0008,0021)	AUTO	Current date	ALWAYS	
Series Time	(0008,0031)	AUTO	Current time	ALWAYS	
Series Description	(0008,103E)	AUTO	"Radiation Dose Information"	ALWAYS	
Referenced Performed Procedure Step	(0008,1111)	AUTO	Generated by device	ALWAYS	
>Referenced SOP Class UID	(0008,1150)	AUTO	Generated by device	ALWAYS	
>Referenced SOP Instance UID	(0008,1155)	AUTO	Generated by device	ALWAYS	
Referenced Performed Procedure Step	(0008,1111)	AUTO	Generated by device	ALWAYS	
Referenced Request Sequence	(0040,A370)	MWL	From Modality Worklist	ANAP	
>Study Instance UID	(0020,000D)	MWL/AUTO	From Modality Worklist or generated by device	ALWAYS	
>Referenced Study Sequence	(0008,1110)	MWL	From Modality Worklist	VNAP	
>>Referenced SOP Class UID	(0008,1150)	MWL	From Modality Worklist	ALWAYS	
>>Referenced SOP Instance UID	(0008,1155)	MWL	From Modality Worklist	ALWAYS	
>Accession Number	(0008,0050)	MWL/USER	From Modality Worklist or user input	VNAP	
>Placer Order Number / Imaging Service Request	(0040,2016)	MWL	From Modality Worklist	VNAP	
>Filler Order Number / Imaging Service Request	(0040,2017)	MWL	From Modality Worklist	VNAP	
>Requested Procedure ID	(0040,1001)	MWL	From Modality Worklist	VNAP	

Attribute	Tag	Source	Value	Presence	Comments
>Requested Procedure Description	(0032,1060)	MWL	From Modality Worklist	VNAP	
>Requested Procedure Code Sequence	(0032,1064)	MWL	From Modality Worklist	VNAP	
>>Code Value	(0008,0100)	MWL	From Modality Worklist	ANAP	
>>Coding Scheme Designator	(0008,0102)	MWL	From Modality Worklist	ANAP	
>>Code Meaning	(0008,0104)	MWL	From Modality Worklist	ALWAYS	
Performing Physician's Name	(0008,1050)	MWL/USER	From Modality Worklist or user input	ANAP	Standard Extended Attribute
Operators' Name	(0008,1070)	USER	User input	ANAP	Standard Extended Attribute
Request Attribute Sequence	(0040,0275)	MWL	From Modality Worklist	ANAP	Standard Extended Attribute
>Requested Procedure Description	(0032,1060)	MWL	From Modality Worklist	ANAP	Standard Extended Attribute
>Scheduled Procedure Step Description	(0040,0007)	MWL	From Modality Worklist	ANAP	Standard Extended Attribute
>Scheduled Procedure Step ID	(0040,0009)	MWL	From Modality Worklist	ANAP	Standard Extended Attribute
>Requested Procedure ID	(0040,1001)	MWL	From Modality Worklist	ANAP	Standard Extended Attribute
Performed Procedure Step ID	(0040,0253)	AUTO	Generated by device	ANAP	Standard Extended Attribute
Performed Procedure Step Start Date	(0040,0244)	AUTO	Current date	ANAP	Standard Extended Attribute
Performed Procedure Step Start Time	(0040,0245)	AUTO	Current time	ANAP	Standard Extended Attribute
Performed Procedure Step Description	(0040,0254)	MWL/USER	From Modality Worklist or User Input (Study Description)	ANAP	Standard Extended Attribute

Table 123: Enhanced General Equipment Module

Attribute	Tag	Source	Value	Presence	Comments
Manufacturer	(0008,0070)	AUTO	“Siemens Healthineers”	ALWAYS	
Manufacturer’s Model Name	(0008,1090)	CONFIG	Equipment-specific Model Name based on "First System Startup" configuration	ALWAYS	
Device Serial Number	(0018,1000)	AUTO	From configuration	ALWAYS	
Software Versions	(0018,1020)	AUTO	From configuration	ALWAYS	

Table 124: SR Document General Module

Attribute	Tag	Source	Value	Presence	Comments
Instance Number	(0020,0013)	AUTO	“999”	ALWAYS	
Completion Flag	(0040,A491)	AUTO	“COMPLETE”	ALWAYS	
Verification Flag	(0040,A493)	AUTO	“UNVERIFIED”	ALWAYS	
Content Date	(0008,0023)	AUTO		ALWAYS	
Content Time	(0008,0033)	AUTO		ALWAYS	
Performed Procedure Code Sequence	(0040,A372)	AUTO		EMPTY	

Table 125: SR Document Content Module

Attribute	Tag	Source	Value	Presence	Comments
Value Type	(0040,A040)	AUTO	“CONTAINER”	ALWAYS	
Concept Name Code Sequence	(0040,A043)	AUTO		ALWAYS	
>Code Value	(0008,0100)	AUTO	“113701”	ALWAYS	
>Coding Scheme Designator	(0008,0102)	AUTO	“DCM”	ALWAYS	
>Code Meaning	(0008,0104)	AUTO	“X-Ray Radiation Dose Report”	ALWAYS	
Continuity of Content	(0040,A050)	AUTO	“SEPARATE”	ALWAYS	
Content Template Sequence	(0040,A504)	AUTO		ALWAYS	
> Mapping Resource	(0008,0105)	AUTO	“DCMR”	ALWAYS	
>Template Identifier	(0040,DB00)	AUTO	“10001”	ALWAYS	

Attribute	Tag	Source	Value	Presence	Comments
Observation DateTime	(0040,A032)	AUTO		ALWAYS	
Content Sequence	(0040,A730)	AUTO		ALWAYS	
>Include content data according to TID 10001		AUTO		ALWAYS	

9.1.1.9 Private Modules

Table 126: Private Viewing Module

Attribute	Tag	Source	Value	Presence	Comments
Private Creator	(0019,00xx)	AUTO	SIEMENS SMS-AX VIEW 1.0	ALWAYS	Private Owner Code contains double-spaces in name definition
Review Mode	(0019,xx00)	AUTO		ALWAYS	No further usage anymore
Anatomical Background Percent	(0019,xx01)	AUTO	Percentage of mix between Subtracted Image Result and Native Mask. Range is from 0 to 100.	ALWAYS	
Number of Phases	(0019,xx02)	AUTO	1-4 (1 or # of “Variable Frame Rate” acq phases)	ALWAYS	
Apply Anatomical Background	(0019,xx03)	AUTO	0 no anatomical background >0 anatomical background or vessel / catheter contrast	ALWAYS	
Pixel Shift Array	(0019,xx04)	AUTO	Array with pixel shift values, 4 values per frame	ANAP	
Brightness	(0019,xx05)	AUTO	Brightness for subtracted display	ANAP	
Contrast	(0019,xx06)	AUTO	Contrast for subtracted display	ANAP	
Enabled Shutters	(0019,xx07)	AUTO	0 - shutter is not applied 1 - shutter is applied	ALWAYS	
Native Edge Enhancement Percent Gain	(0019,xx08)	AUTO	Percent gain for native display	ALWAYS	Set to 0 for processed transfer
Native Edge Enhancement LUT Index	(0019,xx09)	AUTO	Internal value	ALWAYS	
Native Edge Enhancement Kernel Size	(0019,xx0A)	AUTO	Value set in acquisition protocol	ALWAYS	

Attribute	Tag	Source	Value	Presence	Comments
Subtracted Edge Enhancement Percent Gain	(0019,xx0B)	AUTO	Percent gain for sub display	ALWAYS	Set to 0 for processed transfer
Subtracted Edge Enhancement LUT Index	(0019,xx0C)	AUTO	Internal value	ALWAYS	
Subtracted Edge Enhancement Kernel Size	(0019,xx0D)	AUTO	Value set in acquisition protocol	ALWAYS	
Fade Percent	(0019,xx0E)	AUTO	Percent for stored overlay REF	ALWAYS	
Flipped before Laterality Applied	(0019,xx0F)	AUTO	Internal value	ALWAYS	
Apply Fade	(0019,xx10)	AUTO	1 for stored overlay REF	ALWAYS	
Zoom	(0019,xx12)	AUTO	0, 1: no zoom applied 2: zoom 200%	ANAP	Removed for processed transfer
Pan X	(0019,xx13)	AUTO	Pan value in x direction	ANAP	Removed for processed transfer
Pan Y	(0019,xx14)	AUTO	Pan value in y direction	ANAP	Removed for processed transfer
Native Advanced Edge Enhancement Percent Gain	(0019,xx15)	AUTO	Percent gain for native display	ALWAYS	Set to 0 for processed transfer
Subtracted Advanced Edge Enhancement Percent Gain	(0019,xx16)	AUTO	Percent gain for sub display	ALWAYS	Set to 0 for processed transfer
Invert Flag	(0019,xx17)	AUTO	1: invert image (black/white)	ALWAYS	Set to 0 for processed transfer
Full Resolution Flag	(0019,xx1B)	AUTO	0, 1	ALWAYS	Removed or set to 0 for processed transfer
Auto Window Center	(0019,xx1C)	AUTO	Value calculated by algorithm	ANAP	
Auto Window Width	(0019,xx1D)	AUTO	Value calculated by algorithm	ANAP	
Auto Window Correct Value	(0019,xx1E)	AUTO	2 values center shift multiplier (10 = 1.0)	ANAP	
Sigmoid Window Parameter	(0019,xx1F)	AUTO	4	ANAP	

Attribute	Tag	Source	Value	Presence	Comments
Roadmap Catheter Contrast	(0019,xx20)	AUTO	Decimal string, 1.000000 = 100 %	ANAP	
Roadmap Vessel Contrast	(0019,xx21)	AUTO	Decimal string, 1.000000 = 100 %	ANAP	
CLEARstent ROI Origin	(0019,xx23)	AUTO	From algorithm x, y of upper left corner	ANAP	Removed or set to 0 for processed transfer
CLEARstent ROI Size	(0019,xx24)	AUTO	From algorithm x, y of ROI size	ANAP	Removed or set to 0 for processed transfer
VFR Info	(0019,xx25)	AUTO	2 values per phase	ANAP	
Frame # Roadmap - Min Amplification	(0019,xx30)	AUTO		ANAP	
Frame # Roadmap - Vessel Map	(0019,xx31)	AUTO		ANAP	
Roadmap Device Presentation	(0019,xx32)	AUTO	Internal value	ANAP	
Roadmap Vessel Presentation	(0019,xx33)	AUTO	Internal value	ANAP	
DSA Vessel Presentation	(0019,xx34)	AUTO	Internal value	ANAP	
Interpolation Parameter	(0019,xx35)	AUTO	Internal value	ANAP	
Roadmap Clean Phase 3	(0019,xx36)	AUTO	0: clean phase 3 is off 1: clean phase 3 is on	ANAP	
Overlay Device Presentation	(0019,xx37)	AUTO	Internal value	ANAP	Not with rotational images
Overlay Vessel Presentation	(0019,xx38)	AUTO	Internal value	ANAP	Not with rotational images
RT Pixel Shift Values	(0019,xx41)	AUTO	6 values per frame	ANAP	
RT Pixel Shift Indicator	(0019,xx42)	AUTO	0 – no RT pixel shift 1 – RT pixel shift values available 3- RT pixel shift values applied to pixel data	ANAP	Set to 0 for processed transfer
Applied RT Pixel Shift Values	(0019,xx43)	AUTO	6 values per frame	ANAP	
Pixel Shift Validity	(0019,xx44)	AUTO	2 values per frame	ANAP	

Attribute	Tag	Source	Value	Presence	Comments
UIPnat Processing Mode	(0019,xx51)	AUTO	Internal value for UIP algorithm	ANAP	Removed for processed transfer
UIPnat DDO Kernel Size	(0019,xx52)	AUTO	Internal value for UIP algorithm	ANAP	Removed for processed transfer
UIPnat DDO Gain	(0019,xx53)	AUTO	Internal value for UIP algorithm	ANAP	Removed for processed transfer
UIPnat Contrast	(0019,xx54)	AUTO	Internal value for UIP algorithm	ANAP	removed for processed transfer
UIPnat Dynamic	(0019,xx55)	AUTO	Internal value for UIP algorithm	ANAP	Removed for processed transfer
UIPnat Peak Reduction	(0019,xx57)	AUTO	Internal value for UIP algorithm	ANAP	Removed for processed transfer
UIPnat Brightness Control	(0019,xx58)	AUTO	Internal value for UIP algorithm	ANAP	Removed for processed transfer
UIPnat Brightness Value	(0019,xx59)	AUTO	Internal value for UIP algorithm	ANAP	Removed for processed transfer
Visibility Overlay	(0019,xx61)	AUTO	Internal value	ANAP	
UIPnat Modulation 1	(0019,xx63)	AUTO	2 internal values for UIP algorithm	ANAP	Removed for processed transfer
UIPnat Modulation 2	(0019,xx64)	AUTO	2 internal values for UIP algorithm	ANAP	Removed for processed transfer
UIPnat Modulation 3	(0019,xx65)	AUTO	2 internal values for UIP algorithm	ANAP	Removed for processed transfer
UIPnat Gamma Layer	(0019,xx66)	AUTO	Internal value for UIP algorithm	ANAP	Removed for processed transfer

Table 127: Private Basic Viewing Module

Attribute	Tag	Source	Value	Presence	Comments
Private Creator	(0019,00xx)	AUTO	SIEMENS SMS-AX VIEW 1.0	ALWAYS	Private Owner Code contains

Attribute	Tag	Source	Value	Presence	Comments
					double-spaces in name definition
Number of Phases	(0019,xx02)	AUTO	0	ALWAYS	
Brightness	(0019,xx05)	AUTO	512	ALWAYS	
Contrast	(0019,xx06)	AUTO	1024	ALWAYS	

Table 128: Private Acquisition Module

Attribute	Tag	Source	Value	Presence	Comments
Private Creator	(0021,00xx)	AUTO	SIEMENS SMS-AX ACQ 1.0	ALWAYS	Private Owner Code contains double-spaces in name definition
Acquisition Type	(0021,xx00)	AUTO	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, 14 = pulsed fluoro	ALWAYS	
Acquisition Mode	(0021,xx01)	AUTO	Technical Mode of Acquisition performed to get image result. Defined Terms are: 1 = Digital Radiography, 2 = DSA, 3 = Peri-DSA, 4 = DR stepping, 7 = Card, 8 = Service mode (internal), 9 = 3D Mode 10 = Service mode (internal), 11 = Vessel Phase Roadmap, 19 = Bypass Fluoro, 20 = Roadmap Fluoro, 21 = Normal Fluoro	ALWAYS	
Footswitch Index	(0021,xx02)	AUTO		ALWAYS	
Acquisition Room	(0021,xx03)	AUTO	0 = Exam Room, 1 = Control Room	ALWAYS	
Current Time Product	(0021,xx04)	AUTO	In µAs	ALWAYS	
Dose	(0021,xx05)	AUTO	In nGy/pulse	ALWAYS	

Attribute	Tag	Source	Value	Presence	Comments
Referenced Air Kerma Rate	(0021,xx08)	AUTO	0.01 mGy / min	ALWAYS	
Copper Filter	(0021,xx0A)	AUTO	X-ray filter in 0.1 mm	ALWAYS	
Measuring Field	(0021,xx0B)	AUTO	1 = left 2 = middle 3 = left + middle 4 = right 5 = left + right 6 = right + middle 7 = left + right + middle 8 = central 9 = left + central 10 = internal (IQAP) 12 = right + central 13 = left + right + central 14 = auto	ALWAYS	
Total Steps	(0021,xx0E)	AUTO	Number of multi-frame images which make up a Peri or DR-Step acquisition	ANAP	Only with peri images
Dyna X-Ray Info	(0021,xx0F)	AUTO	Per frame info (4 * number of frames). (V, µA value, µs, µAs)	ANAP	Only with rotational images
Modality LUT Input Gamma	(0021,xx10)	AUTO	Internal value	ALWAYS	
Modality LUT Output Gamma	(0021,xx11)	AUTO	Internal value	ALWAYS	
SH_STPAR	(0021,xx12)	AUTO	Binary structure with stand info	ALWAYS	
Dyna Angulation Step	(0021,xx14)	AUTO	In 0.01 deg / pulse	ANAP	Only with rotational images
DR Single Flag	(0021,xx16)	AUTO	1 = DR single frame acquisition	ALWAYS	
Source to Isocenter	(0021,xx17)	AUTO	In mm 750, 785	ALWAYS	
ECG Index Array	(0021,xx19)	AUTO	Array of pointers to ECG data	ANAP	Only if ECG data is recorded
SH_ZOOM	(0021,xx1B)	AUTO	Binary structure with acquisition zoom info	ALWAYS	
SH_COLPAR	(0021,xx1C)	AUTO	Binary structure with collimator info	ALWAYS	
K-Factor	(0021,xx1D)	AUTO	ID for motion detection	ALWAYS	
EVE	(0021,xx1E)	AUTO	Parameter set ID for Extended Vessel Enhancement	ANAP	
Total Scene Time	(0021,xx1F)	AUTO	In s (rounded to integer)	ALWAYS	

Attribute	Tag	Source	Value	Presence	Comments
Restore Flag	(0021,xx20)	AUTO	internal	ALWAYS	
Stand Movement Flag	(0021,xx21)	AUTO	1 = movements during acquisition	ALWAYS	
FD Rows	(0021,xx22)	AUTO	Acquisition matrix, rows	ALWAYS	
FD Columns	(0021,xx23)	AUTO	Acquisition matrix, columns	ALWAYS	
Table Movement Flag	(0021,xx24)	AUTO	1 = movements (stand or table) during acquisition	ALWAYS	
Gamma LUT Sequence	(0021,xx28)	AUTO	Non-linear LUT applied to raw data (12bit –> 12bit)	ALWAYS	Not with rotational images
>Private Creator	(0021,00xx)	AUTO	SIEMENS SMS-AX ACQ 1.0	ALWAYS	Private Owner Code contains double-spaces in name definition
>Gamma LUT Descriptor	(0021,xx40)	AUTO		ALWAYS	
>Gamma LUT Type	(0021,xx41)	AUTO		ALWAYS	
>Gamma LUT Data	(0021,xx42)	AUTO		ALWAYS	
Scene Time in s	(0021,xx29)	AUTO	In s (accuracy in ms)	ALWAYS	
Organ Program Info	(0021,xx30)	AUTO	Binary structure with protocol info	ALWAYS	
Source Image Distance	(0021,xx31)	AUTO	Per frame info for rotational images	ALWAYS	
Original Pixel Spacing	(0021,xx32)	AUTO	Imager pixel spacing at acquisition	ANAP	
Advanced I-Noise Flag	(0021,xx33)	AUTO	0 = No Advanced I-Noise applied 1 = Advanced I-Noise applied	ANAP	Not with rotational images
Global Gain	(0021,xx43)	AUTO	Detector gain value	ANAP	Only with rotational raw images
Global Offset	(0021,xx44)	AUTO	Detector offset value	ANAP	Only with rotational raw images
Dipp Mode	(0021,xx45)	AUTO	Internal value	ALWAYS	
Artis System Type	(0021,xx46)	AUTO	Type of system 11 = floor, 13 = ceiling, 14 = biplane, 15 = pheno	ALWAYS	
Artis Table Type	(0021,xx47)	AUTO	Type of table	ALWAYS	

Attribute	Tag	Source	Value	Presence	Comments
			Defined Terms are: 7 = surgery 9 = surgery 10 = basic, 11 = tilting, 12 = cradle		
Artis Table Top Type	(0021,xx48)	AUTO	Type of table top Defined Terms are: 1 = card, 2 = neuro, 3 = universal, 4 = surgery, 5 = other type, > 10 = surgery table types	ALWAYS	
Water Value	(0021,xx49)	AUTO	Equivalent water value of the patient/object in 0.1 mm	ALWAYS	
CNR Flag	(0021,xx4A)	AUTO	0: CNR dose control not used 1: CNR dose control used	ALWAYS	
CNR / Dose Requested	(0021,xx4B)	AUTO		ALWAYS	
CNR / Dose Achieved	(0021,xx4C)	AUTO		ALWAYS	
X-ray Tube Type	(0021,xx50)	AUTO	String identifying the x-ray tube	ALWAYS	
3D Positioner Primary Start Angle	(0021,xx51)	AUTO	In degree	ANAP	Only with rotational images
3D Positioner Secondary Start Angle	(0021,xx52)	AUTO	In degree	ANAP	Only with rotational images
Stand Position	(0021,xx53)	AUTO	In 0.1 mm; x, y , z	ANAP	Only with rotational images
Rotation Angle	(0021,xx54)	AUTO	In 0.1 degree	ANAP	Only with rotational images
Image Rotation	(0021,xx55)	AUTO	Rotation in relation to default patient position 0 = not rotated, 1 = rotated in clockwise direction, 2 = rotated in counterclockwise direction	ANAP	Only with rotational images
Table Coordinates	(0021,xx56)	AUTO	Table position in mm; x, y, z	ANAP	Only with rotational images
Isocenter Table Position	(0021,xx57)	AUTO	Table position in relation to isocenter in 0.1 mm; x, y, z	ALWAYS	

Attribute	Tag	Source	Value	Presence	Comments
Table Object Distance	(0021,xx58)	CONFIG	Table object distance in mm configured for per acquisition type, not updated during distance calibration	ALWAYS	
C-Arm Coordinate System	(0021,xx59)	AUTO	12 values per frame	ANAP	Only with rotational images
Robot Axes	(0021,xx5A)	AUTO	6 values per frame	ANAP	Only with rotational images on pheno
Table Coordinate System	(0021,xx5B)	AUTO	12 values	ANAP	Only with rotational images
Patient Coordinate System	(0021,xx5C)	AUTO	12 values	ANAP	Only with rotational images
Angulation	(0021,xx5D)	AUTO	In 0.01 degree 1 value per frame	ANAP	Only with rotational images
Orbital	(0021,xx5E)	AUTO	In 0.01 degree 1 value per frame	ANAP	Only with rotational images
3D Start Position ID	(0021,xx5F)	AUTO	In 0.01 degree	ANAP	Only with rotational images
3D Rotation Time	(0021,xx60)	AUTO	-1= minimal In ms otherwise	ANAP	Only with rotational images
Large Volume Overlap	(0021,xx61)	AUTO	In 0.1 mm	ANAP	Only with rotational images
Reconstruction Preset	(0021,xx62)	AUTO	0, 1, ... 48 ID for reconstruction	ANAP	Only with rotational images
3D Start Angle	(0021,xx63)	AUTO	In 0.01 degree	ANAP	Only with rotational images
3D Planned Angle	(0021,xx64)	AUTO	In 0.01 degree	ANAP	Only with rotational images
3D Rotation Plane Alpha	(0021,xx65)	AUTO	In 0.01 degree	ANAP	Only with rotational images

Attribute	Tag	Source	Value	Presence	Comments
3D Rotation Plane Beta	(0021,xx66)	AUTO	In 0.01 degree	ANAP	Only with rotational images
3D First Image Angle	(0021,xx67)	AUTO	In 0.01 degree	ANAP	Only with rotational images
3D Trigger Angle	(0021,xx68)	AUTO	In 0.01 degree 1 value per frame	ANAP	Only with rotational images
Amplitude	(0021,xx69)	AUTO	In 0.1 degree	ANAP	Only with rotational images
Detector Rotation	(0021,xx71)	AUTO	In degree 1 value per frame for rotational images	ALWAYS	
Physical Detector Rotation	(0021,xx72)	AUTO	In 0.01 degree 1 value per frame for rotational images	ALWAYS	
Table Head Tilt	(0021,xx81)	AUTO	In 0.1 degree	ALWAYS	
Table Rotation	(0021,xx82)	AUTO	In 0.1 degree	ALWAYS	
Table Cradle Tilt	(0021,xx83)	AUTO	In 0.1 degree	ALWAYS	
Artis System Family	(0021,xx84)	AUTO	“Helium”	ALWAYS	
Orientation Stand Table	(0021,xx85)	AUTO	In 0.1 deg	ALWAYS	
Image Rotation DIPP	(0021,xx86)	AUTO	Flip in internal pipeline (pre-processing) 1 = flip left/right 2 = flip up/down 3 = flip left/right and up/down 4 = no flip	ALWAYS	

Table 129: Private Angio Quantification Module

Attribute	Tag	Source	Value	Presence	Comments
Private Creator	(0023,00xx)	AUTO	“SIEMENS SMS-AX QUANT 1.0”	ALWAYS	Private Owner Code contains double-spaces in name definition
Calibration TOD Value	(0023,xx08)	CONFIG	In cm Dependent on acquisition type (card, angio)	ALWAYS	Used for auto distance calibration

Attribute	Tag	Source	Value	Presence	Comments
Private Creator	(2121,00xx)	AUTO	“PMI Private Calibration Module Version 2.0”	ANAP	Only with manual distance calibration
Calibration Method	(2121,xx01)	AUTO	“SiemensCal”, “Distance” or “Auto”	ANAP	Only with manual distance calibration
Calibration Method Info	(2121,xx02)	AUTO	“TOD”, TOD w/ ROI”, “ISO-center”	ANAP	Only with manual distance calibration
Calibration Object Size	(2121,xx03)	AUTO	0 or size of object used for calibration	ANAP	Only with manual distance calibration
Calibration Object Standard Deviation	(2121,xx04)	AUTO	-1 (no usage)	ANAP	Only with manual distance calibration
Horizontal Pixel Spacing	(2121,xx05)	AUTO	Calibration result: Pixel size (X)	ANAP	Only with manual distance calibration
Vertical Pixel Spacing	(2121,xx06)	AUTO	Calibration result: Pixel size (Y)	ANAP	Only with manual distance calibration
Calibration SOP Instance UID	(2121,xx08)	AUTO	UID of calibrated image	ANAP	Only with manual distance calibration
Calibration Frame Number	(2121,xx09)	AUTO	-1 (no usage)	ANAP	Only with manual distance calibration
Calibration Object Unit	(2121,xx0A)	AUTO	“mm”	ANAP	Only with manual distance calibration
Number Of Averaged Calibrations Performed	(2121,xx0B)	AUTO	-1 (no usage)	ANAP	Only with manual distance calibration
Auto Magnify Factor	(2121,xx0C)	AUTO	-1 (no usage)	ANAP	Only with manual distance calibration
Horizontal Pixel Standard Deviation	(2121,xx0D)	AUTO	-1 (no usage)	ANAP	Only with manual distance calibration
Vertical Pixel Standard Deviation	(2121,xx0E)	AUTO	-1 (no usage)	ANAP	Only with manual distance calibration

Table 130: Private Original Image Info Module

Attribute	Tag	Source	Value	Presence	Comments
Private Creator	(0025,00xx)	AUTO	"SIEMENS SMS-AX ORIGINAL IMAGE INFO"	ALWAYS	Private Owner Code contains double-spaces in name definition
View Native	(0025,xx00)	AUTO	0 = subtracted display 1 = native display	ANAP	
Original Series Number	(0025,xx01)	AUTO	Series number of scene from which derived image was created	ANAP	
Original Image Number	(0025,xx02)	AUTO	Instance number of scene from which derived image was created	ANAP	
Original Window Center	(0025,xx03)	AUTO	For native display: window center in original image	ANAP	
Original Window Width	(0025,xx04)	AUTO	For native display: window width in original image	ANAP	
Original Window Brightness	(0025,xx05)	AUTO	For subtracted display: brightness in original image	ANAP	
Original Window Contrast	(0025,xx06)	AUTO	For subtracted display: contrast in original image	ANAP	
Original Frame Number	(0025,xx07)	AUTO	Frame number in original image	ANAP	
Original Mask Frame Number	(0025,xx08)	AUTO	Frame number of mask in original image	ANAP	
Opac	(0025,xx09)	AUTO	1 = opacification was applied if derived image was created	ANAP	
Original Number of Frames	(0025,xx0A)	AUTO	Number of frames of scene from which derived image was created	ANAP	
Original Scene Timer	(0025,xx0B)	AUTO	Time stamp for frame within original scene	ANAP	
Image Object ID	(0025,xx0C)	AUTO	SOP Instance UID of original image (derived images) or "AXIM_READY_PROCESSED" (processed during transfer)	ANAP	
Original Scene VFR Info	(0025,xx0D)	AUTO	Number of phases, then followed by n pairs (Last Frame Number, then Frame Rate)	ANAP	
Original Frame ECG Position	(0025,xx0E)	AUTO	Point number in ECG data	ANAP	
Zoom Flag	(0025,xx10)	AUTO	0 = no zoom applied if derived image was created	ANAP	

Attribute	Tag	Source	Value	Presence	Comments
			1 = zoom applied if derived image was created		
Flexible Pixel Shift	(0025,xx11)	AUTO	1 = flexible pixel shift applied if derived image was created 2 = image from iFlow application	ANAP	
Number of Mask Frames	(0025,xx12)	AUTO	Number of mask frames averaged if derived image was created	ANAP	
Number of Fill Frames	(0025,xx13)	AUTO	0: no averaging >0: number of fill frames averaged if derived image was created	ANAP	
Series Number	(0025,xx14)	AUTO	Series number of scene from which derived image was created	ANAP	
Image Number	(0025,xx15)	AUTO	Instance number of scene from which derived image was created	ANAP	
Ready Processing Status	(0025,xx16)	AUTO	1 = Ready Processing 2 = Resizing 3 = Resizing and Ready Processing	ANAP	
Original Start Trim	(0025,xx22)	AUTO	Start Trim value before transfer processing	ANAP	

Table 131: Private OOG Overlay Module

Attribute	Tag	Source	Value	Presence	Comments
Private Creator	(0029,00xx)	AUTO	“SIEMENS AX OOG”	ALWAYS	
OOG Type	(0029,0008)	AUTO	“AX OOG”	ALWAYS	
OOG Version	(0029,0009)	AUTO	“VE20V00”	ALWAYS	
OOG Overlay Sequence	(0029,0010)	AUTO		ALWAYS	
>Private Creator	(0029,00xx)	AUTO	“SIEMENS AX OOG”	ALWAYS	
>Overlay Data	(0029,xx0A)	AUTO	Overly data stream	ALWAYS	
>Overlay Type	(0029,xx0B)	AUTO	1, 2, 3, 4, 5	ALWAYS	
>Bitmap Coordinate	(0029,xx0C)	AUTO		ANAP	
>Bitmap Data	(0029,xx0D)	AUTO		ANAP	

Table 132: Private Edge Enhancement Module

Attribute	Tag	Source	Value	Presence	Comments
Private Creator	(0029,00xx)	AUTO	"CARDIO-D.R. 1.0"	ALWAYS	
Standard Edge Enhancement Sequence	(0029,xx00)	AUTO	2 items for DSA, item 1 for native, item 2 for subtracted display	AWAYS	
>Private Creator	(0029,00xx)	AUTO	"CARDIO-D.R. 1.0"	ALWAYS	
>Convolution Kernel Size	(0029,xx01)	AUTO		AWAYS	
>Convolution Kernel Coefficients	(0029,xx02)	AUTO		AWAYS	
>Edge Enhancement Gain	(0029,xx03)	AUTO		AWAYS	

Table 133: Private Data Padding Module

Attribute	Tag	Source	Value	Presence	Comments
Private Creator	(7FDF,00xx)	AUTO	"SIEMENS SYNGO DATA PADDING"	ALWAYS	
Pixel Data Leading Padding	(7FDF,xxFC)	AUTO	Non-significant values to fill gap to pixel data	ALWAYS	

Table 134: Private Dose SR Data Module

Attribute	Tag	Source	Value	Presence	Comments
Private Creator	(0021,00xx)	AUTO	"SIEMENS SMS-AX ACQ 1.0"	ANAP	Private Owner Code contains double-spaces in name definition
Emergency Patient Flag	(0021,xxB0)	AUTO	1 = Registered as Emergency Patient	ANAP	
Private Creator	(0029,00xx)	AUTO	"SIEMENS CSA REPORT"	ALWAYS	
SR Variant	(0029,xx15)	AUTO	6	ALWAYS	

9.1.2 Image Type Values

9.1.2.1 X-Ray Angiographic Image IOD – Acquired and Derived Images

- Value 1:
  - ORIGINAL – original scenes and single images
  - DERIVED – derived images and processed images (transfer processing)
- Value 2:
  - PRIMARY - original scenes and single images, including processed images (transfer processing)
  - SECONDARY – derived images (Store Monitor, Reference Image, CLEARstent)
- Value 3:
  - SINGLE PLANE – original scenes and single images
  - BIPLANE A – plane A image of a biplane acquisition
  - BIPLANE B – plane B image of a biplane acquisition
- Value 4:
  - SINGLE A – single image acquired in plane A or acquired on a single plane system
  - SINGLE B – single image acquired in plane B
  - <empty> – 4th value is empty for biplane images
- Value 5:
  - ALT ACQ – image acquired with alternate footswitch
  - REFIMAGE– Reference image
  - STORE MONITOR – Store Monitor image
  - STORE FLUORO – stored fluoro scene
  - ROADMAP – stored roadmap scene
  - 4PHASE RDMP DSA – roadmap vessel phase scene
  - ICSTENT DYNAMIC – CLEARstent image
  - CLEARSTENT_LIVE – CLEARstent image
  - PERI – peri image (stepping or perivision)
  - 3D ACQ – Rotational image
- Value 6:
  - ICSTENT REF – Reference image within CLEARstent workflow
  - RDMAP MAX OPAC – Reference image for Roadmap DSA workflow
  - DR - Rotational image: DR mode
  - DSA - Rotational image: DSA mode
  - CARD_NO_TRIGGER - Rotational image: multiple runs / perfusion
  - LV – Rotational image: Large Volume
  - LV FAST – 3D Acquisition 360°
- Value 7 and higher:
  - step numbers for peri
  - MASK, FILL, INJECTION and run numbers for rotational acquisition

9.1.2.2 X-Ray Angiographic Image IOD – Exam Protocol as XA Image

- Value 1:
  - DERIVED
- Value 2:
  - SECONDARY

- Value 3:
  - SINGLE PLANE
- Value 4:
  - SINGLE A – single image acquired in plane A or acquired on a single plane system
- Value 5:
  - EXAM PROTOCOL

9.1.2.3 Secondary Capture Image IOD – iFlow

- Value 1:
  - DERIVED
- Value 2:
  - SECONDARY
- Value 3:
  - IFLOW

9.1.3 Usage of Attributes from received IODs

N/A

9.1.4 Attribute mapping

For details regarding the mapping between Modality Worklist and created object, refer to Section 9.1.1Created SOP Instances

For the mapping between Modality Worklist and MPPS, refer to section 4.2.6 Modality Performed Procedure Step AE Specification

9.1.5 Coerced / Modified fields

N/A

9.2 Data Dictionary of Private Attributes

Table 135 lists private attributes created which may be included in instances generated by the ARTIS VE50. These private attributes may be deprecated or replaced with standard attributes in the future.

Table 135: Private Data Element Dictionary

DICOM Tag	Name	VR	VM
(0019,SIEMENS SMS-AX VIEW 1.0,00)	Review Mode	US	1
(0019,SIEMENS SMS-AX VIEW 1.0,01)	Anatomical Background Percent	US	1
(0019,SIEMENS SMS-AX VIEW 1.0,02)	Number of Phases	US	1
(0019,SIEMENS SMS-AX VIEW 1.0,03)	Apply Anatomical Background	US	1
(0019,SIEMENS SMS-AX VIEW 1.0,04)	Pixel Shift Array	SS	4-4n
(0019,SIEMENS SMS-AX VIEW 1.0,05)	Brightness	US	1

DICOM Tag	Name	VR	VM
(0019,SIEMENS SMS-AX VIEW 1.0,06)	Contrast	US	1
(0019,SIEMENS SMS-AX VIEW 1.0,07)	Enabled Shutters	US	1
(0019,SIEMENS SMS-AX VIEW 1.0,08)	Native Edge Enhancement Percent Gain	US	1
(0019,SIEMENS SMS-AX VIEW 1.0,09)	Native Edge Enhancement LUT Index	SS	1
(0019,SIEMENS SMS-AX VIEW 1.0,0A)	Native Edge Enhancement Kernel Size	SS	1
(0019,SIEMENS SMS-AX VIEW 1.0,0B)	Subtracted Edge Enhancement Percent Gain	US	1
(0019,SIEMENS SMS-AX VIEW 1.0,0C)	Subtracted Edge Enhancement LUT Index	SS	1
(0019,SIEMENS SMS-AX VIEW 1.0,0D)	Subtracted Edge Enhancement Kernel Size	SS	1
(0019,SIEMENS SMS-AX VIEW 1.0,0E)	Fade Percent	US	1
(0019,SIEMENS SMS-AX VIEW 1.0,0F)	Flipped before Laterality Applied	US	1
(0019,SIEMENS SMS-AX VIEW 1.0,10)	Apply Fade	US	1
(0019,SIEMENS SMS-AX VIEW 1.0,12)	Zoom	US	1
(0019,SIEMENS SMS-AX VIEW 1.0,13)	Pan X	SS	1
(0019,SIEMENS SMS-AX VIEW 1.0,14)	Pan Y	SS	1
(0019,SIEMENS SMS-AX VIEW 1.0,15)	Native Advanced Edge Enhancement Percent Gain	SS	1
(0019,SIEMENS SMS-AX VIEW 1.0,16)	Subtracted Advanced Edge Enhancement Percent Gain	SS	1
(0019,SIEMENS SMS-AX VIEW 1.0,17)	Invert Flag	US	1
(0019,SIEMENS SMS-AX VIEW 1.0,1B)	Full Resolution Flag	US	1
(0019,SIEMENS SMS-AX VIEW 1.0,1C)	Auto Window Center	DS	1
(0019,SIEMENS SMS-AX VIEW 1.0,1D)	Auto Window Width	DS	1
(0019,SIEMENS SMS-AX VIEW 1.0,1E)	Auto Window Correct Value	IS	2
(0019,SIEMENS SMS-AX VIEW 1.0,1F)	Sigmoid Window Parameter	DS	1
(0019,SIEMENS SMS-AX VIEW 1.0,20)	Roadmap Catheter Contrast	DS	1
(0019,SIEMENS SMS-AX VIEW 1.0,21)	Roadmap Vessel Contrast	DS	1
(0019,SIEMENS SMS-AX VIEW 1.0,23)	CLEARstent ROI Origin	US	2
(0019,SIEMENS SMS-AX VIEW 1.0,24)	CLEARstent ROI Size	US	2
(0019,SIEMENS SMS-AX VIEW 1.0,25)	VFR Info	US	2-2n
(0019,SIEMENS SMS-AX VIEW 1.0,30)	Frame # Roadmap - Min Amplification	US	1
(0019,SIEMENS SMS-AX VIEW 1.0,31)	Frame # Roadmap - Vessel Map	US	1
(0019,SIEMENS SMS-AX VIEW 1.0,32)	Roadmap Device Presentation	US	1
(0019,SIEMENS SMS-AX VIEW 1.0,33)	Roadmap Vessel Presentation	US	1
(0019,SIEMENS SMS-AX VIEW 1.0,34)	DSA Vessel Presentation	US	1
(0019,SIEMENS SMS-AX VIEW 1.0,35)	Interpolation Parameter	US	1
(0019,SIEMENS SMS-AX VIEW 1.0,36)	Roadmap Clean Phase 3	US	1
(0019,SIEMENS SMS-AX VIEW 1.0,41)	RT Pixel Shift Values	FL	6-6n
(0019,SIEMENS SMS-AX VIEW 1.0,42)	RT Pixel Shift Indicator	US	1

DICOM Tag	Name	VR	VM
(0019,SIEMENS SMS-AX VIEW 1.0,43)	Applied RT Pixel Shift Values	FL	6-6n
(0019,SIEMENS SMS-AX VIEW 1.0,44)	Pixel Shift Validity	US	2-2n
(0019,SIEMENS SMS-AX VIEW 1.0,51)	UIPnat Processing Mode	US	1
(0019,SIEMENS SMS-AX VIEW 1.0,52)	UIPnat DDO Kernel Size	US	1
(0019,SIEMENS SMS-AX VIEW 1.0,53)	UIPnat DDO Gain	US	1
(0019,SIEMENS SMS-AX VIEW 1.0,54)	UIPnat Contrast	US	1
(0019,SIEMENS SMS-AX VIEW 1.0,55)	UIPnat Dynamic	US	1
(0019,SIEMENS SMS-AX VIEW 1.0,57)	UIPnat Peak Reduction	US	1
(0019,SIEMENS SMS-AX VIEW 1.0,58)	UIPnat Brightness Control	US	1
(0019,SIEMENS SMS-AX VIEW 1.0,59)	UIPnat Brightness Value	US	1
(0019,SIEMENS SMS-AX VIEW 1.0,61)	Visibility Overlay	US	1
(0019,SIEMENS SMS-AX VIEW 1.0,63)	UIPnat Modulation 1	SS	2
(0019,SIEMENS SMS-AX VIEW 1.0,64)	UIPnat Modulation 2	SS	2
(0019,SIEMENS SMS-AX VIEW 1.0,65)	UIPnat Modulation 3	SS	2
(0019,SIEMENS SMS-AX VIEW 1.0,66)	UIPnat Gamma Layer	SS	1
(0021,SIEMENS SMS-AX ACQ 1.0,00)	Acquisition Type	US	1
(0021,SIEMENS SMS-AX ACQ 1.0,01)	Acquisition Mode	US	1
(0021,SIEMENS SMS-AX ACQ 1.0,02)	Footswitch Index	US	1
(0021,SIEMENS SMS-AX ACQ 1.0,03)	Acquisition Room	US	1
(0021,SIEMENS SMS-AX ACQ 1.0,04)	Current Time Product	SL	1
(0021,SIEMENS SMS-AX ACQ 1.0,05)	Dose	SL	1
(0021,SIEMENS SMS-AX ACQ 1.0,08)	Referenced Air Kerma Rate	SL	1
(0021,SIEMENS SMS-AX ACQ 1.0,0A)	Copper Filter	UL	1
(0021,SIEMENS SMS-AX ACQ 1.0,0B)	Measuring Field	US	1
(0021,SIEMENS SMS-AX ACQ 1.0,0E)	Total Steps	SS	1
(0021,SIEMENS SMS-AX ACQ 1.0,0F)	Dyna X-Ray Info	SL	4-4n
(0021,SIEMENS SMS-AX ACQ 1.0,10)	Modality LUT Input Gamma	US	1
(0021,SIEMENS SMS-AX ACQ 1.0,11)	Modality LUT Output Gamma	US	1
(0021,SIEMENS SMS-AX ACQ 1.0,12)	SH_STPAR	OB	1
(0021,SIEMENS SMS-AX ACQ 1.0,14)	Dyna Angulation Step	SS	1
(0021,SIEMENS SMS-AX ACQ 1.0,16)	DR Single Flag	US	1
(0021,SIEMENS SMS-AX ACQ 1.0,17)	Source to Isocenter	SL	1
(0021,SIEMENS SMS-AX ACQ 1.0,19)	ECG Index Array	SL	1-n
(0021,SIEMENS SMS-AX ACQ 1.0,1B)	SH_ZOOM	OB	1
(0021,SIEMENS SMS-AX ACQ 1.0,1C)	SH_COLPAR	OB	1
(0021,SIEMENS SMS-AX ACQ 1.0,1D)	K-Factor	US	1

DICOM Tag	Name	VR	VM
(0021,SIEMENS SMS-AX ACQ 1.0,1E)	EVE	US	1
(0021,SIEMENS SMS-AX ACQ 1.0,1F)	Total Scene Time	SL	1
(0021,SIEMENS SMS-AX ACQ 1.0,20)	Restore Flag	US	1
(0021,SIEMENS SMS-AX ACQ 1.0,21)	Stand Movement Flag	US	1
(0021,SIEMENS SMS-AX ACQ 1.0,22)	FD Rows	US	1
(0021,SIEMENS SMS-AX ACQ 1.0,23)	FD Columns	US	1
(0021,SIEMENS SMS-AX ACQ 1.0,24)	Table Movement Flag	US	1
(0021,SIEMENS SMS-AX ACQ 1.0,28)	Gamma LUT Sequence	SQ	1
(0021,SIEMENS SMS-AX ACQ 1.0,29)	Scene Time in s	DS	1
(0021,SIEMENS SMS-AX ACQ 1.0,30)	Organ Program Info	OB	1
(0021,SIEMENS SMS-AX ACQ 1.0,31)	Source Image Distance	SS	1-n
(0021,SIEMENS SMS-AX ACQ 1.0,32)	Original Pixel Spacing	DS	2
(0021,SIEMENS SMS-AX ACQ 1.0,40)	Gamma LUT Descriptor	US	3
(0021,SIEMENS SMS-AX ACQ 1.0,41)	Gamma LUT Type	LO	1
(0021,SIEMENS SMS-AX ACQ 1.0,42)	Gamma LUT Data	US	1-n
(0021,SIEMENS SMS-AX ACQ 1.0,43)	Global Gain	US	1
(0021,SIEMENS SMS-AX ACQ 1.0,44)	Global Offset	US	1
(0021,SIEMENS SMS-AX ACQ 1.0,45)	Dipp Mode	US	1
(0021,SIEMENS SMS-AX ACQ 1.0,46)	Artis System Type	US	1
(0021,SIEMENS SMS-AX ACQ 1.0,47)	Artis Table Type	US	1
(0021,SIEMENS SMS-AX ACQ 1.0,48)	Artis Table Top Type	US	1
(0021,SIEMENS SMS-AX ACQ 1.0,49)	Water Value	SS	1
(0021,SIEMENS SMS-AX ACQ 1.0,4A)	CNR Flag	US	1
(0021,SIEMENS SMS-AX ACQ 1.0,4B)	CNR / Dose Requested	FL	1
(0021,SIEMENS SMS-AX ACQ 1.0,4C)	CNR / Dose Achieved	FL	1
(0021,SIEMENS SMS-AX ACQ 1.0,50)	X-ray Tube Type	LO	1
(0021,SIEMENS SMS-AX ACQ 1.0,51)	3D Positioner Primary Start Angle	DS	1
(0021,SIEMENS SMS-AX ACQ 1.0,52)	3D Positioner Secondary Start Angle	DS	1
(0021,SIEMENS SMS-AX ACQ 1.0,53)	Stand Position	SS	3
(0021,SIEMENS SMS-AX ACQ 1.0,54)	Rotation Angle	SS	1
(0021,SIEMENS SMS-AX ACQ 1.0,55)	Image Rotation	US	1
(0021,SIEMENS SMS-AX ACQ 1.0,56)	Table Coordinates	SS	3
(0021,SIEMENS SMS-AX ACQ 1.0,57)	Isocenter Table Position	SS	3
(0021,SIEMENS SMS-AX ACQ 1.0,58)	Table Object Distance	DS	1
(0021,SIEMENS SMS-AX ACQ 1.0,59)	C-Arm Coordinate System	FL	1-n
(0021,SIEMENS SMS-AX ACQ 1.0,5A)	Robot Axes	FL	1-n

DICOM Tag	Name	VR	VM
(0021,SIEMENS SMS-AX ACQ 1.0,5B)	Table Coordinate System	FL	12
(0021,SIEMENS SMS-AX ACQ 1.0,5C)	Patient Coordinate System	FL	12
(0021,SIEMENS SMS-AX ACQ 1.0,5D)	Angulation	SL	1-n
(0021,SIEMENS SMS-AX ACQ 1.0,5E)	Orbital	SL	1-n
(0021,SIEMENS SMS-AX ACQ 1.0,5F)	3D Start Position ID	US	1
(0021,SIEMENS SMS-AX ACQ 1.0,60)	3D Rotation Time	SL	1
(0021,SIEMENS SMS-AX ACQ 1.0,61)	Large Volume Overlap	SS	1
(0021,SIEMENS SMS-AX ACQ 1.0,62)	Reconstruction Preset	US	1
(0021,SIEMENS SMS-AX ACQ 1.0,63)	3D Start Angle	SS	1
(0021,SIEMENS SMS-AX ACQ 1.0,64)	3D Planned Angle	SL	1
(0021,SIEMENS SMS-AX ACQ 1.0,65)	3D Rotation Plane Alpha	SL	1
(0021,SIEMENS SMS-AX ACQ 1.0,66)	3D Rotation Plane Beta	SL	1
(0021,SIEMENS SMS-AX ACQ 1.0,67)	3D First Image Angle	SL	1
(0021,SIEMENS SMS-AX ACQ 1.0,68)	3D Trigger Angle	SS	1-n
(0021,SIEMENS SMS-AX ACQ 1.0,69)	Amplitude	SS	1
(0021,SIEMENS SMS-AX ACQ 1.0,71)	Detector Rotation	DS	1-n
(0021,SIEMENS SMS-AX ACQ 1.0,72)	Physical Detector Rotation	SL	1-n
(0021,SIEMENS SMS-AX ACQ 1.0,81)	Table Head Tilt	SS	1
(0021,SIEMENS SMS-AX ACQ 1.0,82)	Table Rotation	SS	1
(0021,SIEMENS SMS-AX ACQ 1.0,83)	Table Cradle Tilt	SS	1
(0021,SIEMENS SMS-AX ACQ 1.0,84)	Artis System Family	LO	1
(0021,SIEMENS SMS-AX ACQ 1.0,85)	Orientation Stand Table	SS	1
(0021,SIEMENS SMS-AX ACQ 1.0,86)	Image Rotation DIPP	US	1
(0021,SIEMENS SMS-AX ACQ 1.0,B0)	Emergency Patient Flag	US	1
(0023,SIEMENS SMS-AX QUANT 1.0,08)	Calibration TOD Value	IS	1
(0025,SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0,00)	View Native	US	1
(0025,SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0,01)	Original Series Number	US	1
(0025,SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0,02)	Original Image Number	US	1
(0025,SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0,03)	Original Window Center	US	1
(0025,SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0,04)	Original Window Width	US	1
(0025,SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0,05)	Original Window Brightness	US	1
(0025,SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0,06)	Original Window Contrast	US	1

DICOM Tag	Name	VR	VM
(0025,SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0,07)	Original Frame Number	US	1
(0025,SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0,08)	Original Mask Frame Number	US	1
(0025,SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0,09)	Opac	US	1
(0025,SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0,0A)	Original Number of Frames	US	1
(0025,SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0,0B)	Original Scene Timer	DS	1
(0025,SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0,0C)	Image Object ID	LO	1
(0025,SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0,0D)	Original Scene VFR Info	SS	1-n
(0025,SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0,0E)	Original Frame ECG Position	SS	1
(0025,SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0,10)	Zoom Flag	SS	1
(0025,SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0,11)	Flexible Pixel Shift	US	1
(0025,SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0,12)	Number of Mask Frames	US	1
(0025,SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0,13)	Number of Fill Frames	US	1
(0025,SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0,14)	Series Number	IS	1
(0025,SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0,15)	Image Number	IS	1
(0025,SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0,16)	Ready Processing Status	IS	1
(0025,SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0,22)	Original Start Trim	US	1
(0029,CARDIO-D.R. 1.0,00)	Standard Edge Enhancement Sequence	SQ	1
(0029,CARDIO-D.R. 1.0,01)	Convolution Kernel Size	US	2
(0029,CARDIO-D.R. 1.0,02)	Convolution Kernel Coefficients	US	1-n
(0029,CARDIO-D.R. 1.0,03)	Edge Enhancement Gain	FL	1
(0029,SIEMENS AX OOG,08)	OOG Type	CS	1
(0029,SIEMENS AX OOG,09)	OOG Version	LO	1
(0029,SIEMENS AX OOG,0A)	Overlay Data	OB	1
(0029,SIEMENS AX OOG,0B)	Overlay Type	CS	1
(0029,SIEMENS AX OOG,0C)	Bitmap Coordinate	SL	4
(0029,SIEMENS AX OOG,0D)	Bitmap Data	OB	1

DICOM Tag	Name	VR	VM
(0029,SIEMENS AX OOG,10)	OOG Overlay Sequence	SQ	1
(0029,SIEMENS CSA REPORT,15)	SR Variant	US	1
(2121,PMI Private Calibration Module Version 2.0,01)	Calibration Method	ST	1
(2121,PMI Private Calibration Module Version 2.0,02)	Calibration Method Info	ST	1
(2121,PMI Private Calibration Module Version 2.0,03)	Calibration Object Size	FL	1
(2121,PMI Private Calibration Module Version 2.0,04)	Calibration Object Standard Deviation	FL	1
(2121,PMI Private Calibration Module Version 2.0,05)	Horizontal Pixel Spacing	FL	1
(2121,PMI Private Calibration Module Version 2.0,06)	Vertical Pixel Spacing	FL	1
(2121,PMI Private Calibration Module Version 2.0,08)	Calibration SOP Instance UID	ST	1
(2121,PMI Private Calibration Module Version 2.0,09)	Calibration Frame Number	IS	1
(2121,PMI Private Calibration Module Version 2.0,0A)	Calibration Object Unit	SH	1
(2121,PMI Private Calibration Module Version 2.0,0B)	Number Of Averaged Calibrations Performed	SS	1
(2121,PMI Private Calibration Module Version 2.0,0C)	Auto Magnify Factor	FL	1
(2121,PMI Private Calibration Module Version 2.0,0D)	Horizontal Pixel Standard Deviation	FL	1
(2121,PMI Private Calibration Module Version 2.0,0E)	Vertical Pixel Standard Deviation	FL	1
(7FDF,SIEMENS SYNGO DATA PADDING,FC)	Pixel Data Leading Padding	OB	1

Interpretation of the DICOM Tags from the above table:
(gggg, pp,ee) -> (gggg, ppee)
gggg - odd group number
pp - private creator identification code
ee - private element

Note: Some of the Private Owner Codes contain double-spaces in the name definitions. The following term (only double-spaces marked) are defined:

SIEMENS SMS-AX<spc><spc>VIEW 1.0
SIEMENS SMS-AX<spc><spc>ACQ 1.0
SIEMENS SMS-AX<spc><spc>QUANT 1.0
SIEMENS SMS-AX<spc><spc>ORIGINAL IMAGE INFO 1.0

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

9.3 Coded Terminology and Templates

9.3.1 Context Groups

N/A

9.3.2 Template Specifications

The ARTIS VE50 system creates and stores, upon completion of the procedure step, a DICOM X-Ray Radiation Dose SR object. The X-Ray Radiation Dose SR uses template TID 10001.

9.3.2.1 X-Ray Radiation Dose SR

Table 136: X-Ray Radiation Dose (TID 10001)

NL	Rel with Parent	VT	Concept Name	VM	Presence	Value
		CONTAINER	(113701, DCM, "X-Ray Radiation Dose Report")	1	ALWAYS	
>	HAS CONCEPT MOD	CODE	(121058, DCM, "Procedure reported")	1	ALWAYS	“Projection X-Ray”
>>	HAS CONCEPT MOD	CODE	(363703001, SCT, "Has intent")	1	ALWAYS	“Combined Diagnostic and Therapeutic Intent“
>		INCLUDE	Observer Context	2	ALWAYS	TID 1002
>	HAS OBS CONTEXT	CODE	(113705, DCM, "Scope of Accumulation")	1	ALWAYS	“Performed Procedure Step”
>>	HAS PROPERTIES	UIDREF	(121126, DCM, "Performed Procedure Step SOP Instance UID")	1	ALWAYS	
>	CONTAINS	INCLUDE	(113702, DCM, "Accumulated X-Ray Dose Data")	1-2	ALWAYS	TID 10002 One container per plane
>	CONTAINS	INCLUDE	(113706, DCM, Irradiation Event X-Ray Data)	1-n	ALWAYS	TID 10003 One container per irradiation event
>	CONTAINS	TEXT	(121106, DCM, "Comment")	1	ALWAYS	Private structure with additional info that is not covered in standard codes
>	CONTAINS	CODE	(113854, DCM, "Source of Dose Information")	1	ALWAYS	“Dosimeter”

Table 137: Observer Context (TID 1002)

NL	Rel with Parent	VT	Concept Name	VM	Presence	Value
	HAS OBS CONTEXT	CODE	(121005, DCM, "Observer Type")	1	ALWAYS	“Device”
	HAS OBS CONTEXT	UIDREF	(121012, DCM, "Device Observer UID")	1	ALWAYS	

NL	Rel with Parent	VT	Concept Name	VM	Presence	Value
	HAS OBS CONTEXT	TEXT	(121013,DCM, "Device Observer Name")	1	ALWAYS	Station Name of system
	HAS OBS CONTEXT	TEXT	(121014,DCM, "Device Observer Manufacturer")	1	ALWAYS	Manufacturer value as given in (0008,0070)
	HAS OBS CONTEXT	TEXT	(121015,DCM, "Device Observer Model Name")	1	ALWAYS	Manufacturer's Model name value as given in (0008,1090)
	HAS OBS CONTEXT	TEXT	(121016,DCM, "Device Observer Serial Number")	1	ALWAYS	
	HAS OBS CONTEXT	CODE	(121005, DCM, "Observer Type")	1	ALWAYS	“Person”
	HAS OBS CONTEXT	TEXT	(121008,DCM, "Person Observer Name")	1	ALWAYS	Performing Physician or “Not set”
	HAS OBS CONTEXT	TEXT	(121011, DCM, "Person Observer's Role in this Procedure")	1	ALWAYS	“Irradiation Administering”

Table 138: Accumulated X-Ray Dose (TID 10002)

NL	Rel with Parent	VT	Concept Name	VM	Presence	Value
		CONTAINER	(113702,DCM,"Accumulated X-Ray Dose Data")	1	ALWAYS	
>	HAS CONCEPT MOD	CODE	(113764, DCM, "Acquisition Plane")	1	ALWAYS	“Single Plane”, “Plane A”, “Plane B”
>	CONTAINS	CONTAINER	(122505, DCM,"Calibration")	1	ALWAYS	
>>	HAS CONCEPT MOD	CODE	(113794, DCM, "Dose Measurement Device")	1	ALWAYS	“Dosimeter”
>>	CONTAINS	DATETIME	(113723, DCM, "Calibration DateTime")	1	ALWAYS	
>>	CONTAINS	NUM	(122322, DCM, "Calibration Factor")	1	ALWAYS	1
>>	CONTAINS	NUM	(113763, DCM, "Calibration Uncertainty")	1	ALWAYS	Value from calibration service UID
>>	CONTAINS	TEXT	(113724, DCM, "Calibration Responsible Party")	1	ALWAYS	Value from calibration service UID
>>	CONTAINS	TEXT	(113720, DCM, "Calibration Protocol")	1	ALWAYS	“Manufacturer Calibration”
>	CONTAINS	NUM	(113722, DCM, "Dose Area Product Total")	1	ALWAYS	
>	CONTAINS	NUM	(113725, DCM, "Dose (RP) Total")	1	ALWAYS	

NL	Rel with Parent	VT	Concept Name	VM	Presence	Value
>	CONTAINS	NUM	(113726, DCM, "Fluoro Dose Area Product Total")	1	ALWAYS	
>	CONTAINS	NUM	(113728, DCM, "Fluoro Dose (RP) Total")	1	ALWAYS	
>	CONTAINS	NUM	(113730, DCM, "Total Fluoro Time")	1	ALWAYS	
>	CONTAINS	NUM	(113727, DCM, "Acquisition Dose Area Product Total")	1	ALWAYS	
>	CONTAINS	NUM	(113729, DCM, "Acquisition Dose (RP) Total")	1	ALWAYS	
>	CONTAINS	NUM	(113855, DCM, "Total Acquisition Time")	1	ALWAYS	
>	CONTAINS	CODE	(113780, DCM, "Reference Point Definition")	1	ALWAYS	“15cm from Isocenter toward Source”

Table 138: Irradiation Event X-Ray Data (TID 10003)

NL	Rel with Parent	VT	Concept Name	VM	Presence	Value
		CONTAINER	(113706, DCM, Irradiation Event X-Ray Data)	1	ALWAYS	
>	HAS CONCEPT MOD	CODE	(113764, DCM, "Acquisition Plane")	1	ALWAYS	“Single Plane”, “Plane A”, “Plane B”
>	CONTAINS	DATETIEM	(111526, DCM, "DateTime Started")	1	ALWAYS	
>	CONTAINS	CODE	(113721, DCM, "Irradiation Event Type")	1	ALWAYS	“Fluoroscopy”, “Stationary Acquisition”, “Stepping Acquisition”, “Rotational Acquisition”
>	CONTAINS	TEXT	(125203, DCM, "Acquisition Protocol")	1	ALWAYS	
>	CONTAINS	CODE	(113745, DCM, "Patient Table Relationship")	1	ALWAYS	“headfirst”, “feet-first”
>	CONTAINS	CODE	(113743, DCM, "Patient Orientation")	1	ALWAYS	“recumbent”
>>	HAS CONCEPT MOD	CODE	(113744, DCM, "Patient Orientation Modifier")	1	ALWAYS	“supine”, “prone”, “right lateral decubitus”, “left lateral decubitus”
>	CONTAINS	CODE	(113780, DCM, "Reference Point Definition")	1	ALWAYS	“15cm from Isocenter toward Source”
>	CONTAINS	UIDREF	(113769, DCM, "Irradiation Event UID")	1	ALWAYS	

NL	Rel with Parent	VT	Concept Name	VM	Presence	Value
>	CONTAINS	NUM	(122130, DCM, "Dose Area Product")	1	ALWAYS	
>	CONTAINS	NUM	(111638, DCM, "Patient Equivalent Thickness")	1	ALWAYS	
>	CONTAINS	NUM	(113738, DCM, "Dose (RP)")	1	ALWAYS	
>	CONTAINS	NUM	(112011, DCM, "Positioner Primary Angle")	1	ALWAYS	
>	CONTAINS	NUM	(112012, DCM, "Positioner Secondary Angle")	1	ALWAYS	
>	CONTAINS	NUM	(113739, DCM, "Positioner Primary End Angle")	1	ALWAYS	
>	CONTAINS	NUM	(113740, DCM, "Positioner Secondary End Angle")	1	ALWAYS	
>	CONTAINS	NUM	(113754, DCM, "Table Head Tilt Angle")	1	ALWAYS	
>	CONTAINS	NUM	(113755, DCM, "Table Horizontal Rotation Angle")	1	ALWAYS	
>	CONTAINS	NUM	(113756, DCM, "Table Cradle Tilt Angle")	1	ALWAYS	
>	CONTAINS	NUM	(113790, DCM, "Collimated Field Area")	1	ALWAYS	
>	CONTAINS	NUM	(113788, DCM, "Collimated Field Height")	1	ALWAYS	
>	CONTAINS	NUM	(113789, DCM, "Collimated Field Width")	1	ALWAYS	
>	CONTAINS	CONTAINER	(113771, DCM, "X-Ray Filters")	1	ALWAYS	
>>	CONTAINS	CODE	(113772, DCM, "X-Ray Filter Type")	1	ALWAYS	“Flat filter”, “No filter”
>>	CONTAINS	CODE	(113757, DCM, "X-Ray Filter Material")	1	ANAP	IFF filter was used: “Copper”
>>	CONTAINS	NUM	(113758, DCM, "X-Ray Filter Thickness Minimum")	1	ALWAYS	IFF filter was used
>>	CONTAINS	NUM	(113773, DCM, "X-Ray Filter Thickness Maximum")	1	ALWAYS	IFF filter was used
>	CONTAINS	CODE	(113732, DCM, "Fluoro Mode")	1	ANAP	IFF Irradiation Event Type = Fluoroscopy: “Pulsed”
>	CONTAINS	NUM	(113791, DCM, "Pulse Rate")	1	ALWAYS	

NL	Rel with Parent	VT	Concept Name	VM	Presence	Value
>	CONTAINS	NUM	(113768, DCM, "Number of Pulses")	1	ALWAYS	
>	CONTAINS	NUM	(113733, DCM, "KVP")	1	ALWAYS	
>	CONTAINS	NUM	(113734, DCM, "X-Ray Tube Current")	1	ALWAYS	
>	CONTAINS	NUM	(113824, DCM, "Exposure Time")	1	ALWAYS	
>	CONTAINS	NUM	(113793, DCM, "Pulse Width")	1	ALWAYS	
>	CONTAINS	NUM	(113742, DCM, "Irradiation Duration")	1	ALWAYS	
>	CONTAINS	NUM	(113736, DCM, "Exposure")	1	ALWAYS	
>	CONTAINS	NUM	(113766, DCM, "Focal Spot Size")	1	ALWAYS	
>	CONTAINS	NUM	(113750, DCM, "Distance Source to Detector")	1	ALWAYS	
>	CONTAINS	NUM	(113748, DCM, "Distance Source to Isocenter")	1	ALWAYS	
>	CONTAINS	NUM	(113751, DCM, "Table Longitudinal Position")	1	ALWAYS	
>	CONTAINS	NUM	(113752, DCM, "Table Lateral Position")	1	ALWAYS	
>	CONTAINS	NUM	(113753, DCM, "Table Height Position")	1	ALWAYS	
>	CONTAINS	NUM	(113759, DCM, "Table Longitudinal End Position")	1	ANAP	IFF table moved during irradiation event
>	CONTAINS	NUM	(113760, DCM, "Table Lateral End Position")	1	ANAP	IFF table moved during irradiation event
>	CONTAINS	NUM	(113761, DCM, "Table Height End Position")	1	ANAP	IFF table moved during irradiation event
>	CONTAINS	NUM	(113737, DCM, "Distance Source to Reference Point")	1	ALWAYS	
>	CONTAINS	CODE	(123014 , DCM, "Target Region")	1	ALWAYS	“Entire body”
>	CONTAINS	TEXT	(121106, DCM, "Comment")	1	ALWAYS	Private structure with additional info that is not covered in standard codes
>	CONTAINS	CODE	(113876, DCM, "Device Role in Procedure")	1	ALWAYS	“Irradiating Device”
>>	HAS PROPERTIES	TEXT	(113877, DCM, "Device Name")	1	ALWAYS	Station Name of system

NL	Rel with Parent	VT	Concept Name	VM	Presence	Value
>>	HAS PROPERTIES	TEXT	(113878, DCM, "Device Manufacturer")	1	ALWAYS	Manufacturer value as given in (0008,0070)
>>	HAS PROPERTIES	TEXT	(113879, DCM, "Device Model Name")	1	ALWAYS	Manufacturer's Model name value as given in (0008,1090)
>>	HAS PROPERTIES	TEXT	(113880, DCM, "Device Serial Number")	1	ALWAYS	
>	CONTAINS	IMAGE	(113795, DCM, "Acquired Image")	1	ANAP	IFF image was stored

9.3.3 Private Code definitions

N/A

9.4 Grayscale Image Consistency

The high resolution TFT display monitor option of ARTIS VE50 comes with a DICOM Grayscale Standard Display Function (GSDF) compliant factory pre-setting. A typical working environment setup is assumed for ambient light.

9.5 Standard Extended / Specialized / Private SOP Classes

N/A

9.6 Private Transfer Syntaxes

No private Transfer Syntaxes are defined for or requested by ARTIS VE50 DICOM application.

9.7 Sorting Information in Images

This chapter describes the sorting information in ARTIS VE50 images.
For details about Image Type values refer also to chapter 9.1.2

Table 139: Numbering of Image Objects

Type of Acquisition	Image Type (0008,0008)	Series Number (0020,0011)	Instance Number (0020,0013)
Acquired scenes and single images	Ends with “SINGLE A”, “SINGLE B”, “BIPLANE A”, “BIPLANE B”	Counter started with 1, incremented for each stored fluoro / acquisition	1 – single acquisition and plane A images 2 – plane B image of biplane acquisition
Stored Fluoro	Ends with “STORE FLUORO”		
Stored Roadmap	Ends with “ROADMAP”		
Peri Images	Contains “PERI” and step number		Counter started with 1, incremented for each step
Rotational Images	Contains “3D ACQ” + info about type and run number		Counter started with 1, incremented for each run (in case of multi-run 3D)

Type of Acquisition	Image Type (0008,0008)	Series Number (0020,0011)	Instance Number (0020,0013)
Store Monitor	Contains “STORE MONITOR”	Same as original image	Counter started with 300, incremented for each Store Monitor
Reference Images	Contains “REFMAGE”	Same as original image	Counter started with 100, incremented for each Reference Image
CLEARstent images	End with “CLEARSTENT_LIVE” and does not contain “REFIMAGE”	Same as original image	increments instance number of original scene (2 for single, 3 for biplane)
Vessel Phase (mask for roadmap workflow)	Ends with “4PHASE RDMP DSA”	Counter started with “500”, incremented for each vessel phase	1 – single acquisition and plane A images 2 – plane B image of biplane acquisition
Exam Protocol as XA Image	Ends with “EXAM PROTOCOL”	999	999
iFlow	Ends with “IFLOW”	Counter started with “1”, incremented for each new iFlow series. The user can decide if a new series is created or if images are added to existing iFlow series	Counter within iFlow series started with 1

Table 140: Time Stamps in Image Objects

Attribute	Tag	Comment
Study Time	(0008,0030)	Time when the study was created (patient registered)
Series Time	(0008,0031)	Time when series was created
Acquisition Time	(0008,0032)	Scenes: Time of first x-ray pulse of this acquisition Store Monitor / Reference images: Time of the x-ray pulse for the stored frame, images derived from different frames will have different acquisition times Note: Biplane image are acquired interlaced. Acquisition time of A and B are different. Depending on master plane the first frame might be acquired in plane B
Frame Time Vector	(0018,1065)	Vector with time differences between the stored frames
Content Time	(0008,0033)	Time when pixel data was created. Note: For processed transfer pixel data is recalculated and Content Time will be set to the time of transfer

9.8 Transfer Processing

ARTIS VE50 provides a service configuration for transfer processing (ready processing) to ensure identical image impression on ARTIS VE50 and remote systems' display. Transfer processing can be configured for each DICOM node individually. Pixel data is recalculated during transfer according to these settings:

- Unprocessed:
    - Images are transferred as stored in the database; no processing is applied to the pixel data.
    - Spatial transformation is not applied to the images, flip info is set in DICOM elements *Image Horizontal Flip* (0070,0041) and *Image Rotation* (0070,0042). Zoom and pan are stored in private DICOM elements.
    - Annotations are only available as private DICOM elements.

- Processed:
    - Images are transferred with all processing applied to the pixel data. This includes subtractions, edge enhancement, window level and other processing.
    - Spatial transformation (zoom, pan) is applied to the image, only the visible part of the image is transferred.
    - Subtracted / native view are as displayed at the time of start transfer.
    - Annotations and measurements are burned into pixel data.
    - Frames prior to Start Trim (frames prior DSA mask) are removed.
    - Matrix size is unchanged.
    - SOP Instance UID is appended with ".4".

- Subtracted and Native:
    - DSA images are transferred twice: processed native view and processed subtracted view.
    - SOP Instance UIDs are appended with ".5" (subtracted) or ".6" (native)
    - All other images are sent according to *Processed* rules.

- Processed and Raw:
    - Images are transferred twice: processed and unprocessed.

- Resize 512 (only together with processed):
    - Images are resampled to matrix size 512x512, bit depth is reduced to 8 bit.
    - This mode can be used to reduce the data size, but it will degrade spatial resolution and image quality.

- Resize 1024 (can be together with processed and unprocessed):
    - Images are resampled to matrix size 1024x1024, bit depth is kept 12 bit.
    - This mode can be used for compatibility to systems that do not support all matrix sizes .

Annex A: Index of Tables

Annex B: Table of Figures

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In the interest of complying with legal requirements concerning the environmental compatibility of our products (protection of natural resources and waste conservation), we recycle certain components. Using the same extensive quality assurance measures as for factory-new components, we guarantee the quality of these recycled components.

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