DICOM Conformance Statement

# *syngo*® MR XA80A

| Product Name | |
|---|---|
| MAGNETOM Free.Max | MAGNETOM Free.Star |

October/2026

SIEMENS Healthineers

# DICOM Conformance Statement Overview

The *syngo®* MR XA80A conforms to the DICOM Standard and supports the network services as described in Table 1: Network Services and the media services as described in Table 2: Media Services

Table 1: Network Services

| SOP Classes | SOP Class UID | User of Service (SCU) | Provider of Service (SCP) |
|---|---|---|---|
| **Verification** | | | |
| Verification | 1.2.840.10008.1.1 | Yes | Yes |

**SOP Classes created by *syngo®* MR XA80A**

| | | Create | Send | Store | Display |
|---|---|---|---|---|---|
| MR Image Storage | 1.2.840.10008.5.1.4.1.1.4 | Yes | Yes | Yes | Yes |
| Enhanced MR Image Storage | 1.2.840.10008.5.1.4.1.1.4.1 | Yes | Yes | Yes | Yes |
| MR Spectroscopy Storage | 1.2.840.10008.5.1.4.1.1.4.2 | Yes | Yes | Yes | Yes |
| Enhanced MR Color Image Storage | 1.2.840.10008.5.1.4.1.1.4.3 | Yes | Yes | Yes | Yes |
| Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7 | Yes | Yes | Yes | Yes |
| Multi-frame Grayscale Word Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.3 | Yes | Yes | Yes | Yes |
| Grayscale Softcopy Presentation State Storage | 1.2.840.10008.5.1.4.1.1.11.1 | Yes | Yes | Yes | Yes |
| Color Softcopy Presentation State Storage | 1.2.840.10008.5.1.4.1.1.11.2 | Yes | Yes | Yes | Yes |
| Pseudo-Color Softcopy Presentation State Storage | 1.2.840.10008.5.1.4.1.1.11.3 | Yes | Yes | Yes | Yes |
| Raw Data Storage | 1.2.840.10008.5.1.4.1.1.66 | Yes | Yes | Yes | No |
| Spatial Registration Storage | 1.2.840.10008.5.1.4.1.1.66.1 | Yes | Yes | Yes | Yes |
| Segmentation Storage | 1.2.840.10008.5.1.4.1.1.66.4 | Yes | Yes | Yes | Yes |
| Real World Value Mapping Storage | 1.2.840.10008.5.1.4.1.1.67 | Yes | Yes | Yes | Yes |
| Enhanced SR Storage | 1.2.840.10008.5.1.4.1.1.88.22 | Yes | Yes | Yes | Yes |
| Comprehensive SR Storage | 1.2.840.10008.5.1.4.1.1.88.33 | Yes | Yes | Yes | Yes |

| SOP Classes | SOP Class UID | User of Service (SCU) | | Provider of Service (SCP) | |
|---|---|---|---|---|---|
| Encapsulated PDF Storage | 1.2.840.10008.5.1.4.1.1.104.1 | Yes | Yes | Yes | Yes |
| RT Image Storage | 1.2.840.10008.5.1.4.1.1.481.1 | Yes | Yes | Yes | Yes |
| RT Dose Storage | 1.2.840.10008.5.1.4.1.1.481.2 | Yes | Yes | Yes | Yes |
| RT Structure Set Storage | 1.2.840.10008.5.1.4.1.1.481.3 | Yes | Yes | Yes | Yes |
| RT Plan Storage | 1.2.840.10008.5.1.4.1.1.481.5 | Yes | Yes | Yes | Yes |
| **SOP Classes managed by *syngo®* MR XA80A** | | | | | |
| | | Create | Send | Store | Display |
| Computed Radiography Image Storage | 1.2.840.10008.5.1.4.1.1.1 | No | Yes | Yes | Yes |
| Digital X-Ray Image Storage - For Presentation | 1.2.840.10008.5.1.4.1.1.1.1 | No | Yes | Yes | Yes |
| Digital X-Ray Image Storage – For Processing | 1.2.840.10008.5.1.4.1.1.1.1.1 | No | Yes | Yes | Yes |
| Digital Mammography X-Ray Image Storage – For Presentation | 1.2.840.10008.5.1.4.1.1.1.2 | No | Yes | Yes | Yes |
| Digital Mammography X-Ray Image Storage – For Processing | 1.2.840.10008.5.1.4.1.1.1.2.1 | No | Yes | Yes | Yes |
| Digital Intra-Oral X-Ray Image - For Presentation | 1.2.840.10008.5.1.4.1.1.1.3 | No | Yes | Yes | Yes |
| Digital Intra-Oral X-Ray Image - For Processing | 1.2.840.10008.5.1.4.1.1.1.3.1 | No | Yes | Yes | Yes |
| CT Image Storage | 1.2.840.10008.5.1.4.1.1.2 | No | Yes | Yes | Yes |
| Enhanced CT Image Storage | 1.2.840.10008.5.1.4.1.1.2.1 | No | Yes | Yes | Yes |
| Ultrasound Multi-frame Image Storage | 1.2.840.10008.5.1.4.1.1.3.1 | No | Yes | Yes | Yes |
| Ultrasound Image Storage | 1.2.840.10008.5.1.4.1.1.6.1 | No | Yes | Yes | Yes |
| Enhanced US Volume Storage | 1.2.840.10008.5.1.4.1.1.6.2 | No | Yes | Yes | Yes |
| Multi-frame Single Bit Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.1 | No | Yes | Yes | Yes |
| Multi-frame Grayscale Byte Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.2 | No | Yes | Yes | Yes |

| SOP Classes | SOP Class UID | User of Service (SCU) | | Provider of Service (SCP) | |
|---|---|---|---|---|---|
| Multi-frame True Color Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.4 | No | Yes | Yes | Yes |
| 12-lead ECG Waveform Storage | 1.2.840.10008.5.1.4.1.1.9.1.1 | No | Yes | Yes | No |
| General ECG Waveform Storage | 1.2.840.10008.5.1.4.1.1.9.1.2 | No | Yes | Yes | No |
| Ambulatory ECG Waveform Storage | 1.2.840.10008.5.1.4.1.1.9.1.3 | No | Yes | Yes | No |
| Hemodynamic Waveform Storage | 1.2.840.10008.5.1.4.1.1.9.2.1 | No | Yes | Yes | No |
| Cardiac Electrophysiology Waveform Storage | 1.2.840.10008.5.1.4.1.1.9.3.1 | No | Yes | Yes | No |
| Basic Voice Audio Waveform Storage | 1.2.840.10008.5.1.4.1.1.9.4.1 | No | Yes | Yes | No |
| General Audio Waveform Storage | 1.2.840.10008.5.1.4.1.1.9.4.2 | No | Yes | Yes | No |
| Arterial Pulse Waveform Storage | 1.2.840.10008.5.1.4.1.1.9.5.1 | No | Yes | Yes | No |
| Respiratory Waveform Storage | 1.2.840.10008.5.1.4.1.1.9.6.1 | No | Yes | Yes | No |
| Blending Softcopy Presentation State Storage | 1.2.840.10008.5.1.4.1.1.11.4 | No | Yes | Yes | Yes |
| Grayscale Planar MPR Volumetric Presentation State Storage | 1.2.840.10008.5.1.4.1.1.11.6 | No | Yes | Yes | No |
| Compositing Planar MPR Volumetric Presentation State Storage | 1.2.840.10008.5.1.4.1.1.11.7 | No | Yes | Yes | No |
| Advanced Blending Presentation State Storage | 1.2.840.10008.5.1.4.1.1.11.8 | No | Yes | Yes | No |
| Volume Rendering Volumetric Presentation State Storage | 1.2.840.10008.5.1.4.1.1.11.9 | No | Yes | Yes | No |
| Segmented Volume Rendering Volumetric Presentation State Storage | 1.2.840.10008.5.1.4.1.1.11.10 | No | Yes | Yes | No |
| Multiple Volume Rendering Volumetric Presentation State Storage | 1.2.840.10008.5.1.4.1.1.11.11 | No | Yes | Yes | No |
| X-Ray Angiographic Image Storage | 1.2.840.10008.5.1.4.1.1.12.1 | No | Yes | Yes | Yes |
| Enhanced XA Image Storage | 1.2.840.10008.5.1.4.1.1.12.1.1 | No | Yes | Yes | Yes |
| X-Ray Radiofluoroscopic Image Storage | 1.2.840.10008.5.1.4.1.1.12.2 | No | Yes | Yes | Yes |

| SOP Classes | SOP Class UID | User of Service (SCU) | | Provider of Service (SCP) | |
|---|---|---|---|---|---|
| Enhanced XRF Image Storage | 1.2.840.10008.5.1.4.1.1.12.2.1 | No | Yes | Yes | Yes |
| X-Ray 3D Angiographic Image Storage | 1.2.840.10008.5.1.4.1.1.13.1.1 | No | Yes | Yes | Yes |
| Breast Tomosynthesis Image Storage | 1.2.840.10008.5.1.4.1.1.13.1.3 | No | Yes | Yes | Yes |
| Nuclear Medicine Image Storage | 1.2.840.10008.5.1.4.1.1.20 | No | Yes | Yes | Yes |
| Spatial Fiducials Storage | 1.2.840.10008.5.1.4.1.1.66.2 | No | Yes | Yes | No |
| Deformable Spatial Registration | 1.2.840.10008.5.1.4.1.1.66.3 | No | Yes | Yes | No |
| Segmentation Storage | 1.2.840.10008.5.1.4.1.1.66.4 | Yes | Yes | Yes | Yes |
| Surface Segmentation Storage | 1.2.840.10008.5.1.4.1.1.66.5 | No | Yes | Yes | Yes |
| Basic Text SR Storage | 1.2.840.10008.5.1.4.1.1.88.11 | No | Yes | Yes | Yes |
| Procedure Log Storage Storage | 1.2.840.10008.5.1.4.1.1.88.40 | No | Yes | Yes | No |
| Mammography CAD SR Storage | 1.2.840.10008.5.1.4.1.1.88.50 | No | Yes | Yes | No |
| Key Object Selection Document Storage | 1.2.840.10008.5.1.4.1.1.88.59 | No | Yes | Yes | No |
| X-Ray Radiation Dose SR Storage | 1.2.840.10008.5.1.4.1.1.88.67 | No | Yes | Yes | No |
| Radiopharmaceutical Radiation Dose SR | 1.2.840.10008.5.1.4.1.1.88.68 | No | Yes | Yes | No |
| Positron Emission Tomography Image Storage | 1.2.840.10008.5.1.4.1.1.128 | No | Yes | Yes | Yes |
| RT Beams Treatment Record Storage | 1.2.840.10008.5.1.4.1.1.481.4 | No | Yes | Yes | No |
| Radio Therapy Brachy Treatment Record Storage | 1.2.840.10008.5.1.4.1.1.481.6 | No | Yes | Yes | No |
| RT Treatment Summary Record Storage | 1.2.840.10008.5.1.4.1.1.481.7 | No | Yes | Yes | No |
| RT Ion Plan Storage | 1.2.840.10008.5.1.4.1.1.481.8 | No | Yes | Yes | No |
| RT Ion Beams Treatment Record Storage | 1.2.840.10008.5.1.4.1.1.481.9 | No | Yes | Yes | No |
| Hanging Protocol Storage | 1.2.840.10008.5.1.4.38.1 | No | Yes | Yes | No |
| **Transfer (Private SOP Class)** | | | | | |
| Syngo Non-Image Storage | 1.3.12.2.1107.5.9.1 | Yes | | Yes | |
| **Storage Commitment** | | | | | |
| Storage Commitment Push Model | 1.2.840.10008.1.20.1 | Yes | | No | |
| **Worklist Management** | | | | | |

| SOP Classes | SOP Class UID | User of Service (SCU) | Provider of Service (SCP) |
|---|---|---|---|
| Modality Worklist Information Model - FIND | 1.2.840.10008.5.1.4.31 | Yes | No |
| Modality Performed Procedure Step | 1.2.840.10008.3.1.2.3.3 | Yes | No |
| **Query/Retrieve** | | | |
| Patient Root Query/Retrieve Information Model – FIND | 1.2.840.10008.5.1.4.1.2.1.1 | Yes | Yes |
| Patient Root Query/Retrieve - Information Model - MOVE | 1.2.840.10008.5.1.4.1.2.1.2 | Yes | Yes |
| Study Root Query/Retrieve - Information Model - FIND | 1.2.840.10008.5.1.4.1.2.2.1 | Yes | Yes |
| Study Root Query/Retrieve - Information Model - MOVE | 1.2.840.10008.5.1.4.1.2.2.2 | Yes | Yes |
| Patient/Study Only Query/Retrieve - Information Model – FIND | 1.2.840.10008.5.1.4.1.2.3.1 | Yes | Yes |
| Patient/Study Only Query/Retrieve - Information Model – MOVE | 1.2.840.10008.5.1.4.1.2.3.2 | Yes | Yes |
| **Print Management** | | | |
| Basic Grayscale Print Management Meta SOP Class | 1.2.840.10008.5.1.1.9 | Yes | No |
| Basic Color Print Management Meta SOP Class | 1.2.840.10008.5.1.1.18 | Yes | No |
| Basic Film Sesssion 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 or FSU) | Read Files (FSR) |
|---|---|---|
| **Compact Disk - Recordable** | | |

| | | |
|---|---|---|
| STD-GEN-CD | Yes | Yes |
| AUG-GEN-CD | Yes | Yes |
| **DVD** | | |
| AUG-GEN-DVD | Yes | Yes |
| AUG- GEN-DVD-J2K | Yes | Yes |
| STD-GEN-DVD-JPEG | Yes | Yes |
| STD-GEN-DVD-J2K | Yes | Yes |
| **USB** | | |
| AUG- GEN-USB-J2K | Yes | Yes |
| STD-GEN-USB-J2K | Yes | Yes |

Table 3: Implementation Identifying Information

| Name | Value |
|---|---|
| Application Context Name | 1.2.840.100008.3.1.1.1 |
| Implementation Class UID | 1.3.12.2.1107.5.2 |
| Implementation Version Name | “SYNGO_MR_DE20” |

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# 3 Introduction

## 3.1 Revision History

| Version | Date | Change |
|---|---|---|
| *syngo®* MR XA50A | 2022-05-19 | *syngo®* MR XA50A version (predecessor versions: *syngo®* MR XA30A, *syngo®* MR XA31A and *syngo®* MR XA40A)<br><br>New system support:<br>MAGNETOM Avanto Fit, MAGNETOM Free.Max, MAGNETOM Free.Star, MAGNETOM Lumina, MAGNETOM Skyra Fit, MAGNETOM Vida, MAGNETOM Vida Fit<br><br>IOD Tables added for: Enhanced MR Image, Enhanced MR Color Image, MR Spectroscopy, Raw Data |
| *syngo®* MR XA51A | 2022-08-26 | *syngo®* MR XA51A version (predecessor version: *syngo®* MR XA31A, *syngo®* MR XA20A)<br><br>System support: MAGNETOM Altea, MAGNETOM Sola, MAGNETOM Sola Fit<br><br>Added Echo Number(s) (0018,0086) to MR Echo Macro. |
| *syngo®* MR XA60A<br>. | 2024-07-26 | *syngo®* MR XA60A version (predecessor version: *syngo®* MR XA51A)<br><br>System support: MAGNETOM Aera, MAGNETOM Aera Mobile, MAGNETOM Seara, MAGNETOM Skyra, MAGNETOM Prisma, MAGNETOM Prisma$^{fit}$, MAGNETOM Vida, MAGNETOM Lumina, MAGNETOM Free.Max, MAGNETOM Free.Star, MAGNETOM Terra, MAGNETOM Terra.X<br><br>Added description of private attributes, changes in de-identification. |
| *syngo®* MR XA61A | 2024-09-11 | *syngo®* MR XA61A version (predecessor version: syngo® MR XA60A)<br><br>System support: MAGNETOM Avanto fit, MAGNETOM Skyra fit, MAGNETOM Altea, MAGNETOM Sola, MAGNETOM Cima.X, MAGNETOM Cima.X Fit, MAGNETOM Connectom.X |
| *syngo®* MR XA70A | 2026-09-28 | *syngo®* MR XA70A version (predecessor version: *syngo®* MR XA61A)<br><br>System support: MAGNETOM Avanto Fit, MAGNETOM Skyra Fit, MAGNETOM Sola Fit, MAGNETOM Viato.Mobile, MAGNETOM Flow.Plus, MAGNETOM Flow.Ace |

| | | |
|---|---|---|
| *syngo®* MR XA80A | 2026-10-07 | *syngo®* MR XA80A version (predecessor version: *syngo®* MR XA70A)<br>System support: MAGNETOM Free.Max, MAGNETOM Free.Star |

## 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 syngo® MR XA80A and other DICOM conformant equipment.
- Test procedures should be defined and executed to validate the required level of interoperability with specific compatible DICOM equipment, as established by the healthcare facility.

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

## 3.4 Definitions, Terms and Abbreviations

Definitions, terms, and abbreviations used in this document are defined within the different parts of the DICOM standard. Additional Abbreviations and terms are as follows:

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

## 3.5 References

[1] Digital Imaging and Communications in Medicine (DICOM), https://www.dicomstandard.org
[2] Integrating the Healthcare Enterprise – IHE Radiology Technical Framework – http://www.ihe.net

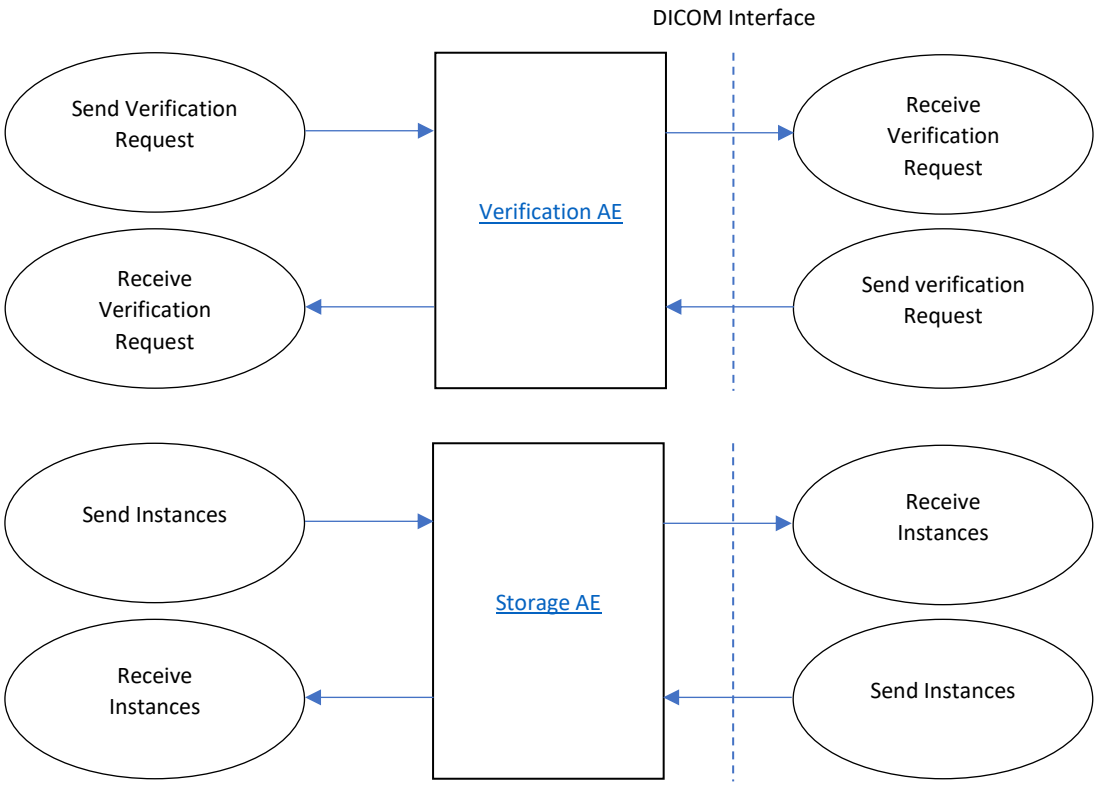
# 4 Networking

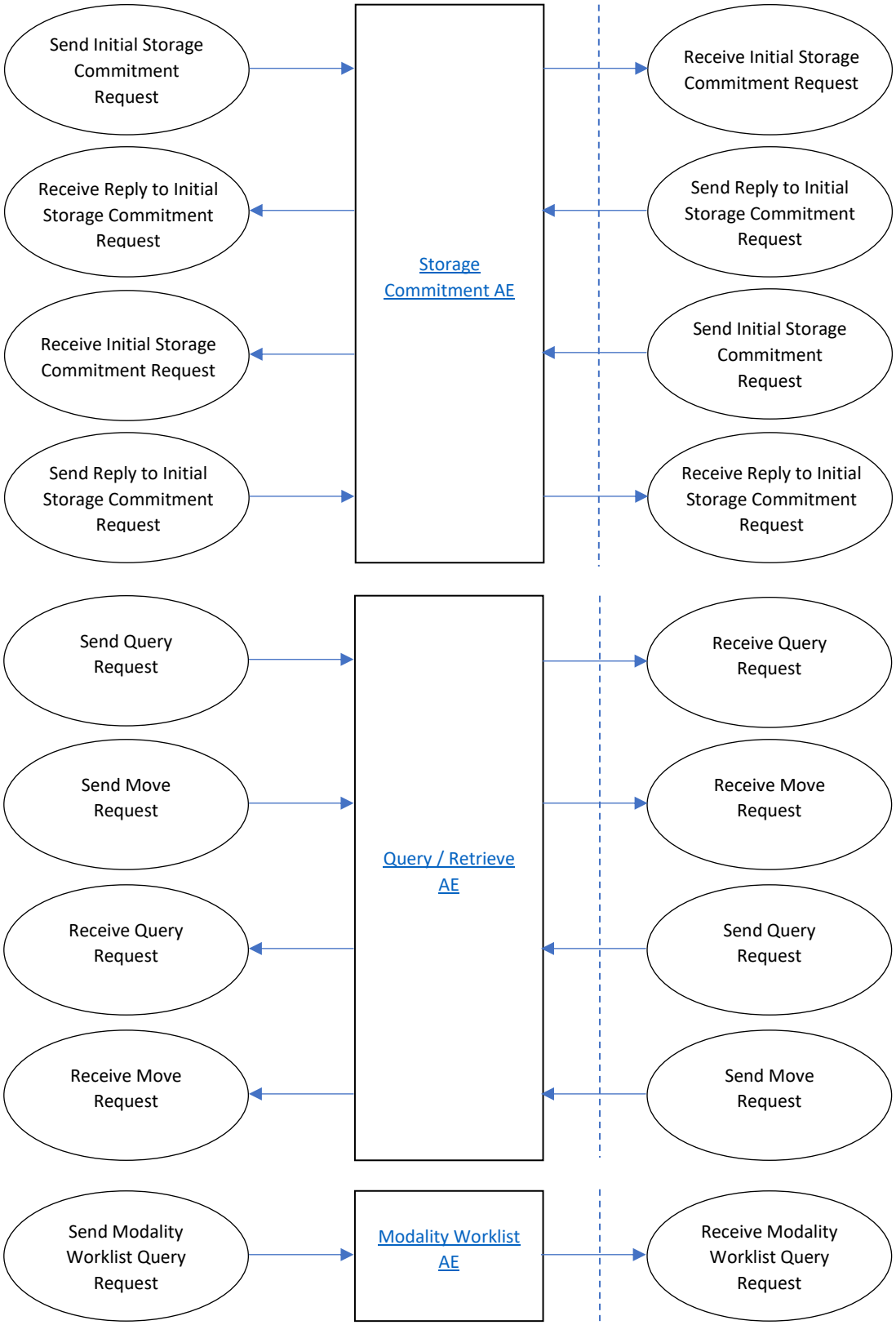
## 4.1 Implementation Model

*syngo®* MR XA80A 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 *syngo®* MR XA80A can query remote notes, retrieve and store selected instances from that node. Using the Modality Worklist service the *syngo®* MR XA80A can query a HIS/RIS for scheduled procedures. Performed procedure status and other procedure data can be returned to the HIS/RIS using the Modality Performed Procedure Step (MPPS) Service. Furthermore, printing of color and grayscale images is supported.

### 4.1.1 Application Data Flow

The following figures provide a functional overview of the *syngo®* MR XA80A 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

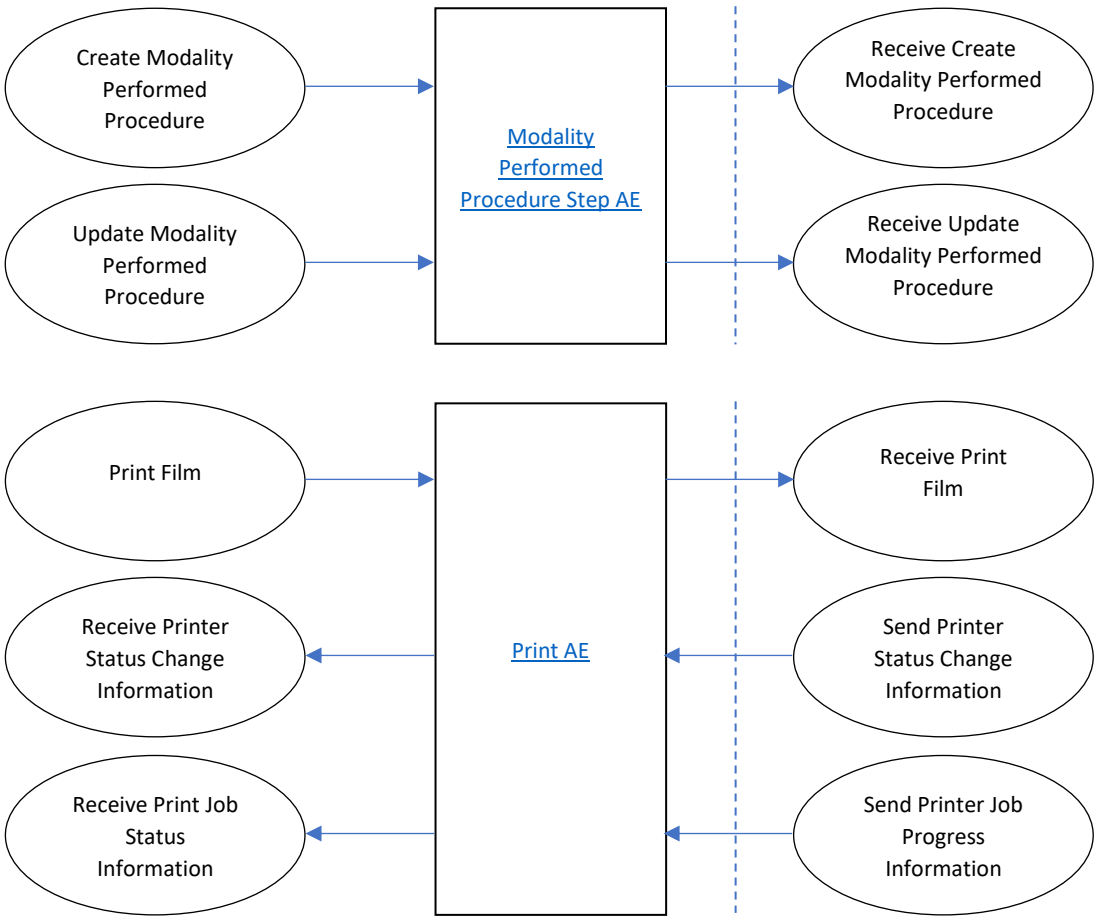



Figure 1: *syngo®* MR XA80A DICOM Data Flow diagram

#### 4.1.2 Functional Definitions of Application Entities

The SCP components of the Application Entities of the *syngo®* MR XA80A 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 *syngo®* MR XA80A supports the Verification service as a SCP and SCU. As a SCU, Verification can be activated from the Administrator Portal during system configuration by sending a C-ECHO-Request.

As a SCP of the Verification Service the *syngo®* MR XA80A processes and responds to incoming verification requests using the C-ECHO-Response.

##### 4.1.2.2 Functional Definition of Storage of AE

The *syngo®* MR XA80A Storage SCU is invoked either directly by the user, by an auto-archive trigger or internally by the Query/Retrieve Application Entity that is responsible for processing retrieve requests. The job consists of data describing the composite objects selected for storage and the destination Application Entity Title. An association is negotiated with the destination Application Entity and the image data is transferred using the C-STORE-Request. The transfer status is reported to the initiator of the Storage request.

The Storage SCP component of the *syngo®* MR XA80A starts to receive the Composite Objects and import them into the database after accepting an association with a negotiated Presentation Context. The system responses to the Storage Request immediately after reception of the Data.

#### 4.1.2.3 Functional Definition of the Storage Commitment AE

If configured, the *syngo®* MR XA80A can serve as a SCU for the DICOM Storage Commitment service. Upon successful completion of a storage job, the system uses the N-ACTION-Request to request storage commitment from a remote DICOM Storage Commitment SCP. This can either be the same as the storage destination or a different system depending on the system configuration. Storage Commitment Requests are sent after a configurable delay after storing the objects. The *syngo®* MR XA80A can receive the N-EVENT-REPORT-Request on the same or a different association.

#### 4.1.2.4 Functional Specification of Query/Retrieve AE

The *syngo®* MR XA80A supports DICOM Query/Retrieve as a SCU: The user can initiate a query to a remote node using the C-FIND-Request. After matching the specified keys, the remote Query /Retrieve SCP uses the C-FIND-Response to return the results of its search, which will be displayed to the user. Depending on user action the *syngo®* MR XA80A Query/Retrieve DICOM SCU sends a C-MOVE-Request to initiate a C-STORE sub-operation on the SCP to start an image transfer from remote Storage SCU (running on Query/Retrieve SCP) to the system's Storage SCP.

The *syngo®* MR XA80A supports the following query model:

- Study Root Query Model
- Patient Root Query Model
- Patient/Study only Query Model

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

The *syngo®* MR XA80A DICOM Query/Retrieve SCP accepts C-FIND Request, queries the local database based on the provided matching keys and returns the matches using the C-FIND-Response. Depending on further request from the remote Query/Retrieve SCU, the *syngo®* MR XA80A responds to C-MOVE-Requests by initiating a C-STORE sub-operation to send image objects to the Storage SCP of the querying system.

#### 4.1.2.5 Functional Definition of Modality Worklist AE

The *syngo®* MR XA80A Modality Worklist SCU issues DICOM Modality Worklist requests using C-FIND-Requests. The results in the C-FIND-Response are stored in internal database. The provided Patient and Procedure information is used for patient registration prior to starting an exam.

#### 4.1.2.6 Functional Definition of Modality Performed Procedure Step SCU AE

The *syngo®* MR XA80A MPPS SCU uses the N-CREATE-Request to inform an Information System that a procedure step is IN PROGRESS.

The *syngo®* MR XA80A MPPS SCU uses the N-SET-Request to inform the Information System about the finalization of the Procedure Step, using either a status of COMPLETED or DISCONTINUED.

#### 4.1.2.7 Functional Definition of Print AE

The Print SCU of the *syngo®* MR XA80A is invoked by the user interface to setup film-sheet layout and whenever an image is ready to be printed on film. The Print SCU will hold and maintain all data needed to compile a complete film-sheet from the data (images, layout, configuration) received. Whenever a film-sheet is ready to print the related data is used to supply the Information to the SOP Classes of the Print Management Service Class. A queue is maintained in order to intermediately store several film-sheets in case of resource problems on printer. The SCU will only supply and require the mandatory SOP Classes of the Print Management Service Class.

### 4.1.3 Sequencing of Activities

This section describes the sequencing of Real-World Activities performed by the *syngo®* MR XA80A Entities using a UML sequence diagram. Real-World Activities are depicted as vertical bars and arrows show the events exchanged between them.

#### 4.1.3.1 System Configuration

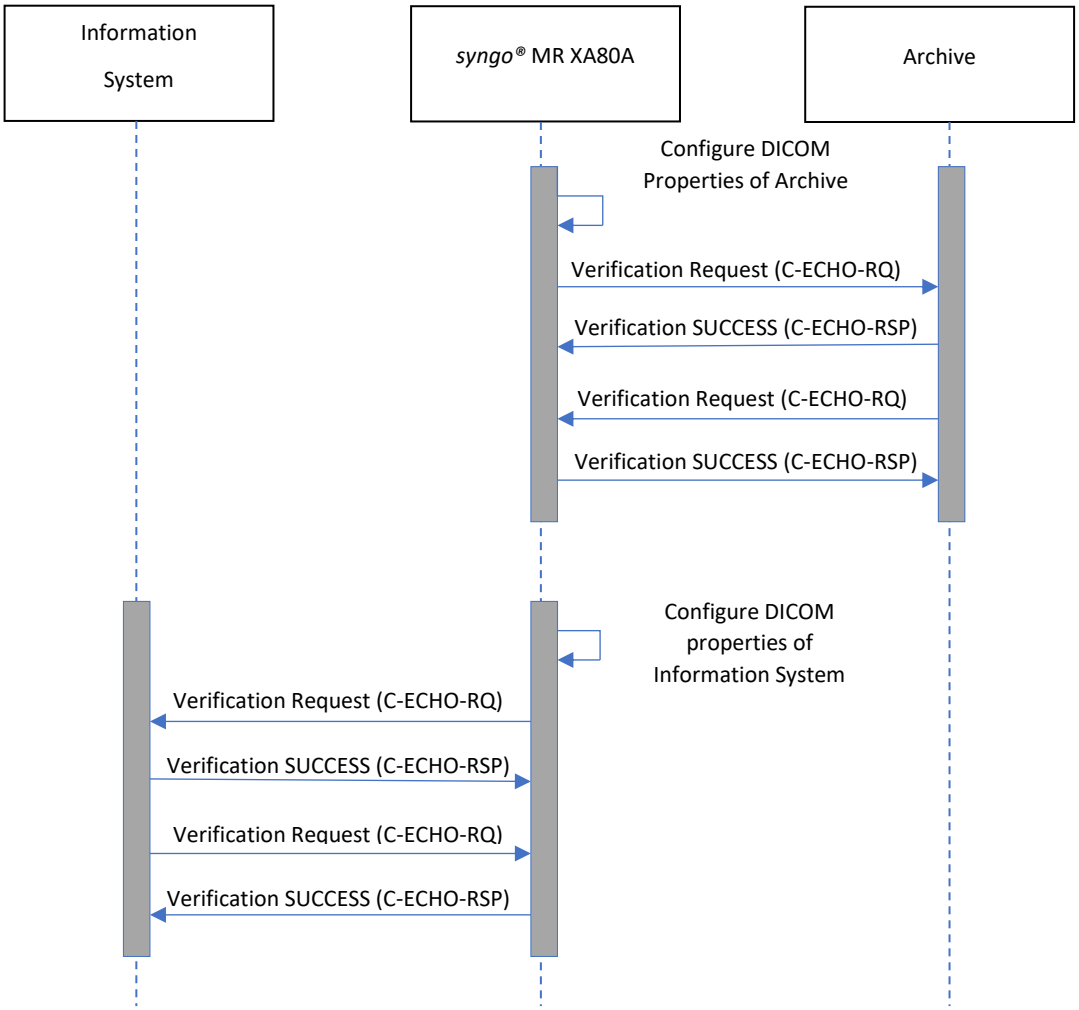



Figure 2: Sequence Diagram for Real World Activities - System Configuration

#### 4.1.3.2 Acquisition Workflow

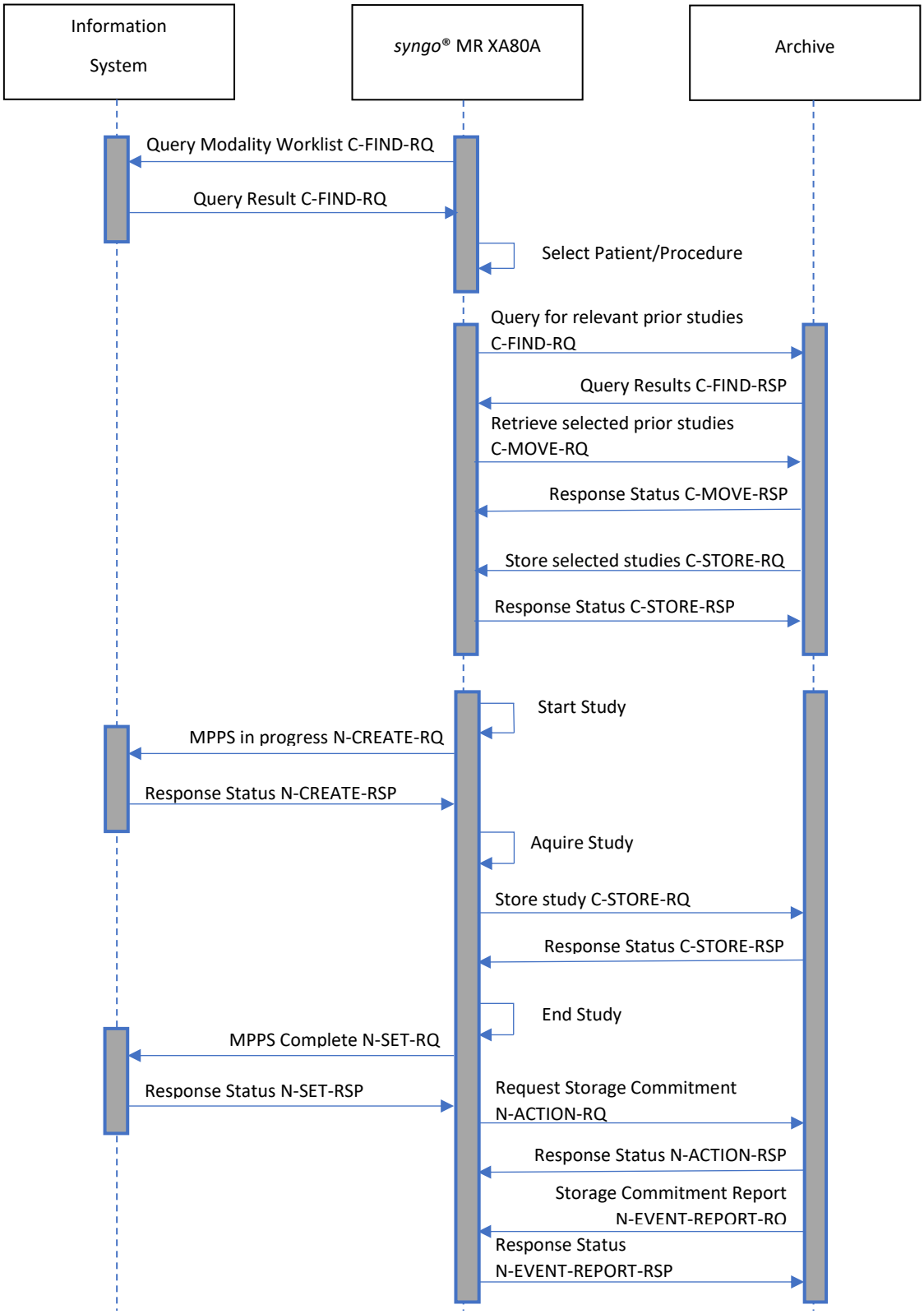



**Figure 3: Sequence Diagram for Real World Activities -Acquisition workflow**

#### 4.1.3.3 Printing Workflow

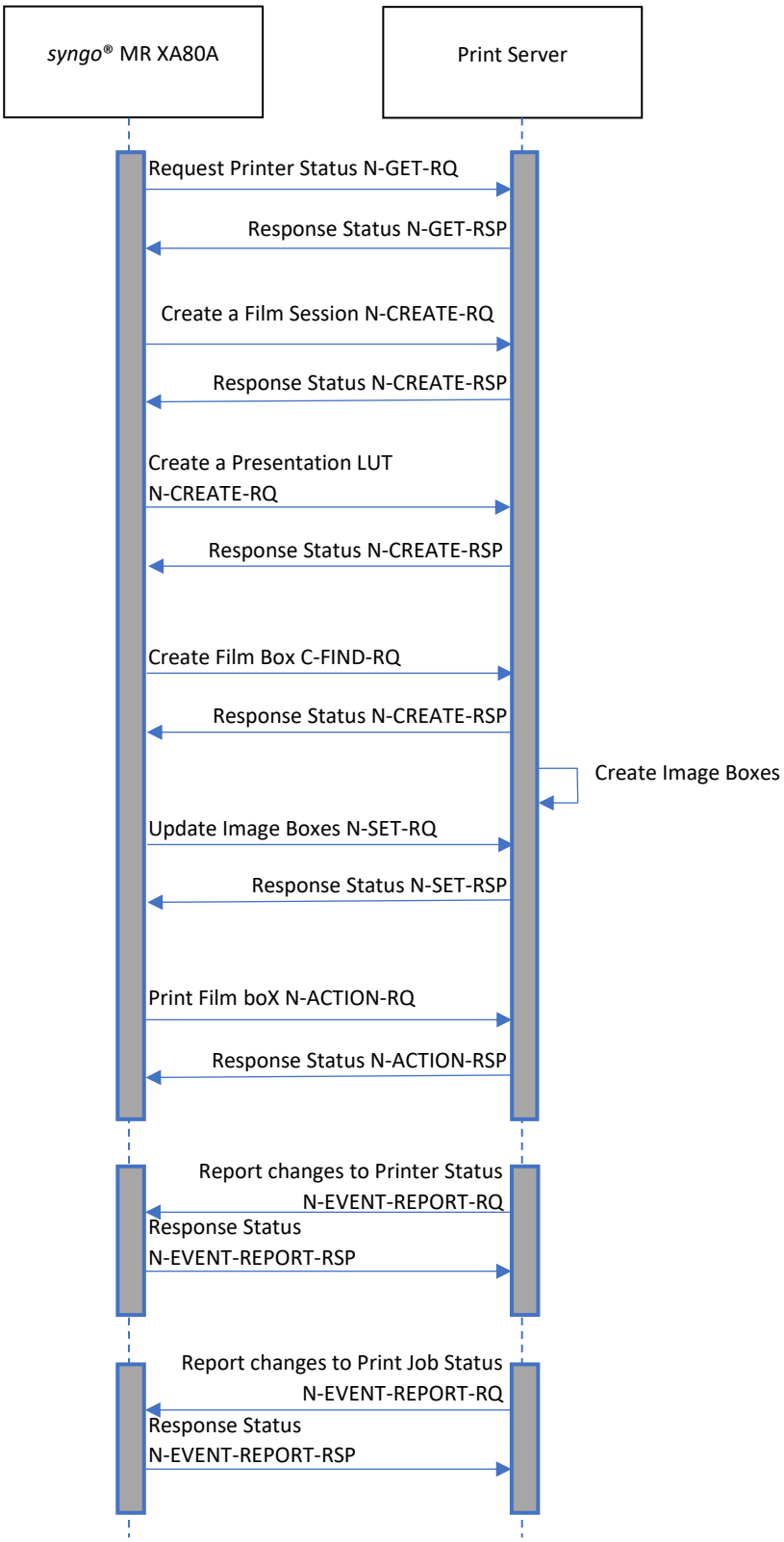



**Figure 4: Sequence Diagram for Real World Activities - Printing**

## 4.2 AE Specifications

This section outlines the specifications for each of the Application Entities that are part of the *syngo®* MR XA80A.

### 4.2.1 Verification AE Specification

#### 4.2.1.1 SOP Classes

The Verification AE of the *syngo®* MR XA80A 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 syngo® MR XA80A 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[1] |
| **Maximum number of simultaneous associations as an association initiator** | unlimited |

##### 4.2.1.2.1 Asynchronous Nature

The syngo® MR XA80A 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".

#### 4.2.1.3 Association Initiation Policy

##### 4.2.1.3.1 Activity – "Send Activity"

###### *4.2.1.3.1.1 Description and Sequencing of Activities*

The *syngo®* MR XA80A serves as a SCU of the Verification Service Class. A C-ECHO-Request 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 Response from the remote Application contains a status other than "Success" this will be indicated to the user and the association is closed.

[1] Default, the value is configurable

##### *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 |

##### *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 *syngo®* MR XA80A serves as a SCP of the Verification Service Class. If the Verification SCP accepts an association, it will respond to C-ECHO-Requests. If the Called AE Title does not match any pre-configured AE Title shared by SCP, the association will be rejected.

##### *4.2.1.4.1.2 Accepted Presentation Contexts*

The syngo® MR XA80A 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 |

##### *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 *syngo®* MR XA80A" and "SOP Classes Managed by the *syngo®* MR XA80A" in the "Conformance Statement Overview".

#### 4.2.2.2 Association Policy

Table 8: Association Policy

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

The *syngo®* MR XA80A 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 configurable at run time, based on the system resources available. By default, the maximum number of associations is set to 12.

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

##### 4.2.2.2.1 Asynchronous Nature

The syngo® MR XA80A 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

For general information regarding the association initiation policies please see Chapter 4.2.1.2

##### 4.2.2.3.1 Activity- "Send Verification Request"

The Storage AE supports the Verification SOP Class. For further details please see chapter 4.2.1.2.1.

##### 4.2.2.3.2 Activity "Send Instances"

###### *4.2.2.3.2.1 Description and Sequencing of Activities*

The *syngo®* MR XA80A serves as a SCU of the Storage Service Class. The Storage SCU is triggered by the transfer job queue or by an external retrieve request. An association request is sent to the destination AE. Upon successful negotiation of a Presentation Context, the transfer is started. Objects will be transferred sequentially on the same open association.

###### *4.2.2.3.2.2 Proposed Presentation Contexts*

*syngo®* MR XA80A proposes one Presentation Context for each SOP Class/Transfer Syntax combination in the A-ASSOCIATE-RQ. The number of Presentation Contexts in an A-ASSOCIATE-RQ message is limited to 128. If this limit is exceeded, multiple Transfer Syntaxes are offered in one Presentation Context.

[1] Default, the value is configurable

For all Image Objects listed in Table 1 in the Conformance Statement Overview the Transfer Syntaxes marked with “yes” in the Image Objects Column of the table below are proposed in a Presentation Context.

For all Non-Image Objects listed in Table 1 in the Conformance Statement Overview the Transfer Syntaxes marked with “yes” in the Non-Image Objects Column of the table below are proposed in a Presentation Context.

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 (Retired) | Yes | Yes |
| 1.2.840.10008.1.2.4.50 | JPEG Baseline (Process 1) | Yes | No |
| 1.2.840.10008.1.2.4.51 | JPEG Extended (Process 2 & 4) | 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 [Selection Value 1]) | Yes | No |
| 1.2.840.10008.1.2.4.90 | JPEG 2000 Image Compression (Lossless Only) | 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 | Yes | No |

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

An instance will be JPEG lossless 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 or YBR_FULL_422
- 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
- 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 VR 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) neither '16' nor '8'

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 or RGB
- Bits Stored (0028,0101) equal to '12' or '8'
- Only lossy transfer syntaxes are supported (Implicit VR Little Endian is not supported) at the remote side

There is no extended negotiation as an SCU.

#### *4.2.2.3.2.3 SOP Specific Conformance for SOP Classes*

The *syngo®* MR XA80A 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 *syngo®* MR XA80A when encountering status codes in a C-STORE response 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 |
|---|---|
| Association Negotiation Timeout | Log message is created (Timeout configurable; default 30s) |
| Association Aborted | Send is failed. Log message is created. |

#### *4.2.2.3.2.4 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.

A configuration setting is available if UIDs should be changed in case of Patient Merge and Correction. Per default the UID change is activated to ensure that the corrected instances are displayed at the PACS. If the UID change is deactivated it is recommended to delete any corrected or rearranged objects from the PACS before attempting to archive them again, to ensure that the PACS system can store them successfully.

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

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

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

When the Patient Birth Date or the Study Date is corrected, the system recalculates the Patient Age.

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

#### 4.2.2.4 Association Acceptance Policy

##### 4.2.2.4.1 Activity – "Receive Instances"

###### *4.2.2.4.1.1 Description and Sequencing of Activities*

The *syngo®* MR XA80A serves as a SCP of the Storage Service Class. The storage SCP accepts incoming C-Store Request from any configured AE Title, receives supported objects transmitted on that association and stores them in the local database.

###### *4.2.2.4.1.2 Accepted Presentation Contexts*

When receiving an association request from a remote node, *syngo®* MR XA80A accepts all presentation context containing a transfer syntax configured for that node. If multiple transfer syntaxes are proposed within one presentation context, *syngo®* MR XA80A selects it based on the configured preference order configured for that node. The preference order is the order of occurrence of the transfer syntaxes in the configuration. For each node it is possible to select Transfer Syntaxes, that can be used, and Transfer Syntaxes, that are excluded. The configuration can even be extended, based on the combination of SOP Classes and supported Transfer Syntaxes.

Table 10 lists all Transfer Syntaxes that are supported for the Transfer Objects (see "Table 1: Network Services" section "SOP Classes Created by the *syngo®* MR XA80A" and "SOP Classes Managed by the *syngo®* MR XA80A" in the "Conformance Statement Overview".).

There is no Extended Negotiation as an SCP.

###### *4.2.2.4.1.3 SOP-specific Conformance Statement for Storage SOP classes*

The *syngo®* MR XA80A 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 *syngo®* MR XA80A 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 *syngo®* MR XA80A can return:

Table 13: Storage C-STORE Response Status

| Service Status | Further Meaning | Error Code | Reason |
|---|---|---|---|
| Success | Success | 0000 | Image received correctly<br>(success notification is done after receiving, before indexing and storing) |
| Failure | Out-of-resource | A700 | No resource left in the Short Term Storage |
| Failure | Unable to Process | Cxxx | Error during instance reception |
| Failure | Data set does not match SOP Class | A9xx | The data set is not 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 *syngo®* MR XA80A provides standard conformance to the SOP Class listed in "Table 1: Network Services" section "Storage Commitment" in the "Conformance Statement Overview".

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[1] |
| **Maximum number of simultaneous associations as an association initiator** | unlimited |

The *syngo®* MR XA80A 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 configurable at run time, based on the system resources available. By default, the maximum number of associations is set to 12.

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

[1] Default, the value is configurable

#### 4.2.3.1.1 Asynchronous Nature

The syngo® MR XA80A 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 *syngo®* MR XA80A serves as a SCU of the Storage Commitment Service Class. After successful transfer of Imaging Objects to a configured Archive, the Storage Commitment SCU initiates an N-Action Request, if Storage Commitment is configured. This request will be sent on a different association than the storage request.

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

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

The *syngo®* MR XA80A will accept the N-Event-Report-Request on the same association if sent immediately after the N-ACTION-Response. However, it will not wait for it. The association is closed after three seconds.

##### *4.2.3.2.1.2 Proposed Presentation Contexts*

The *syngo® MR XA80A* 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 *syngo®* MR XA80A when encountering status codes in an N-ACTION response 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 |
|---|---|
| Association Negotiation 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 |

#### 4.2.3.3 Association Acceptance Policy

For general information regarding the association acceptance policies please see Chapter 4.2.1.3.

##### 4.2.3.3.1 Activity – "Receive Verification Request"

The Storage Commitment AE supports the Verification SOP Class. For further details please see chapter 4.2.1.4.1.

##### 4.2.3.3.2 Activity "Receive Reply to Initial Storage Commitment Request"

###### *4.2.3.3.2.1 Description and Sequencing of Activities*

The syngo® MR XA80A 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 syngo® MR XA80A has a configurable expiration timeout for the TransactionUID. By default, the TransactionUID is 60 minutes.

###### *4.2.3.3.2.2 Accepted Presentation Contexts*

The syngo® MR XA80A DICOM application supports the presentation contexts listed in the following table for the Storage Commitment Service Class.

Table 19: Presentation Context Table "Update Flag Information"

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

#### *4.2.3.3.2.3 SOP-specific Conformance Statement for Storage Commitment SOP classes*

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

##### *4.2.3.3.2.3.1 Storage Commitment Failure Conditions*

Table 20 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-EVEN-REPORT-RQ.

Table 20: Storage Commitment Failure Behaviour

| Status Code | Description | Behaviour |
|---|---|---|
| 0110 | Processing failure: A general failure in processing the operation was encountered. | The modules itself does not handle the Status Codes. Following processing is in place:<br>1. Logging<br>All the incoming Status Codes are logged.<br>2. Tracing<br>All the incoming Status Codes can be traced.<br>3. Providing the Status Codes to the user of the module<br>The activity provides for the users an API to get all the Status Codes |
| 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. | |
| 0213 | Resource limitation: The SCP does not currently have enough resources to store the requested SOP Instance(s). | |

#### 4.2.3.3.3 Activity "Receive Initial Storage Commitment Request"

##### *4.2.3.3.3.1 Description and Sequencing of Activities*

When receiving an initial Storage Commitment request (N-ACTION-RQ) the syngo® MR XA80A 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.

##### *4.2.3.3.3.2 Accepted Presentation Contexts*

The syngo® MR XA80A DICOM application supports the presentation contexts listed in the following table for the Storage Commitment Service Class.

Table 21: 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 | | |

##### *4.2.3.3.3.3 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 22: 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 is 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 23: Association Policies

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

The *syngo®* MR XA80A 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 configurable at run time, based on the system resources available. By default, the maximum number of associations is set to 12.

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

##### 4.2.4.2.1 Asynchronous Nature

The syngo® MR XA80A 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 24: Asynchronous Nature as an Association Initiator

| | |
|---|---|
| **Maximum number of outstanding asynchronous transactions** | 10 |

##### 4.2.4.2.2 Implementation Identifying Information

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

#### 4.2.4.3 Association Initiation Policy

For general information regarding the association initiation policies please see Chapter 4.2.1.2

##### 4.2.4.3.1 Activity "Send Verification Request"

The Query/Retrieve AE supports the Verification SOP Class. For further details please see chapter 4.2.1.2.1

##### 4.2.4.3.2 Activity "Send Query Request" for Instances

###### *4.2.4.3.2.1 Description and Sequencing of Activities*

The *syngo®* MR XA80A serves as a SCU for the following SOP Classes

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

[1] Default, the value is configurable

- 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.

#### *4.2.4.3.2.2 Proposed Presentation Contexts*

The *syngo®* MR XA80A will propose Presentation Contexts as shown in the following table:

Table 25: Proposed Presentation Contexts for Query

| 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 | SCU | 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 | SCU | 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 | SCU | None |
| | | Explicit VR Little Endian | 1.2.840.10008.1.2.1 | | |
| | | Explicit VR Big Endian | 1.2.840.10008.1.2.2 | | |

Table 26: Extended Negotiation as an SCU

| 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 |

#### *4.2.4.3.2.3 SOP Specific Conformance Statement to Query SOP classes*

The *syngo®* MR XA80A checks for the following status codes in the Query SCP's C-FIND-RSP:

Table 27: 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 28 below indicates the behavior if exceptions occur:

Table 28: DICOM Command Communication Failure Behavior

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

The *syngo®* MR XA80A supports the following query levels:

- Study
- Series

Matching Keys on Instance Level is not supported by the *syngo®* MR XA80A 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 29: 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 |
| 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 |

| Attribute Name | Tag | Type | User input | UI |
|---|---|---|---|---|
| Modalities in Study | (0008,0061) | O | enter value | Yes |
| Number of Study Related Series | (0020,1206) | O | - | Yes |
| **Series Level** | | | | |
| Modality | (0008,0060) | O | enter value | Yes |
| Series Date | (0008,0021) | O | enter value | Yes |
| Series Time | (0008,0031) | O | enter value | Yes |
| Number of Series related Instances | (0020,1209) | O | - | Yes |
| Series Number | (0020,0011) | O | enter value | Yes |
| Series Description | (0008,103E) | O | enter value | Yes |
| Request Attributes Sequence \ Requested Procedure ID | (0040,0275) \ (0040,1001) | O | enter value | Yes |
| Request Attributes Sequence \ Scheduled Procedure Step ID | (0040,0275) \ (0040,0009) | O | enter value | Yes |
| Performed Procedure Step Start Date | (0040,0244) | O | enter value | Yes |
| Performed Procedure Step Start Time | (0040,0245) | O | enter value | Yes |
| Series Instance UID | (0020,000E) | U | - | Yes |

#### 4.2.4.3.3 **Activity "Send Move Request"**

##### ***4.2.4.3.3.1 Description and Sequencing of Activities***

The *syngo®* MR XA80A serves as a SCU for the following SOP Classes

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

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

##### ***4.2.4.3.3.2 Proposed Presentation Contexts***

The *syngo®* MR XA80A proposes Presentation Contexts shown in the following table:

Table 30: Proposed Presentation Contexts for Retrieve and Activity "Send Move Request"

| Abstract Syntax | | Transfer Syntax | | Role | Ext. Neg. |
|---|---|---|---|---|---|
| Name | UID | Name List | UID List | | |
| Patient Root Query/Retrieve Information Model – MOVE | 1.2.840.10008.5.1.4.1.2.1.2 | 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 | | |
| | 1.2.840.10008.5.1.4.1.2.2.2 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU | None |

| | | | | | |
|---|---|---|---|---|---|
| Study Root Query/Retrieve Information Model – MOVE | | 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 – MOVE | 1.2.840.10008.5.1.4.1.2.3.2 | 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 | | |

#### *4.2.4.3.3.3 SOP Specific Conformance Statement for Move SCU Classes*

The behavior of *syngo®* MR XA80A when encountering status codes in a C-MOVE RSP is summarized in Table 31

Table 31: 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 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 |

### 4.2.4.4 Association Acceptance Policy

The *syngo®* MR XA80A provides standard conformance as an SCP of the C-FIND and C-MOVE SOP Classes.

**Latency**

The syngo® MR XA80A 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 syngo® MR XA80A.

The syngo® MR XA80A 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 *syngo®* MR XA80A 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 *syngo®* MR XA80A DICOM application supports the presentation contexts listed in the following table for the Query/Retrieve Service Class:

Table 33: 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 34: 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 *syngo®* MR XA80A provides one of the following status codes in the C-FIND-RSP:

Table 35: 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 *syngo®* MR XA80A supports the following query levels:

- Study
- Series

Matching Keys on Instance Level is not supported by the *syngo®* MR XA80A 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 36: Attributes supported for Study/Series Query – SCP

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

| Attribute Name | Tag | Type | User input | UI |
|---|---|---|---|---|
| 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 |

#### 4.2.4.4.2 Activity "Receive Move Request"

##### *4.2.4.4.2.1 Description and Sequencing of Activities*

The *syngo*® MR XA80A serves as an SCP for the following SOP Classes

- Patient Root Query/Retrieve Information Model – MOVE SOP Class
- Study Root Query/Retrieve Information Model – MOVE SOP Class
- Patient/Study Only Query/Retrieve 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 *syngo*® MR XA80A accepts Presentation Contexts shown in the following table:

Table 37: Acceptable 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 Information 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 Information 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 Information 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 *syngo*® MR XA80A when encountering status codes in a C-MOVE-RSP is summarized in Table 38

Table 38: 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 Specifation

#### 4.2.5.1 SOP Classes

The Modality Worklist AE provides Standard Conformance to the SOP Class "Modality Worklist Information Model – FIND" as it is listed in "Table 1: Network Services" in the "Conformance Statement Overview".

#### 4.2.5.2 Association Policy

Table 39: Association Policies

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

The *syngo®* MR XA80A 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 configurable at run time, based on the system resources available. By default, the maximum number of associations is set to 12.

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

##### 4.2.5.2.1 Asynchronous Nature

The syngo® MR XA80A 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 40: 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

Table 3: Implementation Identifying Information in the "Conformance Statement Overview".

#### 4.2.5.3 Association Initiation Policy

##### 4.2.5.3.1 Activity "Querying a Remote Node" for Modality Worklist

###### *4.2.5.3.1.1 Description and Sequencing of Activities*

The *syngo®* MR XA80A serves as a 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 *syngo®* MR XA80A will propose Presentation Contexts as shown in the following table:

[1] Default, the value is configurable

Table 41: 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 *syngo®* MR XA80A Modality Worklist SCU supports “broad worklist queries” with all required search keys. The following tables describe the “broad query” search keys that the SCU supports. The list is configurable in ‘DICOM Modality Worklist Query’.

Table 42: 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 | <configured by Modality> or “*” |
| >Scheduled Station AE Title | (0040,0001) | R | <own AET> or “*”[1] |
| >Scheduled Procedure Step Start Date | (0040,0002) | R | Range from UI [2] |
| >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 | |
| 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 | |

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

### Return Key Attributes of the Modality Worklist C-FIND

The *syngo®* MR XA80A 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 43: Modality Worklist C-Find Return keys

| Attribute Name | Tag | Return Key Type | UI | Notes |
|---|---|---|---|---|
| **SOP Common** | | | | |
| Specific Character Set | (0008,0005) | 1C | No | |
| **Scheduled Procedure Step** | | | | |
| Scheduled Procedure Step Sequence | (0040,0100) | 1 | No | |
| >Modality | (0008,0060) | 1 | Yes | |
| >Scheduled Station AE Title | (0040,0001) | 1 | | "Scheduled Station AE Title" is taken as default for "Performed Station AE Title" |
| >Scheduled Procedure Step Start Date | (0040,0002) | 1 | Yes | |
| >Scheduled Procedure Step Start Time | (0040,0003) | 1 | Yes | |
| >Scheduled Procedure Step End Date | (0040,0004) | 3 | No | |
| >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 | |

| Attribute Name | Tag | Return Key Type | UI | Notes |
|---|---|---|---|---|
| >>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 | |
| Study Time | (0008,0030) | 3 | No | |
| Referenced Study Sequence | (0008,1110) | 2 | No | Uses universal sequence match |
| >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 | |
| Requested Procedure Code Sequence | (0032,1064) | 1C | No | Uses universal sequence match<br><br>“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 | |

| Attribute Name | Tag | Return Key Type | UI | Notes |
|---|---|---|---|---|
| >>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 | |
| 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** | | | | |

| Attribute Name | Tag | Return Key Type | UI | Notes |
|---|---|---|---|---|
| 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 |
| >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 | |
| 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 | |
| Pregnancy Status | (0010,21C0) | 2 | Yes | |
| Smoking Status | (0010,21A0) | 3 | Yes | |
| Last Menstrual Date | (0010,21D0) | 3 | Yes | |

| Attribute Name | Tag | Return Key Type | UI | Notes |
|---|---|---|---|---|
| Additional Patient History | (0010,21B0) | 3 | Yes | |
| Special Needs | (0038,0050) | 2 | Yes | |

The behavior of the *syngo®* MR XA80A when encountering status codes in a C-FIND RSP is summarized in Table 44.

Table 44: 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 45 below indicates the behavior if exceptions occur:

Table 45: 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 *syngo®* MR XA80A does not provide the functionality of a SCP of the Modality Worklist – Find SOP Class.

### 4.2.6 Modality Performed Procedure Step AE Specification

#### 4.2.6.1 SOP Classes

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

#### 4.2.6.2 Association Policy

Table 46: Association Policies

| | |
|---|---|
| **Application Context Name** | 1.2.840.10008.3.1.1.1 |

| | |
|---|---|
| **PDU size** | 32 kB [1] |
| **Maximum number of simultaneous associations as an association acceptor** | 12[1] |
| **Maximum number of simultaneous associations as an association initiator** | unlimited |

The *syngo®* MR XA80A 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 configurable at run time, based on the system resources available. By default, the maximum number of associations is set to 12.

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

#### 4.2.6.2.1 Asynchronous Nature

The syngo® MR XA80A 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 47: 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 *syngo®* MR XA80A serves as a 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 *syngo®* MR XA80A proposes Presentation Contexts as shown in the following table:

Table 48: 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*

The behavior of *syngo®* MR XA80A when encountering status codes in an N-CREATE-RSP is summarized in Table 49:

Table 49: 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. |

### 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 *syngo®* MR XA80A sends N-SET-RQ to inform the Information System about the finalization of the procedure step (COMPLETED or DISCONTINUED). Table 50 shows the Discontinuation Reasons supported.

Table 50: 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 *syngo®* MR XA80A proposes Presentation Contexts as shown in the following table:

Table 51: 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 *syngo®* MR XA80A when encountering status codes in an N-SET-RSP is summarized in Table 52:

Table 52: MPPS N-SET Response Status Handling Behavior

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

### 4.2.6.4 Association Acceptance Policy

The *syngo®* MR XA80A does not provide the functionality of a SCP of the Modality Performed Procedure Step SOP Class.

### 4.2.7 Print AE Specification

#### 4.2.7.1 SOP Classes

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

#### 4.2.7.2 Association Policy

Table 53: Association Policies

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

[1] Default, the value is configurable

| | |
|---|---|
| **Maximum number of simultaneous associations as an association initiator** | unlimited |

The *syngo®* MR XA80A 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 configurable at run time, based on the system resources available. By default, the maximum number of associations is set to 12.

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

##### 4.2.7.2.1 Asynchronous Nature

The syngo® MR XA80A 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 54: 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 *syngo®* MR XA80A proposes Presentation Contexts as shown in the following table:

Table 55: **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 Session 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 *syngo®* MR XA80A 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 *syngo®* MR XA80A 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 56: 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 57: 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 *syngo®* MR XA80A 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 *syngo®* MR XA80A DICOM Print Management SCU:

Table 58: 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 *syngo®* MR XA80A 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 59: 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 60: 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 61: 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 62: 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 63: 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 64: 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 *syngo®* MR XA80A 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 65: 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 66: 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 *syngo®* MR XA80A Print SCU uses the N-GET-RQ to request information about the printer status. It uses the attributes listed in the table below.

Table 67: 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 | See table in chapter 9.7 for possible values. |

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

Table 68: DICOM Command Communication Failure Behavior

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

#### 4.2.7.4 Association Acceptance Policy

##### 4.2.7.4.1 Activity Print Film

###### *4.2.7.4.1.1 Description and Sequencing of Activities*

The syngo® MR XA80A supports the reverse role negotiation of the Printer SOP Class. Receiving the N-EVENT-REPORT-RQ from a printer the *syngo®* MR XA80A is asynchronously informed about changes of the printer status.

###### *4.2.7.4.1.2 Accepted Presentation Context*

The *syngo®* MR XA80A accepts Presentation Contexts as shown in the following table:

Table 69: 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 70: Attributes for the N-EVENT-REPORT-RQ of the Printer SOP Class

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

##### 4.2.7.4.2 Activity Print Management

###### *4.2.7.4.2.1 Description and Sequencing of Activities*

The *syngo® MR XA80A* supports the reverse role negotiation of the Print Job SOP Class. Receiving the N-EVENT-REPORT-RQ from a printer the *syngo®* MR XA80A is asynchronously informed about the status of a print job for monitoring its progress.

###### *4.2.7.4.2.2 Accepted Presentation Context*

The *syngo®* MR XA80A accepts Presentation Contexts as shown in the following table:

Table 71: 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 72: 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) | --<br>(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) | --<br>(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) | --<br>(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) | --<br>(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 *syngo®* MR XA80A 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 shall be unique within the hospital. A common way to achieve that is to use the hostname as part of the AE Titles. The string can be up to 16 characters and must not contain any extended characters. Only 7-bit ASCII characters (excluding Control Characters) are allowed according to the DICOM Standard.

##### 4.4.1.1 Local AE Titles

The *syngo®* MR XA80A 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 73: 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 *syngo®* MR XA80A need to be configured in *syngo®* MR XA80A, before the association can be established. This behavior is configurable, but it is recommended, not to change this behavior.

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

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

Remote Application Entities can be configured without restarting the process.

###### 4.4.1.2.2 Remote Association Acceptors

For remote applications that shall be able to accept DICOM associations from *syngo®* MR XA80A, 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 *syngo®* MR XA80A with a logical name, that is also entered when configuring the node in the administration UI.

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

Remote Application Entities can be configured without restarting the process.

#### 4.4.1.3 Secure DICOM Communication

The system supports configuring the DICOM communication to use secure channel (TLS) between *syngo®* MR XA80A 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 *syngo®* MR XA80A 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 *syngo®* MR XA80A will not accept the certificate.

### 4.4.2 Parameters

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

Table 74: 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 | Yes | 20 |
| max matches query limit | Yes | 100 |
| max number of parallel receiving associations | Yes | 12 |
| DICOM UID change when data is corrected | Yes (by administrator) | Yes |

# 5 Media Interchange

## 5.1 Implementation Model

### 5.1.1 Application Data Flow Diagram

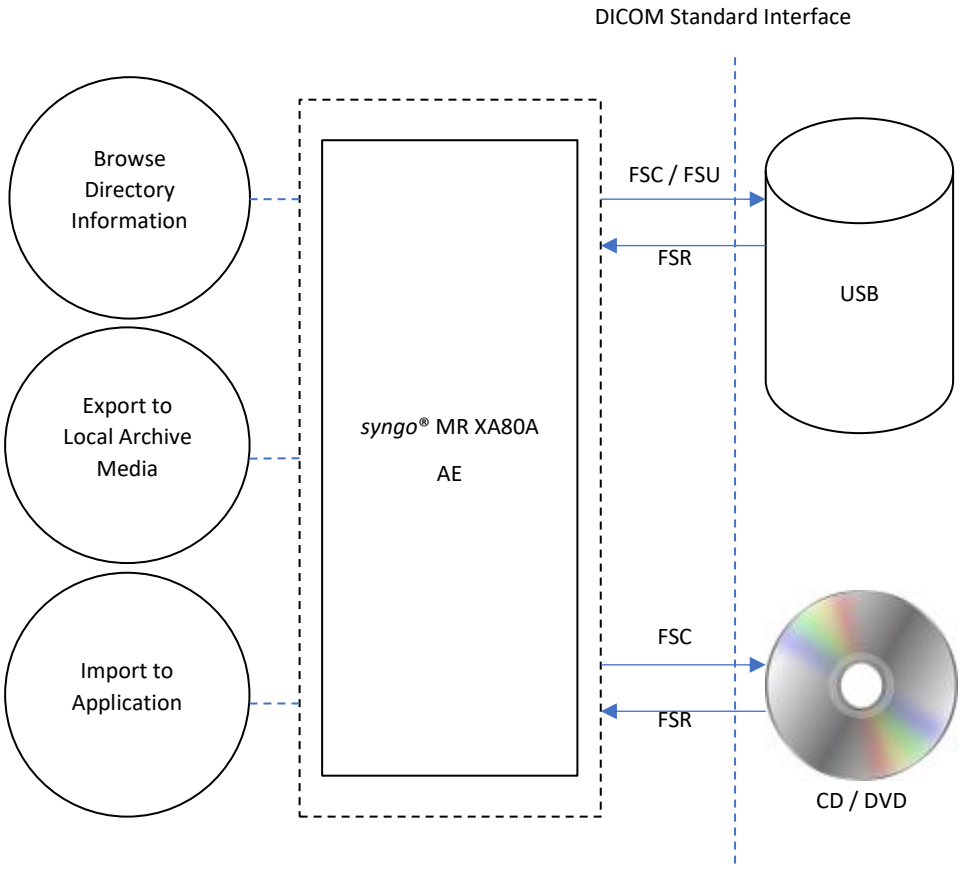



**Figure 5: Media Interchange Application Data Flow Diagram**

The *syngo®* MR XA80A 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 *syngo®* MR XA80A 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, *syngo*® MR XA80A 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, BD-J2K profile is used.

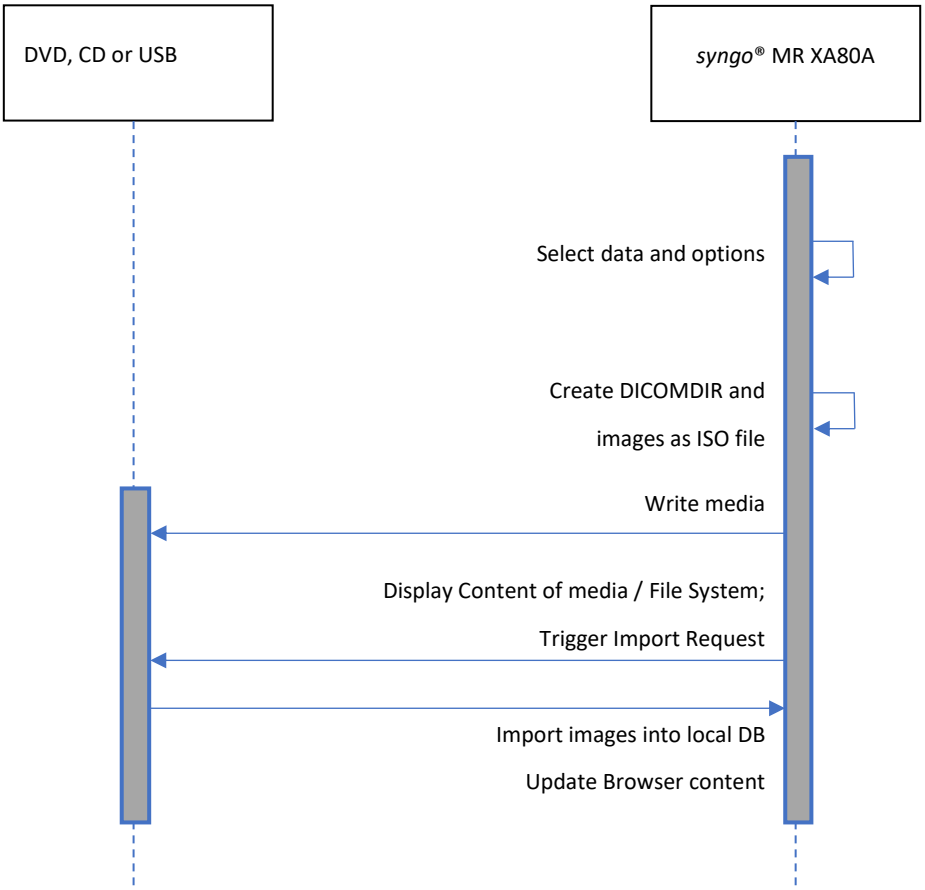



Figure 6: Sequence diagram – Media creation

### 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 75: Implementation Class/Version Name - Media Interchange

| | |
|---|---|
| **File Meta Information Version** | 0001 |
| **Implementation Class UID** | 1.3.12.2.1107.5.8.2 |
| **Implementation Version Name** | SYNGO_MR_DE20 |

## 5.2 AE Specifications

### 5.2.1 Media Storage AE – Specification

The *syngo*® MR XA80A 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 76: Media - Application Profiles and Real-World Activities

| Application Profiles Supported | Real-World Activity | Role | Service Class Option |
|---|---|---|---|
| AUG-GEN-CD | Browse Directory Information<br>Import into Application<br>Export to local Archive Media | FSR, FSC | Interchange |
| AUG-GEN-DVD | | | |
| AUG- GEN-DVD-J2K | | | |
| AUG-GEN-BD | | | |
| AUG-GEN-BD-J2K | | | |
| AUG- GEN-USB-J2K | | FSR, FSC, FSU | |
| STD-GEN-CD | Browse Directory Information<br>Import into Application<br>Export to local Archive Media | FSR, FSC | Interchange |
| STD-GEN-DVD-JPEG | | | |
| STD-GEN-DVD-J2K | | | |
| STD-GEN-BD | | | |
| STD-GEN-BD-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 *syngo*® MR XA80A acts as FSR using the interchange option when requested to read the media directory.

The *syngo*® MR XA80A will read the DICOMDIR and insert those directory entries that are valid for the application profiles supported, into a local database. The database then is used for browsing media contents.

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

##### 5.2.1.1.2 Real World Activity "Import into Application"

The *syngo*® MR XA80A application acts as FSR using the interchange option when requested to read SOP Instances from the medium into the application.

The SOP Instance selected from the media directory will be copied into the running Application. Only SOP Instances, that are valid for the application profile supported and supported by *syngo®* MR XA80A can be retrieved from media.

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

The *syngo®* MR XA80A 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 *syngo®* MR XA80A has not already processed the generated ISO file.

The *syngo®* MR XA80A 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 *syngo®* MR XA80A 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 *syngo®* MR XA80A provides Standard Conformance to the SOP Classes listed in "Table 1: Network Services" section "SOP Classes Created by the *syngo®* MR XA80A" and "SOP Classes Managed by the *syngo®* MR XA80A" in the "Conformance Statement Overview".

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

Table 77: Transfer Syntaxes for STD-GEN-DVD-J2K, STD-GEN-BD-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-BD, AUG- GEN-USB, STD-GEN-DVD, STD-GEN-BD, STD-GEN-USB) only Explicit VR Little Endian (1.2.840.10008.1.2.1) is supported.

## 5.3 Augmented and Private Application Profiles

### 5.3.1 Augmented Application Profiles

N/A

## 5.4 Media Configuration

None

# 6 Support of Extended Character Sets

The syngo® MR XA80A DICOM application supports the following character sets as defined in the four tables below:

Table 78: 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 79: Single-Byte Characters Sets with Code Extension

| Character Set Description | Defined Term | Standard for Code Extension | ESC sequence | ISO registration number | Character Set |
|---|---|---|---|---|---|
| Default repertoire | ISO 2022 IR 6 | ISO 2022 | ESC 02/08 04/02 | ISO-IR 6 | ISO 646 |
| Latin alphabet No.1 | ISO 2022 IR 100 | ISO 2022 | ESC 02/13 04/01 | ISO-IR 100 | Supplementary set |
| | | ISO 2022 | ESC 02/08 04/02 | ISO-IR 6 | ISO 646 |
| Latin alphabet No.2 | ISO 2022 IR 101 | ISO 2022 | ESC 02/13 04/02 | ISO-IR 101 | Supplementary set |
| | | ISO 2022 | ESC 02/08 04/02 | ISO-IR 6 | ISO 646 |
| Latin alphabet No.3 | ISO 2022 IR 109 | ISO 2022 | ESC 02/13 04/03 | ISO-IR 109 | Supplementary set |
| | | ISO 2022 | ESC 02/08 04/02 | ISO-IR 6 | ISO 646 |
| Latin alphabet No.4 | ISO 2022 IR 110 | ISO 2022 | ESC 02/13 04/04 | ISO-IR 110 | Supplementary set |
| | | ISO 2022 | ESC 02/08 04/02 | ISO-IR 6 | ISO 646 |

Multi-Byte Character Sets without Code Extension

Table 80: 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 81: Multi-Byte Character Sets with Code Extension

| Character Set Description | Defined Term | Standard for Code Extension | ESC sequence | ISO registration number | Character Set |
|---|---|---|---|---|---|
| Japanese | ISO 2022 IR 159 | ISO 2022 | ESC 02/04 02/08 04/04 | ISO-IR 159<br>ISO-IR 87 | 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 specific 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 *syngo®* MR XA80A supports Kanji characters in the byte zones after 74 (79, 7A, 7B and 7C).

# 7 Attribute confidentiality profiles

## 7.1 De-identification

The *syngo*® MR XA80A application can de-identify attributes, when exporting to Media. Three different levels of de-identification are supported:

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

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

Handling public attributes during de-identification:

- Attributes listed in Table 82: Application Level Confidentiality Profile attributes (standard tags) will be de-identified as specified for the different levels. Attributes not listed in the table are not PII / PHI relevant and will not be de-identified.

Handling private attributes during de-identification:

- Full de-identification: private attributes are not included in anonymized studies
- Reduced de-identification: private attributes are not included in anonymized studies except for the tags listed in Table 83
- Service de-identification: all private attributes are included in anonymized studies except for the tags listed in Table 83

In the following table for attributes marked with:

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

Table 82: Application Level Confidentiality Profile attributes (standard tags)

| DICOM Tag | Attribute Name | Full | Reduced | Service |
|---|---|---|---|---|
| (0000,1000) | Affected SOP Instance UID | Yes | No | No |
| (0000,1001) | Requested SOP Instance UID | Yes | No | No |
| (0002,0003) | Media Storage SOP Instance UID | Yes | No | No |
| (0004,1511) | Referenced SOP Instance UID in File | Yes | No | No |
| (0008,0014) | Instance Creator UID | Yes | No | No |
| (0008,0015) | Instance Coercion DateTime | Yes | No | No |
| (0008,0018) | SOP Instance UID | Yes | Yes | Yes |
| (0008,0020) | Study Date | Yes | No | No |
| (0008,0021) | Series Date | Yes | No | No |
| (0008,0022) | Acquisition Date | Yes | No | No |
| (0008,0023) | Content Date | Yes | No | No |
| (0008,0024) | Overlay Date | Yes | No | No |
| (0008,0025) | Curve Date | Yes | No | No |
| (0008,002A) | Acquisition DateTime | Yes | No | No |
| (0008,0030) | Study Time | Yes | No | No |
| (0008,0031) | Series Time | Yes | No | No |
| (0008,0032) | Acquisition Time | Yes | No | No |

| DICOM Tag | Attribute Name | Full | Reduced | Service |
|---|---|---|---|---|
| (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 | No | No |
| (0008,0080) | Institution Name | Yes | Yes | No |
| (0008,0081) | Institution Address | Yes | Yes | No |
| (0008,0082) | Institution Code Sequence | Yes | Yes | No |
| (0008,0090) | Referring Physician's Name | Yes | Yes | Yes |
| (0008,0092) | Referring Physician's Address | Yes | Yes | Yes |
| (0008,0094) | Referring Physician's Telephone Numbers | Yes | Yes | Yes |
| (0008,0096) | Referring Physician's Identification Sequence | Yes | Yes | No |
| (0008,010D) | Context Group Extension Creator UID | Yes | No | No |
| (0008,0201) | Timezone Offset From UTC | Yes | No | No |
| (0008,1010) | Station Name | Yes | Yes | Yes |
| (0008,1030) | Study Description | Yes | Yes | No |
| (0008,103E) | Series Description | Yes | Yes | No |
| (0008,1040) | Institutional Department Name | Yes | Yes | No |
| (0008,1048) | Physician(s) of Record | Yes | Yes | Yes |
| (0008,1049) | Physician(s) of Record Identification Sequence | Yes | Yes | No |
| (0008,1050) | Performing Physicians' Name | Yes | Yes | Yes |
| (0008,1052) | Performing Physicians' Identification Sequence | Yes | Yes | No |
| (0008,1060) | Name of Physician(s) Reading Study | Yes | Yes | Yes |
| (0008,1062) | Physician Reading Study Identification Sequence | Yes | Yes | No |
| (0008,1070) | Operators' Name | Yes | Yes | Yes |
| (0008,1072) | Operators' Identification Sequence | Yes | Yes | No |
| (0008,1080) | Admitting Diagnoses Description | Yes | Yes | No |
| (0008,1084) | Admitting Diagnoses Code Sequence | Yes | Yes | No |
| (0008,1110) | Referenced Study Sequence | Yes | No | No |
| (0008,1111) | Referenced Performed Procedure Step Sequence | Yes | No | No |
| (0008,1120) | Referenced Patient Sequence | Yes | Yes | No |
| (0008,1140) | Referenced Image Sequence | Yes | No | No |
| (0008,1155) | Referenced SOP Instance UID | Yes | No | No |
| (0008,1195) | Transaction UID | Yes | No | No |
| (0008,2111) | Derivation Description | Yes | No | No |
| (0008,2112) | Source Image Sequence | Yes | No | No |

| DICOM Tag | Attribute Name | Full | Reduced | Service |
|---|---|---|---|---|
| (0008,3010) | Irradiation Event UID | Yes | No | No |
| (0008,4000) | Identifying Comments | Yes | Yes | No |
| (0008,9123) | Creator Version UID | Yes | No | No |
| (0010,0010) | Patient's Name | Yes | Yes | Yes |
| (0010,0020) | Patient ID | Yes | Yes | Yes |
| (0010,0021) | Issuer of Patient ID | Yes | Yes | No |
| (0010,0030) | Patient's Birth Date | Yes | Yes | Yes |
| (0010,0032) | Patient's Birth Time | Yes | Yes | No |
| (0010,0040) | Patient's Sex | Yes | No | No |
| (0010,0050) | Patient's Insurance Plan Code Sequence | Yes | Yes | Yes |
| (0010,0101) | Patient's Primary Language Code Sequence | Yes | Yes | Yes |
| (0010,0102) | Patient's Primary Language Modifier Code Sequence | Yes | Yes | Yes |
| (0010,1000) | Other Patient IDs | Yes | Yes | Yes |
| (0010,1001) | Other Patient Names | Yes | Yes | Yes |
| (0010,1002) | Other Patient IDs Sequence | Yes | Yes | Yes |
| (0010,1005) | Patient's Birth Name | Yes | Yes | Yes |
| (0010,1010) | Patient's Age | Yes | No | No |
| (0010,1020) | Patient's Size | Yes | No | No |
| (0010,1030) | Patient's Weight | Yes | No | No |
| (0010,1040) | Patient Address | Yes | Yes | Yes |
| (0010,1050) | Insurance Plan Identification | Yes | Yes | No |
| (0010,1060) | Patient's Mother's Birth Name | Yes | Yes | Yes |
| (0010,1080) | Military Rank | Yes | Yes | No |
| (0010,1081) | Branch of Service | Yes | Yes | No |
| (0010,1090) | Medical Record Locator | Yes | Yes | No |
| (0010,1100) | Referenced Patient Photo Sequence | Yes | Yes | No |
| (0010,2000) | Medical Alerts | Yes | Yes | No |
| (0010,2110) | Allergies | Yes | Yes | No |
| (0010,2150) | Country of Residence | Yes | Yes | No |
| (0010,2152) | Region of Residence | Yes | Yes | No |
| (0010,2154) | Patient's Telephone Number | Yes | Yes | Yes |
| (0010,2160) | Ethnic Group | Yes | No | No |
| (0010,2180) | Occupation | Yes | Yes | No |
| (0010,21A0) | Smoking Status | Yes | No | No |
| (0010,21B0) | Additional Patient's History | Yes | Yes | Yes |
| (0010,21C0) | Pregnancy Status | Yes | No | No |

| DICOM Tag | Attribute Name | Full | Reduced | Service |
|---|---|---|---|---|
| (0010,21D0) | Last Menstrual Date | Yes | No | No |
| (0010,21F0) | Patient's Religious Preference | Yes | Yes | No |
| (0010,2203) | Patient Sex Neutered | Yes | No | No |
| (0010,2297) | Responsible Person | Yes | Yes | No |
| (0010,2299) | Responsible Organization | Yes | Yes | No |
| (0010,4000) | Patient Comments | Yes | Yes | Yes |
| (0018,0010) | Contrast Bolus Agent | Yes | Yes | No |
| (0018,1000) | Device Serial Number | Yes | Yes | No |
| (0018,1002) | Device UID | Yes | No | No |
| (0018,1004) | Plate ID | Yes | Yes | No |
| (0018,1005) | Generator ID | Yes | Yes | No |
| (0018,1007) | Cassette ID | Yes | Yes | No |
| (0018,1008) | Gantry ID | Yes | Yes | No |
| (0018,1030) | Protocol Name | Yes | Yes | No |
| (0018,1400) | Acquisition Device Processing Description | Yes | Yes | No |
| (0018,2042) | Target UID | Yes | No | No |
| (0018,4000) | Acquisition Comments | Yes | Yes | No |
| (0018,700A) | Detector ID | Yes | Yes | No |
| (0018,9424) | Acquisition Protocol Description | Yes | Yes | No |
| (0018,9516) | Start Acquisition DateTime | Yes | No | No |
| (0018,9517) | End Acquisition DateTime | Yes | No | No |
| (0018,A003) | Contribution Description | Yes | Yes | No |
| (0020,000D) | Study Instance UID | Yes | Yes | Yes |
| (0020,000E) | Series Instance UID | Yes | Yes | Yes |
| (0020,0010) | Study ID | Yes | Yes | No |
| (0020,0052) | Frame of Reference UID | Yes | No | No |
| (0020,0200) | Synchronization Frame of Reference UID | Yes | No | No |
| (0020,3401) | Modifying Device ID | Yes | Yes | No |
| (0020,3404) | Modifying Device Manufacturer | Yes | Yes | No |
| (0020,3406) | Modified Image Description | Yes | Yes | No |
| (0020,4000) | Image Comments | Yes | Yes | No |
| (0020,9158) | Frame Comments | Yes | Yes | No |
| (0020,9161) | Concatenation UID | Yes | No | No |
| (0020,9164) | Dimension Organization UID | Yes | No | No |
| (0028,1199) | Palette Color Lookup Table UID | Yes | No | No |
| (0028,1214) | Large Palette Color Lookup Table UID | Yes | No | No |

| DICOM Tag | Attribute Name | Full | Reduced | Service |
|---|---|---|---|---|
| (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 |
| (0040,0012) | Pre-Medication | Yes | Yes | No |

| DICOM Tag | Attribute Name | Full | Reduced | Service |
|---|---|---|---|---|
| (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 |
| (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 |

| DICOM Tag | Attribute Name | Full | Reduced | Service |
|---|---|---|---|---|
| (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 | No | No |
| (0040,A172) | Referenced Observation UID (Trial) | Yes | No | No |
| (0040,A192) | Observation Date (Trial) | Yes | No | No |
| (0040,A193) | Observation Time (Trial) | Yes | No | No |
| (0040,A307) | Current Observer (Trial) | Yes | Yes | No |
| (0040,A352) | Verbal Source (Trial) | Yes | Yes | No |
| (0040,A353) | Address (Trial) | Yes | Yes | No |
| (0040,A354) | Telephone Number (Trial) | Yes | Yes | Yes |
| (0040,A358) | Verbal Source Identifier Code Sequence (Trial) | Yes | Yes | No |
| (0040,A402) | Observation Subject UID (Trial) | Yes | No | No |
| (0040,A730) | Content Sequence | Yes | Yes | No |
| (0040,DB0C) | Template Extension Organization UID | Yes | No | No |
| (0040,DB0D) | Template Extension Creator UID | Yes | No | No |
| (0070,0001) | Graphic Annotation Sequence | Yes | Yes | No |
| (0070,0084) | Content Creator’s Name | Yes | Yes | No |
| (0070,0086) | Content Creator’s Identification Code Sequence | Yes | Yes | No |
| (0070,031A) | Fiducial UID | Yes | No | No |
| (0088,0140) | Storage Media Fileset UID | Yes | No | No |
| (0088,0200) | Icon Image Sequence | Yes | Yes | No |

| DICOM Tag | Attribute Name | Full | Reduced | Service |
|---|---|---|---|---|
| (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 |
| (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 |

| DICOM Tag | Attribute Name | Full | Reduced | Service |
|---|---|---|---|---|
| (60xx,4000) | Overlay Comments | Yes | Yes | No |
| (FFFA,FFFA) | Digital Signatures Sequence | Yes | Yes | Yes |
| (FFFC,FFFC) | Data Set Trailing Padding | Yes | Yes | Yes |

Table 83: Application Level Confidentiality Profile Attributes (private tags)

| DICOM Tag | Attribute Name | Full | Reduced | Service |
|---|---|---|---|---|
| (0021,SIEMENS MR SDR 01,01) | Creator Identifier | No | No | No |
| (0021,SIEMENS MR SDR 01,02) | Application Identifier | No | No | No |
| (0021, SIEMENS MR SDS 01, 04) | SliceArrayConcatenations | No | No | No |
| (0021, SIEMENS MR SDS 01, 05) | RelTablePosition | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 06) | CoilForGradient | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 07) | LongModelName | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 08) | GradientMode | No | No | No |
| (0021, SIEMENS MR SDS 01, 09) | PATModeText | no | No | No |
| (0021, SIEMENS MR SDS 01, 0A) | SW_korr_faktor | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 0B) | RfPowerErrorIndicator | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 0C) | PositivePCSDirections | No | No | No |
| (0021, SIEMENS MR SDS 01, 0D) | ProtocolChangeHistory | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 0F) | Stim_lim | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 10) | MrProtocolVersion | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 11) | PhaseGradientAmplitude | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 12) | ReadoutOS | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 13) | t_puls_max | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 14) | NumberOfPrescans | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 16) | dBdt_thresh | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 17) | SelectionGradientAmplitude | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 18) | RFSWDMostCriticalAspect | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 19) | MR Phoenix Protocol | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 1A) | CoilString | No | No | No |
| (0021, SIEMENS MR SDS 01, 1B) | SliceResolution | No | No | No |
| (0021, SIEMENS MR SDS 01, 1C) | Stim_max_online | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 1D) | Operation_mode_flag | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 22) | SequenceFileOwner | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 23) | RfWatchdogMask | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 25) | TablePositionOrigin | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 26) | MiscSequenceParam | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 27) | Isocentered | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 2A) | CoilId | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 2B) | PatReinPattern | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 2C) | Sed | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 2D) | SARMostCriticalAspect | Yes | No | No |

| DICOM Tag | Attribute Name | Full | Reduced | Service |
|---|---|---|---|---|
| (0021, SIEMENS MR SDS 01, 2E) | Stim_mon_mode | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 2F) | GradientDelayTime | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 30) | ReadoutGradientAmplitude | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 31) | AbsTablePosition | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 32) | RFSWDOperationMode | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 33) | CoilForGradient2 | No | No | No |
| (0021, SIEMENS MR SDS 01, 34) | Stim_faktor | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 35) | Stim_max_ges_norm_online | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 36) | dBdt_max | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 37) | FlowCompensation | No | No | No |
| (0021, SIEMENS MR SDS 01, 38) | TransmitterCalibration | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 3D) | PhaseSliceOversampling | No | No | No |
| (0021, SIEMENS MR SDS 01, 44) | B1rms | No | No | No |
| (0021, SIEMENS MR SDS 01, 45) | B1rmsSupervision | No | No | No |
| (0021, SIEMENS MR SDS 01, 46) | TalesReferencePower | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 48) | DICOMImageFlavor | No | No | No |
| (0021, SIEMENS MR SDS 01, 49) | DICOMAcquisitionContrast | No | No | No |
| (0021, SIEMENS MR SDS 01, 50) | RFEchoTrainLength | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 51) | GradientEchoTrainLength | Yes | No | No |
| (0021, SIEMENS MR SDS 01, 53) | Laterality4MF | No | No | No |
| (0021, SIEMENS MR SDS 01, 5A) | ScanningSequence | No | No | No |
| (0021, SIEMENS MR SDS 01, 5B) | SequenceVariant | No | No | No |
| (0021, SIEMENS MR SDS 01, 5C) | MeasurementOptions | No | No | No |
| (0021, SIEMENS MR SDS 01, 5D) | ScanRegionPositionIso | No | No | No |
| (0021, SIEMENS MR SDS 01, 5E) | FieldOfViewText | No | No | No |
| (0021, SIEMENS MR SDS 01, 5F) | RelativeTablePositionText | No | No | No |
| (0021, SIEMENS MR SDS 01, FE) | Series Data Sequence | No | No | No |
| (0021, SIEMENS MR SDI 02, 03) | SliceMeasurementDuration | Yes | No | No |
| (0021, SIEMENS MR SDI 02, 04) | TimeAfterStart | Yes | No | No |
| (0021, SIEMENS MR SDI 02, 06) | ICE_Dims | Yes | No | No |
| (0021, SIEMENS MR SDI 02, 1A) | RFSWDDataType | Yes | No | No |
| (0021, SIEMENS MR SDI 02, 1B) | PhaseEncodingDirectionPositive | Yes | No | No |
| (0021, SIEMENS MR SDI 02, 22) | VoxelThickness | Yes | No | No |
| (0021, SIEMENS MR SDI 02, 24) | MultistepIndex | Yes | No | No |
| (0021, SIEMENS MR SDI 02, 33) | EchoColumnPosition | Yes | No | No |
| (0021, SIEMENS MR SDI 02, 41) | GSWDDataType | Yes | No | No |

| DICOM Tag | Attribute Name | Full | Reduced | Service |
|---|---|---|---|---|
| (0021, SIEMENS MR SDI 02, 42) | RealDwellTime | Yes | No | No |
| (0021, SIEMENS MR SDI 02, 45) | ImaAbsTablePosition | Yes | No | No |
| (0021, SIEMENS MR SDI 02, 48) | EchoPartitionPosition | Yes | No | No |
| (0021, SIEMENS MR SDI 02, 49) | EchoLinePosition | Yes | No | No |
| (0021, SIEMENS MR SDI 02, 4F) | ImaCoilString | No | No | No |
| (0021, SIEMENS MR SDI 02, 51) | SequenceMask | Yes | No | No |
| (0021, SIEMENS MR SDI 02, 56) | ImaPATModeText | No | No | No |
| (0021, SIEMENS MR SDI 02, 58) | AcquisitionMatrixText | No | No | No |
| (0021, SIEMENS MR SDI 02, 5E) | ProtocolSliceNumber | Yes | No | No |
| (0021, SIEMENS MR SDI 02, 67) | ExamDataRole | Yes | No | No |
| (0021, SIEMENS MR SDI 02, 70) | DataSetInfo | Yes | No | No |
| (0021, SIEMENS MR SDI 02, 71) | UsedChannelString | Yes | No | No |
| (0021, SIEMENS MR SDI 02, 75) | ImageType4MF | No | No | No |
| (0021, SIEMENS MR SDI 02,76) | ImageHistory | No | No | No |
| (0021, SIEMENS MR SDI 02, 77) | SequenceInfo | Yes | No | No |
| (0021, SIEMENS MR SDI 02,78) | ImageTypeVisible | No | No | No |
| (0021, SIEMENS MR SDI 02,79) | DistortionCorrectionType | No | No | No |
| (0021, SIEMENS MR SDI 02,88) | SliceCenterDistancefromIsoCenter | No | No | No |
| (0021, SIEMENS MR SDI 02,89) | FrameInversionTime | No | No | No |
| (0021, SIEMENS MR SDI 02,8A) | FrameNumberInSeries | No | No | No |
| (0021, SIEMENS MR SDI 02,8B) | SlicePositionText | No | No | No |
| (0021, SIEMENS MR SDI 02, 8C) | MorphoQCThreshold | Yes | No | No |
| (0021, SIEMENS MR SDI 02, 8D) | MorphoQCIndex | Yes | No | No |
| (0021, SIEMENS MR SDI 02, 8E) | DICOM_Dims | Yes | No | No |
| (0021, SIEMENS MR SDI 02, FE) | Image Data Sequence | No | No | No |

# 8 Security

## 8.1 Security Profiles

### 8.1.1 Time Synchronization Profiles

Time Synchronization Profiles: The *syngo*® MR XA80A acts as an NTP Client in the Maintain Time Transaction.

### 8.1.2 Basic TLS Secure Transport Connection Profile

Basic TLS Secure Transport Connection Profile supports TLS version 1.0, 1.1 and 1.2 protocols with the following features:

Table 84: Secure Transport Connection Profiles

| Supported TLS Feature | Mechanism |
|---|---|
| Entity Authentication | RSA based certificates |
| Exchange of Master Secrets | RSA |
| Data Integrity | SHA |
| Privacy | Triple DES EDE, CBC |

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

## 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

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

# 9 Annexes

## 9.1 IOD Contents

### 9.1.1 Created SOP Instances

#### 9.1.1.1 Enhanced MR Image IOD

This chapter describes the DICOM attributes of Enhanced MR Image Instances performed by the MR acquisition.

| IE | Module | Reference | Presence of Module |
|---|---|---|---|
| Patient | Patient | see chapter 9.1.1.1.1 | always |
| Study | General Study | see chapter 9.1.1.1.2 | always |
| | Patient Study | see chapter 9.1.1.1.3 | always |
| Series | General Series | see chapter 9.1.1.1.4 | always |
| | MR Series | see chapter 9.1.1.1.5 | always |
| Frame of Reference | Frame of Reference | see chapter 9.1.1.1.6 | always |
| Equipment | General Equipment | see chapter 9.1.1.1.7 | always |
| | Enhanced General Equipment | see chapter 9.1.1.1.8 | always |
| Image | Image Pixel | see chapter 9.1.1.1.9 | always |
| | Enhanced Contrast/Bolus | see chapter 9.1.1.1.10 | always |
| | Multi-frame Functional Groups | see chapter 9.1.1.1.11 | always |
| | Multi-frame Dimension | see chapter 9.1.1.1.12 | always |
| | Cardiac Synchronization | see chapter 9.1.1.1.14 | in case of cardiac triggering |
| | Respiratory Synchronization | see chapter 9.1.1.1.15 | in case of respiratory triggering |
| | Bulk Motion Synchronization | see chapter 9.1.1.1.16 | in case of bulk motion triggering |
| | Supplemental Palette Color Lookup Table | see chapter 9.1.1.1.17 | in case of Color LUTs |
| | Acquisition Context | see chapter 9.1.1.1.18 | always |
| | Enhanced MR Image | see chapter 9.1.1.1.19 | always |
| | MR Pulse Sequence | see chapter 9.1.1.1.20 | always |
| | SOP Common | see chapter 9.1.1.1.22 | always (with SOP Class UID for Enhanced MR Image) |
| | Common Instance Reference | see chapter 9.1.1.1.23 | always |
| | SIEMENS MR Common | see chapter 9.2.1.7 | always |

#### 9.1.1.1.1 Patient Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Patient's Name | (0010,0010) | RIS defined or set by creator |
| Patient ID | (0010,0020) | RIS defined or set by creator |
| Issuer of Patient ID | (0010,0021) | RIS defined |
| Patient's Birth Date | (0010,0030) | RIS defined or set by creator |
| Patient`s Birth Time | (0010,0032) | RIS defined or set by creator |
| Patient's Sex | (0010,0040) | RIS defined or set by creator |
| Other Patient IDs | (0010,1000) | RIS defined or set by creator |
| Other Patient Names | (0010,1001) | RIS defined or set by creator |
| Ethnic Group | (0010,2160) | RIS defined or set by creator |
| Patient Comments | (0010,4000) | RIS defined or set by creator |
| Other Patient Names | (0010,1001) | RIS defined or set by creator |
| Patient Identity Removed | (0012,0062) | set by creator |

#### 9.1.1.1.2 General Study Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Study Instance UID | (0020,000D) | RIS defined or set by creator |
| Study Date | (0008,0020) | set by creator |
| Study Time | (0008,0030) | set by creator |
| Referring Physician's Name | (0008,0090) | RIS defined or set by creator |
| Requesting Physician | (0032,1032) | RIS defined or set by creator |
| Study ID | (0020,0010) | set by creator |
| Accession Number | (0008,0050) | RIS defined or set by creator |
| Study Description | (0008,1030) | set by creator |
| Procedure Code Sequence | (0008,1032) | RIS defined |
| >Code Value | (0008,0100) | RIS defined |
| >Code Scheme Designator | (0008,0102) | RIS defined |
| >Code Meaning | (0008,0104) | RIS defined |

#### 9.1.1.1.3 Patient Study Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Patient's Age | (0010,1010) | RIS defined or set by creator |
| Patient's Size | (0010,1020) | RIS defined or set by creator |
| Patient's Weight | (0010,1030) | RIS defined or set by creator |

#### 9.1.1.1.4 General Series Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Modality | (0008,0060) | MR |
| Series Instance UID | (0020,000E) | set by creator |
| Series Number | (0020,0011) | set by creator |
| Series Date | (0008,0021) | set by creator |
| Series Time | (0008,0031) | set by creator |
| Performing Physicians' Name | (0008,1050) | RIS defined or set by creator |
| Protocol Name | (0018,1030) | set by creator |
| Series Description | (0008,103E) | set by creator |
| Referenced Performed Procedure Step Sequence | (0008,1111) | set by creator |
| >Referenced SOP Class UID | (0008,1150) | set by creator |
| >Referenced SOP Instance UID | (0008,1155) | set by creator |
| Body Part Examined | (0018,0015) | set by creator |
| Patient Position | (0018,5100) | set by creator |
| Request Attributes Sequence | (0040,0275) | RIS defined |
| >Requested Procedure ID | (0040,1001) | RIS defined |
| >Accession Number | (0008,0050) | RIS defined |
| >Study Instance UID | (0020,000D) | RIS defined |
| >Requested Procedure Description | (0032,1060) | RIS defined |
| >Scheduled Procedure Step ID | (0040,0009) | RIS defined |
| >Scheduled Procedure Step Description | (0040,0007) | RIS defined |
| > Referenced Study Sequence | (0008,1110) | RIS defined |
| >> Referenced SOP Class UID | (0008,1150) | RIS defined |
| >> Referenced SOP Instance UID | (0008,1155) | RIS defined |
| > Requested Procedure Code Sequence | (0032,1064) | RIS defined |
| >> Code Value | (0008,0100) | RIS defined |
| >> Code Scheme Designator | (0008,0102) | RIS defined |
| >> Code Meaning | (0008,0104) | RIS defined |
| > Scheduled Protocol Code Sequence | (0040,0008) | RIS defined |
| >> Code Value | (0008,0100) | RIS defined |
| >> Code Scheme Designator | (0008,0102) | RIS defined |
| >> Code Meaning | (0008,0104) | RIS defined |
| Performed Procedure Step ID | (0040,0253) | set by creator |
| Performed Procedure Step Start Date | (0040,0244) | set by creator |
| Performed Procedure Step Start Time | (0040,0245) | set by creator |
| Performed Procedure Step Description | (0040,0254) | set by creator |

#### 9.1.1.1.5 MR Series Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Modality | (0008,0060) | MR |

#### 9.1.1.1.6 Frame of Reference Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Frame of Reference UID | (0020,0052) | set by creator |
| Position Reference Indicator | (0020,1040) | empty |

#### 9.1.1.1.7 General Equipment Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Manufacturer | (0008,0070) | Siemens Healthineers |
| Institution Name | (0008,0080) | RIS defined or set by creator |
| Station Name | (0008,1010) | set by creator |
| Institution Address | (0008,0081) | RIS defined set by creator |
| Institutional Department Name | (0008,1040) | set by creator |
| Manufacturer's Model Name | (0008,1090) | set by creator |
| Device Serial Number | (0018,1000) | set by creator |
| Software Versions | (0018,1020) | set by creator |

#### 9.1.1.1.8 Enhanced General Equipment Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Manufacturer | (0008,0070) | Siemens Healthineers |

#### 9.1.1.1.9 Image Pixel Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Samples per Pixel | (0028,0002) | 1 |
| Photometric Interpretation | (0028,0004) | MONOCHROME2 |
| Rows | (0028,0010) | set by creator |
| Columns | (0028,0011) | set by creator |
| Bits Allocated | (0028,0100) | 16 |

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Bits Stored | (0028,0101) | 12 or 16 |
| High Bit | (0028,0102) | 11 or 15 |
| Pixel Representation | (0028,0103) | 0 |
| Pixel Data | (7FE0,0010) | set by creator |
| Smallest Image Pixel Value | (0028,0106) | set by creator |
| Largest Image Pixel Value | (0028,0107) | set by creator |

#### 9.1.1.1.10 Enhanced Contrast/Bolus Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Contrast/Bolus Agent Sequence | (0018,0012) | set by creator |
| >Code Value | (0008,0100) | set by creator |
| >Code Scheme Designator | (0008,0102) | set by creator |
| >Code Meaning | (0008,0104) | set by creator |
| >Contrast/Bolus Agent Number | (0018,9337) | 1 |
| >Contrast/Bolus Administration Route Sequence | (0018,0014) | set by creator |
| >>Code Value | (0008,0100) | set by creator |
| >>Code Scheme Designator | (0008,0102) | set by creator |
| >>Code Meaning | (0008,0104) | set by creator |
| >Contrast/Bolus Ingredient Code Sequence | (0018,9338) | set by creator |
| >>Code Value | (0008,0100) | set by creator |
| >>Code Scheme Designator | (0008,0102) | set by creator |
| >>Code Meaning | (0008,0104) | set by creator |
| >Contrast/Bolus Volume | (0018,1041) | set by creator |
| >Contrast/Bolus Ingredient Concentration | (0018,1049) | set by creator |

#### 9.1.1.1.11 Multi-frame Functional Groups Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Shared Functional Group Sequence | (5200,9229) | set by creator |
| *> Include one or more Functional Group Macros* | | |
| Per-frame Functional Group Sequence | (5200,9230) | set by creator |
| *> Include one or more Functional Group Macros* | | |
| Instance Number | (0020,0013) | set by creator |
| Content Date | (0008,0023) | set by creator |
| Content Time | (0008,0033) | set by creator |
| Number of Frames | (0028,0008) | set by creator |

#### 9.1.1.1.12 Multi-frame Dimension Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Dimension Organization Sequence | (0020,9221) | set by creator |
| Dimension Index Sequence | (0020,9222) | set by creator |

#### 9.1.1.1.13 Enhanced MR Image Functional Groups

| Functional Group Macro | Attribute Name | Tag | Supported Values |
|---|---|---|---|
| Pixel Measures | Pixel Measures Sequence | (0028,9110) | set by creator |
| | >Pixel Spacing | (0018,0030) | set by creator |
| | >Slice Thickness | (0028,0050) | set by creator |
| Frame Content | Frame Content Sequence | (0020,9111) | set by creator |
| | >Frame Acquisition Number | (0020,9156) | set by creator |
| | >Frame Reference Date Time | (0018,9151) | set by creator |
| | >Frame Acquisition Date Time | (0018,9074) | set by creator |
| | >Frame Acquisition Duration | (0018,9220) | set by creator |
| | >Dimension Index Values | (0020,9157) | set by creator |
| | >Temporal Position Index | (0020,9128) | set by creator |
| | >Stack ID | (0020,9056) | set by creator |
| | >In-Stack Position Number | (0020,9057) | set by creator |
| | >Frame Comments | (0020,9158) | set by creator |
| Plane Position | Plane Position Sequence | (0020,9113) | set by creator |
| | >Image Position (Patient) | (0020,0032) | set by creator |
| Plane Orientation | Plane Orientation Sequence | (0020,9116) | set by creator |
| | >Image Orientation (Patient) | (0020,0037) | set by creator |
| Referenced Image | Referenced Image Sequence | (0008,1140) | set by creator |
| | >Referenced SOP Class UID | (0008,1150) | set by creator |
| | >Referenced SOP Instance UID | (0008,1155) | set by creator |
| | >Referenced Frame Number | (0008,1160) | set by creator |
| | >Purpose of Referenced Code Sequence | (0040,A170) | set by creator |
| | >>Code Value | (0008,0100) | e.g. 121311 |
| | >>Coding Scheme Designator | (0008,0102) | e.g. DCM |
| | >>Code Meaning | (0008,0104) | e.g. Localizer |
| Derivation Image | Derivation Image Sequence | (0008,9124) | set by creator |
| | >Derivation Code Sequence | (0008,9215) | set by creator |
| | >>Code Value | (0008,0100) | set by creator |
| | >>Coding Scheme Designator | (0008,0102) | set by creator |
| | >>Code Meaning | (0008,0104) | set by creator |
| | >Source Image Sequence | (0008,2112) | set by creator |
| | >>Referenced SOP Class UID | (0008,1150) | set by creator |
| | >>Referenced SOP Instance UID | (0008,1155) | set by creator |
| | >>Referenced Frame Number | (0008,1160) | set by creator |
| | >>Purpose of Referenced Code Sequence | (0040,A170) | set by creator |

| Functional Group Macro | Attribute Name | Tag | Supported Values |
|---|---|---|---|
| | >>>Code Value | (0008,0100) | set by creator |
| | >>>Coding Scheme Designator | (0008,0102) | set by creator |
| | >>>Code Meaning | (0008,0104) | set by creator |
| Cardiac Synchronization | Cardiac Synchronization Sequence | (0018,9118) | set by creator |
| | >Nominal Percentage of Cardiac Phase | (0020,9241) | set by creator |
| | >Nominal Cardiac Trigger Delay Time | (0020,9153) | set by creator |
| | >Actual Cardiac Trigger Delay Time | (0020,9252) | set by creator |
| | >Nominal Cardiac Trigger Time Prior to R-peak | (0020,9154) | set by creator |
| | >Actual Cardiac Trigger Time Prior to R-peak | (0020,9155) | set by creator |
| | >Intervals Acquired | (0018,1083) | set by creator |
| | >Intervals Rejected | (0018,1084) | set by creator |
| | >Heart Rate | (0018,1088) | set by creator |
| | >R-R Interval Time Nominal | (0020,9251) | set by creator |
| | >Low R-R Value | (0018,1081) | set by creator |
| | >High R-R Value | (0018,1082) | set by creator |
| Frame Anatomy | Frame Anatomy Sequence | (0020,9071) | set by creator |
| | >Frame Laterality | (0020,9072) | set by creator |
| | >Anatomic Region Sequence | (0008,2218) | set by creator |
| | >>Code Value | (0008,0100) | set by creator |
| | >>Coding Scheme Designator | (0008,0102) | set by creator |
| | >>Code Meaning | (0008,0104) | set by creator |
| Pixel Value Transformation | Pixel Value Transformation Sequence | (0028,9145) | set by creator |
| | >Rescale Intercept | (0028,1052) | set by creator |
| | >Rescale Slope | (0028,1053) | set by creator |
| | >Rescale Type | (0028,1054) | set by creator |
| Frame VOI LUT | Frame VOI LUT Sequence | (0028,9132) | set by creator |
| | >Window Center | (0028,1050) | set by creator |
| | >Window Width | (0028,1051) | set by creator |
| Real World Value Mapping | Real World Value Mapping Sequence | (0040,9096) | set by creator |
| | >Real World Value Intercept | (0040,9224) | set by creator |
| | >Real World Value Slope | (0040,9225) | set by creator |
| | >Measurement Units Code Sequence | (0040,08EA) | set by creator |
| | >>Code Value | (0008,0100) | set by creator |
| | >>Coding Scheme Designator | (0008,0102) | set by creator |
| | >>Code Meaning | (0008,0104) | set by creator |
| Contrast/Bolus Usage | Contrast/Bolus Usage Sequence | (0018,9341) | set by creator |
| | >Contrast/Bolus Agent Number | (0018,9337) | 1 |
| | >Contrast/Bolus Agent Administered | (0018,9342) | set by creator |
| | >Contrast/Bolus Agent Detected | (0018,9343) | set by creator |
| | >Contrast/Bolus Agent Phase | (0018,9344) | set by creator |
| MR Image Frame Type | MR Image Frame Type Sequence | (0018,9226) | set by creator |
| | >Frame Type | (0008,9007) | set by creator |
| | >Pixel Presentation | (0008,9205) | set by creator |
| | >Volumetric Properties | (0008,9206) | set by creator |
| | >Volume Based Calculation Technique | (0008,9207) | set by creator |
| | >Complex Image Component | (0008,9208) | set by creator |
| | >Acquisition Contrast | (0008,9209) | set by creator |

| Functional Group Macro | Attribute Name | Tag | Supported Values |
|---|---|---|---|
| | >Functional Settling Phase Frames Present | (0018,9622) | set by creator |
| MR Timing and Related Parameters | MR Timing and Related Parameters Sequence | (0018,9112) | set by creator |
| | >Repetition Time | (0018,0080) | set by creator |
| | >Flip Angle | (0018,1314) | set by creator |
| | >Echo Train Length | (0018,0091) | set by creator |
| | >RF Echo Train Length | (0018,9240) | set by creator |
| | >Gradient Echo Train Length | (0018,9241) | set by creator |
| | >Specific Absorption Rate Sequence[3] | (0018,9239) | set by creator |
| | >>Specific Absorption Rate Definition | (0018,9179) | set by creator |
| | >>Specific Absorption Rate Value | (0018,9181) | set by creator |
| | >Gradient Output Type[3] | (0018,9180) | set by creator |
| | >Gradient Output[3] | (0018,9182) | set by creator |
| | >Operation Mode Sequence[3] | (0018,9176) | set by creator |
| | >>Operating Mode Type | (0018,9177) | set by creator |
| | >>Operating Mode | (0018,9178) | set by creator |
| MR FOV/Geometry | MR FOV/Geometry Sequence | (0018,9125) | set by creator |
| | >In-plane Phase Encoding Direction | (0018,1312) | set by creator |
| | >MR Acquisition Frequency Encoding Steps | (0018,9058) | set by creator |
| | >MR Acquisition Phase Encoding Steps in-plane | (0018,9231) | set by creator |
| | >MR Acquisition Phase Encoding Steps out-of-plane | (0018,9232) | set by creator |
| | >Percent Sampling | (0018,0093) | set by creator |
| | >Percent Phase Field of View | (0018,0094) | set by creator |
| MR Echo | MR Echo Sequence | (0018,9114) | set by creator |
| | >Echo Number(s) | (0018,0086) | set by creator |
| | >Effective Echo Time | (0018,9082) | set by creator |
| MR Modifier | MR Modifier Sequence | (0018,9115) | set by creator |
| | >Inversion Recovery | (0018,9009) | set by creator |
| | >Inversion Times | (0018,9079) | set by creator |
| | >Flow Compensation | (0018,9010) | set by creator |
| | >Flow Compensation Direction | (0018,9183) | set by creator |
| | >Spoiling | (0018,9016) | set by creator |
| | >T2 Preparation | (0018,9021) | set by creator |
| | >Spectrally Selected Excitation | (0018,9026) | set by creator |
| | >Spatial Pre-saturation | (0018,9027) | set by creator |
| | >Partial Fourier | (0018,9081) | set by creator |
| | >Partial Fourier Direction | (0018,9036) | set by creator |
| | >Parallel Acquisition | (0018,9077) | set by creator |
| | >Parallel Acquisition Technique | (0018,9078) | set by creator |
| | >Parallel Reduction Factor In-plane | (0018,9069) | set by creator |
| | >Parallel Reduction Factor out-of-plane | (0018,9155) | set by creator |
| MR Imaging Modifier | MR Imaging Modifier Sequence | (0018,9006) | set by creator |
| | >Magnetization Transfer | (0018,9020) | set by creator |
| | >Blood Signal Nulling | (0018,9022) | set by creator |
| | >Tagging | (0018,9028) | set by creator |
| | >Tag Spacing First Dimension | (0018,9030) | set by creator |
| | >Tag Spacing Second Dimension | (0018,9218) | set by creator |
| | >Tag Angle First Axis | (0018,9019) | set by creator |

[3] Specific Absorption Rate Sequence, Gradient Output Type, Gradient Output, and Operating Mode Sequence are not set for GRASP reconstructed images due to technical reasons. The values can be found in the related preview images of the GRASP acquisition.

| Functional Group Macro | Attribute Name | Tag | Supported Values |
|---|---|---|---|
| | >Tag Angle Second Axis | (0018,9219) | set by creator |
| | >Tag Thickness | (0018,9035) | set by creator |
| | >Tagging Delay | (0018,9184) | set by creator |
| | >Transmitter Frequency | (0018,9098) | set by creator |
| | >Pixel Bandwidth | (0018,0095) | set by creator |
| MR Receive Coil | MR Receive Coil Sequence | (0018,9042) | set by creator |
| | >Receive Coil Name | (0018,1250) | set by creator |
| | >Receive Coil Manufacturer Name | (0018,9041) | set by creator |
| | >Receive Coil Type | (0018,9043) | set by creator |
| | >Quadrature Receive Coil | (0018,9044) | set by creator |
| | >Multi-Coil Definition Sequence | (0018,9045) | set by creator |
| | >>Multi-Coil Element Name | (0018,9047) | set by creator |
| | >>Multi-Coil Element Used | (0018,9048) | set by creator |
| MR Transmit Coil | MR Transmit Coil Sequence | (0018,9049) | set by creator |
| | >Transmit Coil Name | (0018,1251) | set by creator |
| | >Transmit Coil Manufacturer Name | (0018,9050) | set by creator |
| | >Transmit Coil Type | (0018,9051) | set by creator |
| MR Diffusion | MR Diffusion Sequence | (0018,9117) | set by creator |
| | >Diffusion b-value | (0018,9087) | set by creator |
| | >Diffusion Directionality | (0018,9075) | set by creator |
| | >Diffusion Gradient Direction Sequence | (0018,9076) | set by creator |
| | >>Diffusion Gradient Orientation | (0018,9089) | set by creator |
| | >Diffusion b-matrix Sequence | (0018,9601) | set by creator |
| | >>Diffusion b-value XX | (0018,9602) | set by creator |
| | >>Diffusion b-value XY | (0018,9603) | set by creator |
| | >>Diffusion b-value XZ | (0018,9604) | set by creator |
| | >>Diffusion b-value YY | (0018,9605) | set by creator |
| | >>Diffusion b-value YZ | (0018,9606) | set by creator |
| | >>Diffusion b-value ZZ | (0018,9607) | set by creator |
| MR Averages | MR Averages Sequence | (0018,9119) | set by creator |
| | >Number of Averages | (0018,0083) | set by creator |
| MR Velocity Encoding | MR Velocity Encoding Sequence | (0018,9197) | set by creator |
| | >Velocity Encoding Direction | (0018,9090) | set by creator |
| | >Velocity Encoding Minimum Value | (0018,9091) | set by creator |
| | >Velocity Encoding Maximum Value | (0018,9217) | set by creator |
| MR Arterial Spin Labeling | MR Arterial Spin Labeling Sequence | (0018,9251) | set by creator |
| | >ASL Technique Description | (0018,9252) | set by creator |
| | >ASL Context | (0018,9257) | set by creator |
| | >ASL Slab Sequence | (0018,9260) | set by creator |
| | >>ASL Slab Number | (0018,9253) | set by creator |
| | >>ASL Slab Thickness | (0018,9254) | set by creator |
| | >>ASL Slab Orientation | (0018,9255) | set by creator |
| | >>ASL Mid Slab Position | (0018,9256) | set by creator |
| | >>ASL Pulse Train Duration | (0018,9258) | set by creator |
| | >ASL Crusher Flag | (0018,9259) | set by creator |
| | >ASL Crusher Flow Limit | (0018,925A) | set by creator |
| | >ASL Crusher Description | (0018,925B) | set by creator |
| | >ASLBolus Cut-off Flag | (0018,925C) | set by creator |
| | >ASLBolus Cut-off Timing Sequence | (0018,925D) | set by creator |

| Functional Group Macro | Attribute Name | Tag | Supported Values |
|---|---|---|---|
| | >>ASL Bolus Cut-off Delay Time | (0018,925F) | set by creator |
| | >>ASL Bolus Cut-off Technique | (0018,925E) | set by creator |
| SIEMENS MR Shared | *include Table 91: Attributes of SIEMENS MR* | | |
| SIEMENS MR Frame | *include Table 93: Attributes of SIEMENS MR* | | |

#### 9.1.1.1.14 Cardiac Synchronization Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Cardiac Synchronization Technique | (0018,9037) | set by creator |
| Cardiac Signal Source | (0018,9085) | set by creator |
| Cardiac RR Interval Specified | (0018,9070) | set by creator |
| Low R-R Value | (0018,1081) | set by creator |
| High R-R Value | (0018,1082) | set by creator |
| Intervals Acquired | (0018,1083) | set by creator |
| Intervals Rejected | (0018,1084) | set by creator |

#### 9.1.1.1.15 Respiratory Synchronization Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Respiratory Motion Compensation Technique | (0018,9170) | set by creator |

#### 9.1.1.1.16 Bulk Motion Synchronization Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Bulk Motion Compensation Technique | (0018,9172) | set by creator |
| Bulk Motion Signal Source | (0018,9173) | set by creator |

#### 9.1.1.1.17 Supplemental Palette Color Lookup Table Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Red Palette Color Lookup Table Descriptor | (0028,1101) | set by creator |
| Green Palette Color Lookup Table Descriptor | (0028,1102) | set by creator |
| Blue Palette Color Lookup Table Descriptor | (0028,1103) | set by creator |
| Red Palette Color Lookup Table Data | (0028,1201) | set by creator |

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Green Palette Color Lookup Table Data | (0028,1202) | set by creator |
| Blue Palette Color Lookup Table Data | (0028,1203) | set by creator |

#### 9.1.1.1.18 **Acquisition Context Module**

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Acquisition Context Sequence | (0040,0555) | TID 99_3100 |

##### *9.1.1.1.18.1 MR Acquisition Context TID 99_3100*

The MR Acquisition Context TID 99_3100 is used in the Acquisition Context Sequence (0040,0555) of Enhanced MR Images.

Type: Extensible

| VT | Concept Name | VM | Req Type | Value Set Constraint |
|---|---|---|---|---|
| CODE | EV (A-52, 99SMS_CTMR, “MR Technique") | 1 | M | DCID(A-200) |

##### *9.1.1.1.18.2 MR Technique Context Group A-200*

Type: Extensible

| Coding Scheme Designator (0008,0102) | Coding Scheme Version (0008,0103) | Code Value (0008,0100) | Code Meaning (0008,0104) |
|---|---|---|---|
| 99SMS_CTMR | 1.0 | A-200 | GRASP |
| 99SMS_CTMR | 1.0 | A-202 | FastView |
| 99SMS_CTMR | 1.0 | A-204 | Angio |
| 99SMS_CTMR | 1.0 | A-206 | BOLD |
| 99SMS_CTMR | 1.0 | A-208 | Diffusion |
| 99SMS_CTMR | 1.0 | A-210 | DTI |
| 99SMS_CTMR | 1.0 | A-212 | Perfusion |
| 99SMS_CTMR | 1.0 | A-214 | TWIST |

#### 9.1.1.1.19 **Enhanced MR Image Module**

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Acquisition Number | (0020,0012) | set by creator |

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Acquisition Date Time | (0008,002A) | set by creator |
| Acquisition Duration | (0018,9073) | set by creator |
| Content Qualification | (0018,9004) | set by creator |
| Resonant Nucleus | (0018,9100) | set by creator |
| k-space Filtering | (0018,9064) | set by creator |
| Magnetic Field Strength | (0018,0087) | set by creator |
| Applicable Safety Standard Agency | (0018,9174) | set by creator |
| Image Comments | (0020,4000) | set by creator |
| Image Type | (0008,0008) | set by creator |
| Pixel Presentation | (0008,9205) | set by creator |
| Volumetric Properties | (0008,9206) | set by creator |
| Volume Based Calculation Technique | (0008,9207) | set by creator |
| Complex Image Component | (0008,9208) | set by creator |
| Acquisition Contrast | (0008,9209) | set by creator |
| Samples per Pixel | (0028,0002) | 1 |
| Photometric Interpretation | (0028,0004) | MONOCHROME2 |
| Bits Allocated | (0028,0100) | 16 |
| Bits Stored | (0028,0101) | 12 or 16 |
| High Bit | (0028,0102) | 11 or 15 |
| Pixel Representation | (0028,0103) | 0 |
| Burned In Annotation | (0028,0301) | NO |
| Lossy Image Compression | (0028,2110) | 00 |
| Presentation LUT Shape | (2050.0020) | IDENTITY |

#### 9.1.1.1.20 **MR Pulse Sequence Module**

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Pulse Sequence Name | (0018,9005) | set by creator |
| MR Acquisition Type | (0018,0023) | set by creator |
| Echo Pulse Sequence | (0018,9008) | set by creator |
| Multiple Spin Echo | (0018,9011) | set by creator |
| Multi-planar Excitation | (0018,9012) | set by creator |
| Phase Contrast | (0018,9014) | set by creator |
| Velocity Encoding Acquisition Sequence | (0018,9092) | set by creator |
| > Velocity Encoding Direction | (0018,9090) | set by creator |
| Time of Flight Contrast | (0018,9015) | set by creator |
| Arterial Spin Labeling Contrast | (0018,9250) | set by creator |
| Steady State Pulse Sequence | (0018,9017) | set by creator |
| Echo Planar Pulse Sequence | (0018,9018) | set by creator |

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Saturation Recovery | (0018,9024) | set by creator |
| Spectral Selected Suppression | (0018,9025) | set by creator |
| Oversampling Phase | (0018,9029) | set by creator |
| Geometry of k-Space Traversal | (0018,9032) | set by creator |
| Rectilinear Phase Encode Reordering | (0018,9034) | set by creator |
| Segmented k-Space Traversal | (0018,9033) | set by creator |
| Coverage of k-Space | (0018,9094) | set by creator |
| Number of k-Space Trajectories | (0018,9093) | set by creator |

#### 9.1.1.1.21 ICC Profile Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| ICC Profile | (0028,2000) | set by creator |
| Color Space | (0028,2002) | SRGB |

#### 9.1.1.1.22 SOP Common Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| SOP Class UID | (0008,0016) | SOP specific UID |
| SOP Instance UID | (0008,0018) | set by creator |
| Specific Character Set | (0008,0005) | set by creator |
| Instance Creation Date | (0008,0012) | date the SOP instance was created |
| Instance Creation Time | (0008,0013) | time the SOP instance was created |

#### 9.1.1.1.23 Common Instance Reference Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Referenced Series Sequence | (0008,1115) | set by creator |
| >Series Instance UID | (0020,000E) | set by creator |
| > Referenced Instance Sequence | (0008,114A) | set by creator |
| >>Referenced SOP Class UID | (0008,1150) | set by creator |
| >> Referenced SOP Instance UID | (0008,1155) | set by creator |

#### 9.1.1.2 Enhanced MR Color Image IOD

The Enhanced MR Color Image IOD supports the same DICOM attributes as the Enhanced MR Image IOD except for the Photometric Interpretation which is RGB. Also, Supplemental Palette Color Lookup Table module, Pixel Value Transformation Macro, Frame VOI LUT Macro, and Real World Value Mapping Macro are not part of this IOD.

| IE | Module | Reference | Usage |
|---|---|---|---|
| Patient | Patient | see chapter 9.1.1.1.1 | always |
| Study | General Study | see chapter 9.1.1.1.2 | always |
| | Patient Study | see chapter 9.1.1.1.3 | always |
| Series | General Series | see chapter 9.1.1.1.4 | always |
| | MR Series | see chapter 9.1.1.1.5 | always |
| Frame of Reference | Frame of Reference | see chapter 9.1.1.1.6 | always |
| Equipment | General Equipment | see chapter 9.1.1.1.7 | always |
| | Enhanced General Equipment | see chapter 9.1.1.1.8 | always |
| Image | Image Pixel | see chapter 9.1.1.2.1 | always |
| | Enhanced Contrast/Bolus | see chapter 9.1.1.1.10 | always |
| | Multi-frame Functional Groups | see chapter 9.1.1.1.11 | always |
| | Multi-frame Dimension | see chapter 9.1.1.1.12 | always |
| | Cardiac Synchronization | see chapter 9.1.1.1.14 | in case of cardiac triggering |
| | Respiratory Synchronization | see chapter 9.1.1.1.15 | in case of respiratory triggering |
| | Bulk Motion Synchronization | see chapter 9.1.1.1.16 | in case of bulk motion triggering |
| | Acquisition Context | see chapter 9.1.1.1.18 | always |
| | Enhanced MR Image | see chapter 9.1.1.2.2 | always |
| | MR Pulse Sequence | see chapter 9.1.1.1.20 | always |
| | ICC Profile | see chapter 9.1.1.1.21 | always |
| | SOP Common | see chapter 9.1.1.1.22 | always (with SOP Class UID for Enhanced MR Color Image) |
| | Common Instance Reference | see chapter 9.1.1.1.23 | always |
| | SIEMENS MR Common | see chapter 9.2.1.7 | always |

##### 9.1.1.2.1 Image Pixel Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Samples per Pixel | (0028,0002) | 3 |
| Photometric Interpretation | (0028,0004) | RGB |

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Rows | (0028,0010) | set by creator |
| Columns | (0028,0011) | set by creator |
| Bits Allocated | (0028,0100) | 8 |
| Bits Stored | (0028,0101) | 8 |
| High Bit | (0028,0102) | 7 |
| Pixel Representation | (0028,0103) | 0 |
| Planar Configuration | (0028,0006) | 0 |
| Pixel Data | (7FE0,0010) | set by creator |

#### 9.1.1.2.2 Enhanced MR Image Module (for Enhanced MR Color Image)

See chapter 9.1.1.1.19, different attribute values for Enhanced MR Color Images are listed below.

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Samples per Pixel | (0028,0002) | 3 |
| Photometric Interpretation | (0028,0004) | RGB |
| Bits Allocated | (0028,0100) | 8 |
| Bits Stored | (0028,0101) | 8 |
| High Bit | (0028,0102) | 7 |
| Pixel Presentation | (0008,9205) | TRUE_COLOR |
| Presentation LUT Shape | (2050,0020) | not available |

### 9.1.1.3 MR Spectroscopy IOD

This chapter describes the DICOM attributes of MR Spectroscopy Instances performed by the MR acquisition.

| IE | Module | Reference | Usage |
|---|---|---|---|
| Patient | Patient | see chapter 9.1.1.1.1 | always |
| Study | General Study | see chapter 9.1.1.1.2 | always |
| | Patient Study | see chapter 9.1.1.1.3 | always |
| Series | General Series | see chapter 9.1.1.1.4 | always |
| | MR Series | see chapter 9.1.1.1.5 | always |
| Frame of Reference | Frame of Reference | see chapter 9.1.1.1.6 | always |
| Equipment | General Equipment | see chapter 9.1.1.1.7 | always |
| | Enhanced General Equipment | see chapter 9.1.1.1.8 | always |
| MR Spectroscopy | Enhanced Contrast/Bolus | see chapter 9.1.1.1.10 | always |
| | Multi-frame Functional Groups | see chapter 9.1.1.1.11 | always |

| IE | Module | Reference | Usage |
|---|---|---|---|
| | Multi-frame Dimension | see chapter 9.1.1.1.12 | always |
| | Cardiac Synchronization | see chapter 9.1.1.1.14 | in case of cardiac triggering |
| | Respiratory Synchronization | see chapter 9.1.1.1.15 | in case of respiratory triggering |
| | Bulk Motion Synchronization | see chapter 9.1.1.1.16 | in case of bulk motion triggering |
| | Acquisition Context | see chapter 9.1.1.1.18 | always |
| | MR Spectroscopy | see chapter 9.1.1.3.2 | always |
| | MR Spectroscopy Pulse Sequence | see chapter 9.1.1.3.3 | always |
| | MR Spectroscopy Data | see chapter 9.1.1.3.4 | always |
| | SOP Common | see chapter 9.1.1.1.22 | always (with SOP Class UID for MR Spectroscopy) |
| | Common Instance Reference | see chapter 9.1.1.1.23 | always |
| | SIEMENS MR Common | see chapter 9.2.1.7 | always |

#### 9.1.1.3.1 MR Spectroscopy Functional Groups

| Functional Group Macro | Attribute Name | Tag | Supported Values |
|---|---|---|---|
| Pixel Measures | Pixel Measures Sequence | (0028,9110) | set by creator |
| | >Pixel Spacing | (0018,0030) | set by creator |
| | >Slice Thickness | (0028,0050) | set by creator |
| Frame Content | Frame Content Sequence | (0020,9111) | set by creator |
| | >Frame Acquisition Number | (0020,9156) | set by creator |
| | >Frame Reference Date Time | (0018,9151) | set by creator |
| | >Frame Acquisition Date Time | (0018,9074) | set by creator |
| | >Frame Acquisition Duration | (0018,9220) | set by creator |
| | >Dimension Index Values | (0020,9157) | set by creator |
| | >Temporal Position Index | (0020,9128) | set by creator |
| | >Stack ID | (0020,9056) | set by creator |
| | >In-Stack Position Number | (0020,9057) | set by creator |
| | >Frame Comments | (0020,9158) | set by creator |
| Plane Position | Plane Position Sequence | (0020,9113) | set by creator |
| | >Image Position (Patient) | (0020,0032) | set by creator |
| Plane Orientation | Plane Orientation Sequence | (0020,9116) | set by creator |
| | >Image Orientation (Patient) | (0020,0037) | set by creator |

| Functional Group Macro | Attribute Name | Tag | Supported Values |
|---|---|---|---|
| Referenced Image | Referenced Image Sequence | (0008,1140) | set by creator |
| | >Referenced SOP Class UID | (0008,1150) | set by creator |
| | >Referenced SOP Instance UID | (0008,1155) | set by creator |
| | >Referenced Frame Number | (0008,1160) | set by creator |
| | >Purpose of Referenced Code Sequence | (0040,A170) | set by creator |
| | >>Code Value | (0008,0100) | set by creator |
| | >>Coding Scheme Designator | (0008,0102) | set by creator |
| | >>Code Meaning | (0008,0104) | set by creator |
| Derivation Image | Derivation Image Sequence | (0008,9124) | set by creator |
| | >Derivation Code Sequence | (0008,9215) | set by creator |
| | >>Code Value | (0008,0100) | set by creator |
| | >>Coding Scheme Designator | (0008,0102) | set by creator |
| | >>Code Meaning | (0008,0104) | set by creator |
| | >Source Image Sequence | (0008,2112) | set by creator |
| | >>Referenced SOP Class UID | (0008,1150) | set by creator |
| | >>Referenced SOP Instance UID | (0008,1155) | set by creator |
| | >>Referenced Frame Number | (0008,1160) | set by creator |
| | >>Purpose of Referenced Code Sequence | (0040,A170) | set by creator |
| | >>>Code Value | (0008,0100) | set by creator |
| | >>>Coding Scheme Designator | (0008,0102) | set by creator |
| | >>>Code Meaning | (0008,0104) | set by creator |
| Frame Anatomy | Frame Anatomy Sequence | (0020,9071) | set by creator |
| | >Frame Laterality | (0020,9072) | set by creator |
| | >Anatomic Region Sequence | (0008,2218) | set by creator |
| | >>Code Value | (0008,0100) | set by creator |
| | >>Coding Scheme Designator | (0008,0102) | set by creator |
| | >>Code Meaning | (0008,0104) | set by creator |
| Contrast/Bolus Usage | Contrast/Bolus Usage Sequence | (0018,9341) | set by creator |
| | >Contrast/Bolus Agent Number | (0018,9337) | 1 |
| | >Contrast/Bolus Agent Administered | (0018,9342) | set by creator |
| | >Contrast/Bolus Agent Detected | (0018,9343) | set by creator |
| | >Contrast/Bolus Agent Phase | (0018,9344) | set by creator |
| MR Spectroscopy Frame Type | MR Spectroscopy Frame Type Sequence | (0018,9227) | set by creator |
| | >Frame Type | (0008,9007) | set by creator |

| Functional Group Macro | Attribute Name | Tag | Supported Values |
|---|---|---|---|
| | >Volumetric Properties | (0008,9206) | set by creator |
| | >Volume Based Calculation Technique | (0008,9207) | set by creator |
| | >Complex Image Component | (0008,9208) | set by creator |
| | >Acquisition Contrast | (0008,9209) | set by creator |
| MR Timing and Related Parameters | MR Timing and Related Parameters Sequence | (0018,9112) | set by creator |
| | >Repetition Time | (0018,0080) | set by creator |
| | >Flip Angle | (0018,1314) | set by creator |
| | >Echo Train Length | (0018,0091) | set by creator |
| | >RF Echo Train Length | (0018,9240) | set by creator |
| | >Gradient Echo Train Length | (0018,9241) | set by creator |
| | >Specific Absorption Rate Sequence | (0018,9239) | set by creator |
| | >>Specific Absorption Rate Definition | (0018,9179) | set by creator |
| | >>Specific Absorption Rate Value | (0018,9181) | set by creator |
| | >Gradient Output Type | (0018,9180) | set by creator |
| | >Gradient Output | (0018,9182) | set by creator |
| | >Operation Mode Sequence | (0018,9176) | set by creator |
| | >>Operating Mode Type | (0018,9177) | set by creator |
| | >>Operating Mode | (0018,9178) | set by creator |
| MR Spectroscopy FOV/Geometry | MR Spectroscopy FOV/Geometry Sequence | (0018,9103) | set by creator |
| | >Spectroscopy Acquisition Data Columns | (0018,9127) | set by creator |
| | >Spectroscopy Acquisition Phase Rows | (0018,9095) | set by creator |
| | >Spectroscopy Acquisition Phase Columns | (0018,9234) | set by creator |
| | >Spectroscopy Acquisition Out-of-Plane Phase Steps | (0018,9159) | set by creator |
| | >Percent Sampling | (0018,0093) | set by creator |
| | >Percent Phase Field of View | (0018,0094) | set by creator |
| MR Echo | MR Echo Sequence | (0018,9114) | set by creator |
| | >Effective Echo Time | (0018,9082) | set by creator |
| MR Modifier | MR Modifier Sequence | (0018,9115) | set by creator |
| | >Inversion Recovery | (0018,9009) | set by creator |
| | >Inversion Times | (0018,9079) | set by creator |
| | >Flow Compensation | (0018,9010) | set by creator |
| | >Flow Compensation Direction | (0018,9183) | set by creator |
| | >Spoiling | (0018,9016) | set by creator |
| | >T2 Preparation | (0018,9021) | set by creator |

| Functional Group Macro | Attribute Name | Tag | Supported Values |
|---|---|---|---|
| | >Spectrally Selected Excitation | (0018,9026) | set by creator |
| | >Spatial Pre-saturation | (0018,9027) | set by creator |
| | >Partial Fourier | (0018,9081) | set by creator |
| | >Partial Fourier Direction | (0018,9036) | set by creator |
| | >Parallel Acquisition | (0018,9077) | set by creator |
| | >Parallel Acquisition Technique | (0018,9078) | set by creator |
| | >Parallel Reduction Factor In-plane | (0018,9069) | set by creator |
| | >Parallel Reduction Factor out-of-plane | (0018,9155) | set by creator |
| MR Receive Coil | MR Receive Coil Sequence | (0018,9042) | set by creator |
| | >Receive Coil Name | (0018,1250) | set by creator |
| | >Receive Coil Manufacturer Name | (0018,9041) | set by creator |
| | >Receive Coil Type | (0018,9043) | set by creator |
| | >Quadrature Receive Coil | (0018,9044) | set by creator |
| | >Multi-Coil Definition Sequence | (0018,9045) | set by creator |
| | >>Multi-Coil Element Name | (0018,9047) | set by creator |
| | >>Multi-Coil Element Used | (0018,9048) | set by creator |
| MR Transmit Coil | MR Transmit Coil Sequence | (0018,9049) | set by creator |
| | >Transmit Coil Name | (0018,1251) | set by creator |
| | >Transmit Coil Manufacturer Name | (0018,9050) | set by creator |
| | >Transmit Coil Type | (0018,9051) | set by creator |
| MR Averages | MR Averages Sequence | (0018,9119) | set by creator |
| | >Number of Averages | (0018,0083) | set by creator |
| SIEMENS MR Shared | *include Table 91: Attributes of SIEMENS MR Shared Macro* | | |
| SIEMENS MR Frame | *include Table 93: Attributes of SIEMENS MR Frame Macro* | | |

#### 9.1.1.3.2 MR Spectroscopy Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Acquisition Number | (0020,0012) | set by creator |
| Acquisition Date Time | (0018,002A) | set by creator |
| Acquisition Duration | (0018,9073) | set by creator |
| Referenced Raw Data Sequence | (0008,9121) | set by creator |
| Content Qualification | (0018,9004) | set by creator |
| Resonant Nucleus | (0018,9100) | set by creator |

| Attribute Name | Tag | Supported Values |
|---|---|---|
| k-space Filtering | (0018,9064) | set by creator |
| Magnetic Field Strength | (0018,0087) | set by creator |
| Applicable Safety Standard Agency | (0018,9174) | set by creator |
| Image Comments | (0020,4000) | set by creator |
| Image Type | (0008,0008) | set by creator |
| Volumetric Properties | (0008,9206) | set by creator |
| Volume Based Calculation Technique | (0008,9207) | set by creator |
| Complex Image Component | (0008,9208) | set by creator |
| Acquisition Contrast | (0008,9209) | set by creator |
| Transmitter Frequency | (0018,9098) | set by creator |
| Spectral Width | (0018,9052) | set by creator |
| Chemical Shift Reference | (0018,9053) | set by creator |
| Volume Localisation Technique | (0018,9054) | set by creator |
| Volume Localization Sequence | (0018,9126) | set by creator |
| >Slab Thickness | (0018,9104) | set by creator |
| >Slab Orientation | (0018,9105) | set by creator |
| >Mid SlabPosition | (0018,9106) | set by creator |
| De-coupling | (0018,9059) | set by creator |
| De-coupling Nucleus | (0018,9060) | set by creator |
| De-coupling Frequency | (0018,9061) | set by creator |
| De-coupling Method | (0018,9062) | set by creator |
| De-coupling Chemical Shift Reference | (0018,9063) | set by creator |
| Time Domain Filtering | (0018,9065) | set by creator |
| Number Of Zero Fills | (0018,9066) | set by creator |
| Baseline Correction | (0018,9067) | set by creator |
| Frequency Correction | (0018,9101) | set by creator |
| First Order Phase Correction | (0018,9198) | set by creator |
| Water Referenced Phase Correction | (0018,9199) | set by creator |
| Water Reference Acquisition | (0018,9297) | set by creator |
| Referenced Instance Sequence | (0008,114A) | set by creator |
| >Purpose of Reference Code Sequence | (0040,A170) | set by creator |

#### 9.1.1.3.3 MR Spectroscopy Pulse Sequence Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Pulse Sequence Name | (0018,9005) | set by creator |
| MR Spectroscopy Acquisition Type | (0018,9200) | set by creator |
| Echo Pulse Sequence | (0018,9008) | set by creator |

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Multi Spin Echo | (0018,9011) | set by creator |
| Multi-planar Excitation | (0018,9012) | set by creator |
| Steady State Pulse Sequence | (0018,9017) | set by creator |
| Echo Planar Pulse Sequence | (0018,9018) | set by creator |
| Spectrally Selected Suppression | (0018,9025) | set by creator |
| Geometry of k-Space Traversal | (0018,9032) | set by creator |
| Rectilinear Phase Encode Reordering | (0018,9034) | set by creator |
| Segmented k-Space Traversal | (0018,9033) | set by creator |
| Coverage of k-Space | (0018,9094) | set by creator |
| Number of k-Space Trajectories | (0018,9093) | set by creator |
| Echo Peak Position | (0018,9298) | set by creator |

##### 9.1.1.3.4 MR Spectroscopy Data Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Rows | (0028,0010) | set by creator |
| Columns | (0028,0011) | set by creator |
| Data Point Rows | (0028,9001) | set by creator |
| Data Point Columns | (0028,9002) | set by creator |
| Data Representation | (0028,9108) | set by creator |
| Signal Domain Columns | (0028,9003) | set by creator |
| Signal Domains Rows | (0028,9235) | set by creator |
| First Order Phase Correction Angle | (5600,0010) | set by creator |
| Spectroscopy Data | (5600,0020) | set by creator |

#### 9.1.1.4 MR Image

This chapter describes the DICOM attributes of MR Image instances created in interoperability mode. The following table lists the modules created by *syngo*® MR XA80A.

| IE | Module | Reference | Usage |
|---|---|---|---|
| Patient | Patient | see chapter 9.1.1.1.1 | always |
| Study | General Study | see chapter 9.1.1.1.2 | always |
| | Patient Study | see chapter 9.1.1.1.3 | always |
| Series | General Series | see chapter 9.1.1.1.4 | always |
| Frame of Reference | Frame of Reference | see chapter 9.1.1.1.6 | always |
| Equipment | General Equipment | see chapter 9.1.1.1.7 | always |

| IE | Module | Reference | Usage |
|---|---|---|---|
| Image | General Image | see chapter 9.1.1.4.1 | always |
| | General Reference | see chapter 9.1.1.4.2 | always |
| | Image Plane | see chapter 9.1.1.4.3 | always |
| | Image Pixel | see chapter 9.1.1.1.9 | always |
| | Contrast/Bolus | see chapter 9.1.1.4.4 | always |
| | MR Image | see chapter 9.1.1.4.5 | always |
| | Overlay Plane | see chapter 9.1.1.4.6 | always |
| | VOI LUT | see chapter 9.1.1.4.7 | always |
| | SOP Common | see chapter 9.1.1.1.22 | always (with SOP Class UID for MR Image) |
| | Common Instance Reference | see chapter 9.1.1.1.23 | always |
| | SIEMENS MR Series | see chapter 9.2.1.2 | always |
| | SIEMENS MR Image/Frame | see chapter 9.2.1.5 | always |
| | SIEMENS MR Common | see chapter 9.2.1.7 | always |
| | SIEMENS MR HEADER | see chapter 9.2.1.8 | always |

#### 9.1.1.4.1 General Image Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Instance Number | (0020,0013) | set by creator |
| Patient Orientation | (0020,0020) | set by creator |
| Content Date | (0008,0023) | set by creator |
| Content Time | (0008,0033) | set by creator |
| Image Type | (0008,0008) | set by creator |
| Acquisition Number | (0020,0012) | set by creator |
| Acquisition Date | (0008,0022) | set by creator |
| Acquisition Time | (0008,0032) | set by creator |
| Acquisition DateTime | (0008,002A) | set by creator |
| Image Comments | (0020,4000) | set by creator |
| Presentation LUT Shape | (2050,0020) | set by creator |

#### 9.1.1.4.2 General Reference Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Referenced Image Sequence | (0008,1140) | set by creator |
| >Referenced SOP Class UID | (0008,1150) | set by creator |

| Attribute Name | Tag | Supported Values |
|---|---|---|
| >Referenced SOP Instance UID | (0008,1155) | set by creator |
| >Referenced Frame Number | (0008,1160) | If referenced SOP Instance is a multi-frame image |

#### 9.1.1.4.3 **Image Plane Module**

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Pixel Spacing | (0028,0030) | set by creator |
| Image Orientation (Patient) | (0020,0037) | set by creator |
| Image Position (Patient) | (0020,0032) | set by creator |
| Slice Thickness | (0018,0050) | set by creator |
| Slice Location | (0020,1041) | set by creator |

#### 9.1.1.4.4 **Contrast/Bolus Module**

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Contrast/Bolus Agent | (0018,0010) | set by creator |
| Contrast/Bolus Agent Sequence | (0018,0012) | set by creator |
| >Code Value | (0008,0100) | set by creator |
| >Coding Scheme Designator | (0008,0102) | set by creator |
| >Coding Scheme Version | (0008,0103) | set by creator |
| >Code Meaning | (0008,0104) | set by creator |
| Contrast/Bolus Route | (0018,1040) | set by creator |
| Contrast/Bolus Administration Route Sequence | (0018,0014) | set by creator |
| >Code Value | (0008,0100) | set by creator |
| >Coding Scheme Designator | (0008,0102) | set by creator |
| >Coding Scheme Version | (0008,0103) | set by creator |
| >Code Meaning | (0008,0104) | set by creator |
| Contrast/Bolus Volume | (0018,1041) | set by creator |
| Contrast/Bolus Start Time | (0018,1042) | set by creator |
| Contrast/Bolus Stop Time | (0018,1043) | set by creator |
| Contrast/Bolus Total Dose | (0018,1044) | set by creator |
| Contrast Flow Rate | (0018,1046) | set by creator |
| Contrast Flow Duration | (0018,1047) | set by creator |
| Contrast/Bolus Ingredient | (0018,1048) | set by creator |
| Contrast/Bolus Ingredient Concentration | (0018,1049) | set by creator |

#### 9.1.1.4.5 MR Image Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Image Type | (0008,0008) | set by creator |
| Samples per Pixel | (0028,0002) | set by creator |
| Photometric Interpretation | (0028,0004) | set by creator |
| Bits Allocated | (0028,0100) | set by creator |
| Bits Stored | (0028,0101) | set by creator |
| High Bit | (0028,0102) | set by creator |
| Scanning Sequence | (0018,0020) | set by creator |
| Sequence Variant | (0018,0021) | set by creator |
| Scan Options | (0018,0022) | set by creator |
| MR Acquisition Type | (0018,0023) | set by creator |
| Repetition Time | (0018,0080) | set by creator |
| Echo Time | (0018,0081) | set by creator |
| Echo Train Length | (0018,0091) | set by creator |
| Inversion Time | (0018,0082) | set by creator |
| Trigger Time | (0018,1060) | set by creator |
| Sequence Name | (0018,0024) | set by creator |
| Angio Flag | (0018,0025) | set by creator |
| Number of Averages | (0018,0083) | set by creator |
| Imaging Frequency | (0018,0084) | set by creator |
| Imaged Nucleus | (0018,0085) | set by creator |
| Echo Number(s) | (0018,0086) | set by creator |
| Magnetic Field Strength | (0018,0087) | set by creator |
| Spacing Between Slices | (0018,0088) | set by creator |
| Number of Phase Encoding Steps | (0018,0089) | set by creator |
| Percent Sampling | (0018,0093) | set by creator |
| Percent Phase Field of View | (0018,0094) | set by creator |
| Pixel Bandwidth | (0018,0095) | set by creator |
| Nominal Interval | (0018,1062) | set by creator |
| Beat Rejection Flag | (0018,1080) | set by creator |
| Low R-R Value | (0018,1081) | set by creator |
| High R-R Value | (0018,1082) | set by creator |
| Intervals Acquired | (0018,1083) | set by creator |
| Intervals Rejected | (0018,1084) | set by creator |
| PVC Rejection | (0018,1085) | set by creator |
| Skip Beats | (0018,1086) | set by creator |
| Heart Rate | (0018,1088) | set by creator |
| Cardiac Number of Images | (0018,1090) | set by creator |

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Trigger Window | (0018,1094) | set by creator |
| Reconstruction Diameter | (0018,1100) | set by creator |
| Receive Coil Name | (0018,1250) | set by creator |
| Transmit Coil Name | (0018,1251) | set by creator |
| Acquisition Matrix | (0018,1310) | set by creator |
| In-plane Phase Encoding Direction | (0018,1312) | set by creator |
| Flip Angle | (0018,1314) | set by creator |
| SAR | (0018,1316) | set by creator |
| Variable Flip Angle Flag | (0018,1315) | set by creator |
| dB/dt | (0018,1318) | set by creator |
| Temporal Position Identifier | (0020,0100) | set by creator |
| Number of Temporal Positions | (0020,0105) | set by creator |
| Temporal Resolution | (0020,0110) | set by creator |
| B1rms | (0018,1320) | set by creator |

#### 9.1.1.4.6 **Overlay Plane Module**

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Overlay Rows | (60xx,0010) | set by creator |
| Overlay Columns | (60xx,0011) | set by creator |
| Overlay Type | (60xx,0040) | set by creator |
| Overlay Origin | (60xx,0050) | set by creator |
| Overlay Bits Allocated | (60xx,0100) | set by creator |
| Overlay Bit Position | (60xx,0102) | set by creator |
| Overlay Data | (60xx,3000) | set by creator |
| Overlay Description | (60xx,0022) | set by creator |
| Overlay Subtype | (60xx,0045) | set by creator |
| Overlay Label | (60xx,1500) | set by creator |
| ROI Area | (60xx,1301) | set by creator |
| ROI Mean | (60xx,1302) | set by creator |
| ROI Standard Deviation | (60xx,1303) | set by creator |

#### 9.1.1.4.7 **VOI LUT Module**

| Attribute Name | Tag | Supported Values |
|---|---|---|
| VOI LUT Sequence | (0028,3010) | set by creator |
| >LUT Descriptor | (0028,3002) | set by creator |

| Attribute Name | Tag | Supported Values |
|---|---|---|
| >LUT Explanation | (0028,3003) | set by creator |
| >LUT Data | (0028,3006) | set by creator |
| Window Center | (0028,1050) | set by creator |
| Window Width | (0028,1051) | set by creator |
| Window Center and Width Explanation | (0028,1055) | set by creator |
| VOI LUT Function | (0028,1056) | set by creator |

#### 9.1.1.5 Raw Data

Neuro Diffusion Tensor Imaging data are encoded in the Raw Data SOP Class.

| IE | Module | Reference | Usage |
|---|---|---|---|
| Patient | Patient | see chapter 9.1.1.1.1 | always |
| Study | General Study | see chapter 9.1.1.1.2 | always |
| | Patient Study | see chapter 9.1.1.1.3 | always |
| Series | General Series | see chapter 9.1.1.1.4 | always |
| Frame of Reference | Frame of Reference | see chapter 9.1.1.1.6 | always |
| Equipment | General Equipment | see chapter 9.1.1.1.7 | always |
| Image | Acquisition Context | see chapter 9.1.1.1.18 | always |
| | Raw Data | see chapter 9.1.1.5.1 | always |
| | SIEMENS MR Raw Data | see chapter 9.2.1.9 | always |
| | SOP Common | see chapter 9.1.1.1.22 | always (with SOP Class UID for Raw Data) |
| | SIEMENS MR Series | see chapter 9.2.1.2 | always |
| | SIEMENS MR Image/Frame | see chapter 9.2.1.5 | always |
| | SIEMENS MR Common | see chapter 9.2.1.7 | always |

##### 9.1.1.5.1 Raw Data Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Instance Number | (0020,0013) | set by creator |
| Content Date | (0008,0023) | set by creator |
| Content Time | (0008,0033) | set by creator |
| Image Type | (0008,0008) | set by creator |
| Acquisition DateTime | (0008,002A) | set by creator |
| Creator_Version UID | (0008,9123) | set by creator |

#### 9.1.1.6 Multi-frame Grayscale Word Secondary Capture Image

For some use cases Multi-frame Grayscale Word SC Image instances are created for documentation and reporting purposes. The following table lists the modules created by *syngo*® MR XA80A.

| IE | Module | Reference | Presence of Module |
|---|---|---|---|
| Patient | Patient | see chapter 9.1.1.1.1 | always |
| Study | General Study | see chapter 9.1.1.1.2 | always |
| | Patient Study | see chapter 9.1.1.1.3 | always |
| Series | General Series | see chapter 9.1.1.1.4 | always |
| Frame of Reference | Frame of Reference | see chapter 9.1.1.1.6 | always |
| Equipment | General Equipment | see chapter 9.1.1.1.7 | always |
| | SC Equipment | see chapter 9.1.1.6.1 | always |
| Image | General Image | see chapter 9.1.1.4.1 | always |
| | Image Pixel | see chapter 9.1.1.1.9 | always |
| | Cine | n. a. | not used |
| | Multi-frame | see chapter 9.1.1.6.2 | always |
| | Frame Pointers | see chapter 9.1.1.6.3 | always |
| | Multi-frame Functional Groups | see chapter 9.1.1.6.4 | always |
| | SC Image | see chapter 9.1.1.6.6 | always |
| | SC Multi-frame Image | see chapter 9.1.1.6.7 | always |
| | SC Multi-fame Vector | see chapter 9.1.1.6.8 | always |
| | VOI LUT | see chapter 9.1.1.4.6 | always |
| | SOP Common | see chapter 9.1.1.1.22 | always (with SOP Class UID for Multi-frame Grayscale Word Secondary Capture Image) |
| | Common Instance Reference | see chapter 9.1.1.1.23 | always |
| | SIEMENS MR Common | see chapter 9.2.1.7 | always |

##### 9.1.1.6.1 SC Equipment Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Conversion Type | (0008,0064) | set by creator |
| Modality | (0008,0060) | MR |

#### 9.1.1.6.2 Multi-frame Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Number of Frames | (0028,0008) | set by creator |
| Frame Increment Pointer | (0028,0009) | set by creator |

#### 9.1.1.6.3 Frame Pointers Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Representative Frame Number | (0028,6010) | set by creator |
| Frame Numbers of Interest (FOI) | (0028,6020) | set by creator |
| Frame of Interest Description | (0028,6022) | set by creator |
| Frame of Interest Type | (0028,6023) | set by creator |

#### 9.1.1.6.4 Multi-frame Functional Groups Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Shared Functional Groups Sequence | (5200,9229) | set by creator |
| *> Include one or more Functional Group Macros* | | |
| Per-frame Functional Groups Sequence | (5200,9230) | set by creator |
| *> Include one or more Functional Group Macros* | | |
| Instance Number | (0020,0013) | set by creator |
| Content Date | (0008,0023) | set by creator |
| Content Time | (0008,0033) | set by creator |
| Number of Frames | (0028,0008) | set by creator |
| Representative Frame Number | (0028,6010) | set by creator |

#### 9.1.1.6.5 Multi-frame Grayscale Word SC Image Functional Group Macros

| Functional Group Macro | Attribute Name | Tag | Supported Values |
|---|---|---|---|
| Pixel Measures<br>(if Plane Position (Patient) or Plane Orientation (Patient) Macros Present) | Pixel Measures Sequence<br>>Pixel Spacing<br>>Slice Thickness | (0028,9110)<br>(0018,0030)<br>(0028,0050) | set by creator<br>set by creator<br>set by creator |
| Plane Position (Patient)<br>(if Pixel Measures or Plane Orientation (Patient) Macros Present) | Plane Position Sequence<br>>Image Position (Patient) | (0020,9113)<br>(0020,0032) | set by creator<br>set by creator |
| Plane Orientation (Patient)<br>(if Pixel Measures or Plane Position (Patient) Macros Present) | Plane Orientation Sequence<br>>Image Orientation (Patient) | (0020,9116)<br>(0020,0037) | set by creator<br>set by creator |

| Functional Group Macro | Attribute Name | Tag | Supported Values |
|---|---|---|---|
| SIEMENS MR Shared | *include Table 91: Attributes of SIEMENS MR Shared Macro* | | |
| SIEMENS MR Frame | *include Table 93: Attributes of SIEMENS MR Frame Macro* | | |

#### 9.1.1.6.6 SC Image Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Date of Secondary Capture | (0018,1012) | set by creator |
| Time of Secondary Capture | (0018,1014) | set by creator |
| Nominal Scanned Pixel Spa | (0018,2010) | set by creator |
| Pixel Spacing | (0028,0030) | set by creator |
| Pixel Spacing Calibration Type | (0028,0A02) | set by creator |
| Pixel Spacing Calibration Description | (0018,1012) | set by creator |

#### 9.1.1.6.7 SC Multi-frame Image Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Burned In Annotation | (0028,0301) | set by creator |
| Recognizable Visual Features | (0028,0302) | set by creator |
| Presentation LUT Shape | (2050,0020) | set by creator |
| Illumination | (2010,015E) | set by creator |
| Reflected Ambient Light | (2010,0160) | set by creator |
| Rescale Intercept | (0028,1052) | set by creator |
| Rescale Slope | (0028,1053) | set by creator |
| Rescale Type | (0028,1054) | set by creator |
| Frame Increment Pointer | (0028,0009) | set by creator |
| Nominal Scanned Pixel Spacing | (0018,2010) | set by creator |
| Pixel Spacing | (0028,0030) | set by creator |
| Pixel Spacing Calibration Type | (0028,0A02) | set by creator |
| Pixel Spacing Calibration Description | (0028,0A04) | set by creator |
| Digitizing Device Transport Direction | (0018,2020) | set by creator |
| Rotation of Scanned Film | (0018,2030) | set by creator |

#### 9.1.1.6.8 SC Multi-frame Vector Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Frame Time Vector | (0018,1065) | set by creator |

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Page Number Vector | (0018,2001) | set by creator |
| Frame Label Vector | (0018,2002) | set by creator |
| Frame Primary Angle Vector | (0018,2003) | set by creator |
| Frame Secondary Angle Vector | (0018,2004) | set by creator |
| Slice Location Vector | (0018,2005) | set by creator |
| Display Window Label Vector | (0018,2006) | set by creator |

#### 9.1.1.7 Secondary Capture Image

This chapter describes the DICOM attributes of Secondary Capture Image instances created in interoperability mode. The following table lists the modules created by *syngo*® MR XA80A.

| IE | Module | Reference | Usage |
|---|---|---|---|
| Patient | Patient | see chapter 9.1.1.1.1 | always |
| Study | General Study | see chapter 9.1.1.1.2 | always |
| | Patient Study | see chapter 9.1.1.1.3 | always |
| Series | General Series | see chapter 9.1.1.1.4 | always |
| Frame of Reference | Frame of Reference | see chapter 9.1.1.1.6 | always |
| Equipment | General Equipment | see chapter 9.1.1.1.7 | always |
| | SC Equipment | see chapter 9.1.1.6.1 | always |
| Image | General Image | see chapter 9.1.1.4.1 | always |
| | Image Pixel | see chapter 9.1.1.1.9 | always |
| | SC Image | see chapter 9.1.1.6.6 | always |
| | Overlay Plane | see chapter 9.1.1.4.6 | always |
| | Modality LUT | see chapter 9.1.1.7.1 | always |
| | VOI LUT | see chapter 9.1.1.4.7 | always |
| | SOP Common | see chapter 9.1.1.1.22 | always (with SOP Class UID for Secondary Capture Image) |
| | Common Instance Reference | see chapter 9.1.1.1.23 | always |
| | SIEMENS MR Series | see chapter 9.2.1.2 | always |
| | SIEMENS MR Image/Frame | see chapter 9.2.1.5 | always |
| | SIEMENS MR Common | see chapter 9.2.1.7 | always |

##### 9.1.1.7.1 Modality LUT Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Rescale Intercept | (0028,1052) | set by creator |

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Rescale Slope | (0028,1053) | set by creator |
| Rescale Type | (0028,1054) | set by creator |

#### 9.1.1.8 Grayscale Softcopy Presentation State

For some usecases Grayscale Softcopy Presentation State instances are created referencing Enhanced MR Image or Multi-frame Grayscale Word SC Image instances. The following table lists the modules created by the *syngo*® MR XA80A.

| IE | Module | Reference | Usage |
|---|---|---|---|
| Patient | Patient | see chapter 9.1.1.1.1 | always |
| Study | General Study | see chapter 9.1.1.1.2 | always |
| | Patient Study | see chapter 9.1.1.1.3 | always |
| Series | General Series | see chapter 9.1.1.1.4 | always |
| | Presentation Series | see chapter 9.1.1.8.1 | always |
| Equipment | General Equipment | see chapter 9.1.1.1.7 | always |
| Presentation State | Presentation State Identification | see chapter 9.1.1.8.2 | always |
| | Presentation State Relationship | see chapter 9.1.1.8.3 | always |
| | Presentation State Shutter | see chapter 9.1.1.8.4 | always |
| | Presentation State Mask | see chapter 9.1.1.8.5 | always |
| | Displayed Area | see chapter 9.1.1.8.4 | always |
| | Graphic Annotation | see chapter 9.1.1.8.7 | in case of Graphic Annotations |
| | Spatial Transformation | see chapter 9.1.1.8.8 | always |
| | Graphic Layer | see chapter 9.1.1.8.9 | in case of Graphic Annotations |
| | Modality LUT | see chapter 9.1.1.7.1 | always |
| | Softcopy VOI LUT | see chapter 9.1.1.8.11 | always |
| | Softcopy Presentation LUT | see chapter 9.1.1.8.12 | always |
| | SOP Common | see chapter 9.1.1.1.22 | always (with SOP Class UID for Grayscale Softcopy Presentation State) |
| | SIEMENS MR Common | see chapter 9.2.1.7 | always |

##### 9.1.1.8.1 Presentation Series Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Modality | (0008,0060) | PR |

#### 9.1.1.8.2 Presentation State Identification Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Presentation Creation Date | (0070,0082) | set by creator |
| Presentation Creation Time | (0070,0083) | set by creator |
| Instance Number | (0020,0013) | set by creator |
| Content Label | (0070,0080) | set by creator |
| Content Description | (0070,0081) | set by creator |
| Content Creator's Name | (0070,0084) | set by creator |

#### 9.1.1.8.3 Presentation State Relationship Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Referenced Series Sequence | (0008,1115) | set by creator |
| >Series Instance UID | (0020,000E) | set by creator |
| >Referenced Image Sequence | (0008,1140) | set by creator |
| >>Referenced SOP Class UID | (0008,1150) | set by creator |
| >>Referenced SOP Instance UID | (0008,1155) | set by creator |
| >>Referenced Frame Number | (0008,1160) | set by creator |

#### 9.1.1.8.4 Presentation State Shutter

No attributes are available because Display Shutter Module and Bitmap Display Shutter Module are not used.

#### 9.1.1.8.5 Presentation State Mask

No attributes are available because Mask Module is not used.

#### 9.1.1.8.6 Displayed Area Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Displayed Area Selection Sequence | (0070,005A) | set by creator |
| >Referenced Image Sequence | (0008,1140) | set by creator |
| >>Referenced SOP Class UID | (0008,1150) | set by creator |
| >>Referenced SOP Instance UID | (0008,1155) | set by creator |
| >>Referenced Frame Number | (0008,1160) | set by creator |
| >Pixel Origin Interpretation | (0048,0301) | set by creator |
| >Displayed Area Top Left Hand Corner | (0070,0052) | set by creator |
| >Displayed Area Bottom Right Hand Corner | (0070,0053) | set by creator |

| Attribute Name | Tag | Supported Values |
|---|---|---|
| >Presentation Size Mode | (0070,0100) | set by creator |
| >Presentation Pixel Spacing | (0070,0101) | set by creator |
| >Presentation Pixel Aspect Ratio | (0070,0102) | set by creator |
| >Presentation Pixel Magnification Ratio | (0070,0103) | set by creator |

#### 9.1.1.8.7 Graphic Annotation Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Graphic Annotation Sequence | (0070,0001) | set by creator |
| >Referenced Image Sequence | (0008,1140) | set by creator |
| >>Referenced SOP Class UID | (0008,1150) | set by creator |
| >>Referenced SOP Instance UID | (0008,1155) | set by creator |
| >>Referenced Frame Number | (0008,1160) | set by creator |
| >Graphic Layer | (0070,0002) | set by creator |
| >Text Object Sequence | (0070,0008) | set by creator |
| >>Bounding Box Annotation Units | (0070,0003) | set by creator |
| >>Anchor Point Annotation Units | (0070,0004) | set by creator |
| >>Unformatted Text Value | (0070,0006) | set by creator |
| >>Text Style Sequence | (0070,0231) | set by creator |
| >>>Font Name | (0070,0227) | set by creator |
| >>>Font Name Type | (0070,0228) | set by creator |
| >>>CSS Font Name | (0070,0229) | set by creator |
| >>>Text Color CIELab Value | (0070,0241) | set by creator |
| >>>Horizontal Alignment | (0070,0242) | set by creator |
| >>>Vertical Alignment | (0070,0243) | set by creator |
| >>>Shadow Style | (0070,0244) | set by creator |
| >>>Shadow Offset X | (0070,0245) | set by creator |
| >>>Shadow Offset Y | (0070,0246) | set by creator |
| >>>Shadow Color CIELab Val | (0070,0247) | set by creator |
| >>>Shadow Opacity | (0070,0258) | set by creator |
| >>>Underlined | (0070,0248) | set by creator |
| >>>Bold | (0070,0249) | set by creator |
| >>>Italic | (0070,0250) | set by creator |
| >>Bounding Box Top Left Hand Corner | (0070,0010) | set by creator |
| >>Bounding Box Bottom Right Hand Corner | (0070,0011) | set by creator |
| >>Bounding Box Text Horizontal Justification | (0070,0012) | set by creator |
| >>Anchor Point | (0070,0014) | set by creator |
| >>Anchor Point Visibility | (0070,0015) | set by creator |

| Attribute Name | Tag | Supported Values |
|---|---|---|
| >>Compound Graphic Instance ID | (0070,0226) | set by creator |
| >>Graphic Group ID | (0070,0295) | set by creator |
| >Graphic Object Sequence | (0070,0009) | set by creator |
| >>Graphic Annotation Units | (0070,0005) | set by creator |
| >>Graphic Dimensions | (0070,0020) | set by creator |
| >>Number of Graphic Points | (0070,0021) | set by creator |
| >>Graphic Data | (0070,0022) | set by creator |
| >>Graphic Type | (0070,0023) | set by creator |
| >>Line Style Sequence | (0070,0232) | set by creator |
| >>>Pattern On Color CIELab Value; | (0070,0251) | set by creator |
| >>>Pattern Off Color CIELab Value | (0070,0252) | set by creator |
| >>>Pattern On Opacity | (0070,0284) | set by creator |
| >>>Pattern Off Opacity | (0070,0285) | set by creator |
| >>>Line Thickness | (0070,0253) | set by creator |
| >>>Line Dashing Style | (0070,0254) | set by creator |
| >>>Line Pattern | (0070,0255) | set by creator |
| >>>Shadow Style | (0070,0244) | set by creator |
| >>>Shadow Offset X | (0070,0245) | set by creator |
| >>>Shadow Offset Y | (0070,0246) | set by creator |
| >>>Shadow Color CIELab Value | (0070,0247) | set by creator |
| >>>Shadow Opacity | (0070,0258) | set by creator |
| >>Graphic Filled | (0070,0024) | set by creator |
| >>Fill Style Sequence | (0070,0233) | set by creator |
| >>>Pattern On Color CIELab Value; | (0070,0251) | set by creator |
| >>>Pattern Off Color CIELab Value | (0070,0252) | set by creator |
| >>>Pattern On Opacity | (0070,0284) | set by creator |
| >>>Pattern Off Opacity | (0070,0285) | set by creator |
| >>>Fill Mode | (0070,0257) | set by creator |
| >>>Fill Pattern | (0070,0256) | set by creator |
| >>Compound Graphic Instance ID | (0070,0226) | set by creator |
| >>Graphic Group ID | (0070,0295) | set by creator |
| >Compound Graphic Sequence | (0070,0209) | set by creator |
| >>Compound Graphic Instance | (0070,0226) | set by creator |
| >>Compound Graphic Units | (0070,0282) | set by creator |
| >>Graphic Dimensions | (0070,0020) | set by creator |
| >>Number of Graphic Points | (0070,0021) | set by creator |
| >>Graphic Data | (0070,0022) | set by creator |
| >>Compound Graphic Type | (0070,0294) | set by creator |
| >Text Style Sequence | (0070,0231) | set by creator |

| Attribute Name | Tag | Supported Values |
|---|---|---|
| >>>Font Name | (0070,0227) | set by creator |
| >>>Font Name Type | (0070,0228) | set by creator |
| >>>CSS Font Name | (0070,0229) | set by creator |
| >>>Text Color CIELab Value | (0070,0241) | set by creator |
| >>>Horizontal Alignment | (0070,0242) | set by creator |
| >>>Vertical Alignment | (0070,0243) | set by creator |
| >>>Shadow Style | (0070,0244) | set by creator |
| >>>Shadow Offset X | (0070,0245) | set by creator |
| >>>Shadow Offset Y | (0070,0246) | set by creator |
| >>>Shadow Color CIELab Value | (0070,0247) | set by creator |
| >>>Shadow Opacity | (0070,0258) | set by creator |
| >>>Underlined | (0070,0248) | set by creator |
| >>>Bold | (0070,0249) | set by creator |
| >>>Italic | (0070,0250) | set by creator |
| >>Line Style Sequence | (0070,0232) | set by creator |
| >>>Pattern On Color CIELab Value; | (0070,0251) | set by creator |
| >>>Pattern Off Color CIELab Value | (0070,0252) | set by creator |
| >>>Pattern On Opacity | (0070,0284) | set by creator |
| >>>Pattern Off Opacity | (0070,0285) | set by creator |
| >>>Line Thickness | (0070,0253) | set by creator |
| >>>Line Dashing Style | (0070,0254) | set by creator |
| >>>Line Pattern | (0070,0255) | set by creator |
| >>>Shadow Style | (0070,0244) | set by creator |
| >>>Shadow Offset X | (0070,0245) | set by creator |
| >>>Shadow Offset Y | (0070,0246) | set by creator |
| >>>Shadow Color CIELab Value | (0070,0247) | set by creator |
| >>>Shadow Opacity | (0070,0258) | set by creator |
| >>Rotation Angle | (0070,0230) | set by creator |
| >>Rotation Point | (0070,0273) | set by creator |
| >>Gap Length | (0070,0261) | set by creator |
| >>Diameter of Visibility | (0070,0262) | set by creator |
| >>Major Ticks Sequence | (0070,0287) | set by creator |
| >>>Tick Position | (0070,0288) | set by creator |
| >>>Tick Label | (0070,0289) | set by creator |
| >>Tick Alignment | (0070,0274) | set by creator |
| >>Tick Label Alignment | (0070,0279) | set by creator |
| >>Show Tick Label | (0070,0278) | set by creator |
| >>Graphic Filled | (0070,0024) | set by creator |
| >>Fill Style Sequence | (0070,0233) | set by creator |

| Attribute Name | Tag | Supported Values |
|---|---|---|
| >>>Pattern On Color CIELab Value; | (0070,0251) | set by creator |
| >>>Pattern Off Color CIELab Value | (0070,0252) | set by creator |
| >>>Pattern On Opacity | (0070,0284) | set by creator |
| >>>Pattern Off Opacity | (0070,0285) | set by creator |
| >>>Fill Mode | (0070,0257) | set by creator |
| >>>Fill Pattern | (0070,0256) | set by creator |
| >>Graphic Group ID | (0070,0295) | set by creator |

#### 9.1.1.8.8 Spatial Transformation Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Image Rotation | (0070,0042) | 0, 90, 180, 270 |
| Image Horizontal Flip | (0070,0041) | Y, N |

#### 9.1.1.8.9 Graphic Layer Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Graphic Layer Sequence | (0070,0060) | set by creator |
| >Graphic Layer | (0070,0002) | set by creator |
| >Graphic Layer Order | (0070,0062) | set by creator |
| >Graphic Layer Recommended Display Grayscale Value | (0070,0066) | set by creator |
| >Graphic Layer Recommended Display CIELab Value | (0070,0401) | set by creator |
| >Graphic Layer Description | (0070,0068) | set by creator |

#### 9.1.1.8.10 Graphic Group Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Graphic Group Sequence | (0070,0234) | set by creator |
| > Graphic Group ID | (0070,0295) | set by creator |
| > Graphic Group Label | (0070,0207) | set by creator |
| > Graphic Group Description | (0070,0208) | set by creator |

#### 9.1.1.8.11 Softcopy VOI LUT Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Softcopy VOI LUT Sequence | (0028,3110) | set by creator |
| >Referenced Image Sequence | (0008,1140) | set by creator |
| >>Referenced SOP Class UID | (0008,1150) | set by creator |
| >>Referenced SOP Instance UID | (0008,1155) | set by creator |
| >>Referenced Frame Number | (0008,1160) | set by creator |
| >VOI LUT Sequence | (0028,3010) | set by creator |
| >>LUT Descriptor | (0028,3002) | set by creator |
| >>LUT Explanation | (0028,3003) | set by creator |
| >>LUT Data | (0028,3006) | set by creator |
| >Window Center | (0028,1050) | set by creator |
| >Window Width | (0028,1051) | set by creator |
| >Window Center and Width Explanation | (0028,1055) | set by creator |
| >VOI LUT Function | (0028,1056) | set by creator |

#### 9.1.1.8.12 Softcopy Presentation LUT Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Presentation LUT Shape | (2050,0020) | IDENTITY, INVERSE |

### 9.1.1.9 Color Softcopy Presentation State

For some use cases Color Softcopy Presentation State instances are created referencing Enhanced MR Color Image or Multi-frame True Color SC Image instances. The following table lists the modules created by the *syngo*® MR XA80A.

| IE | Module | Reference | Usage |
|---|---|---|---|
| Patient | Patient | see chapter 9.1.1.1.1 | always |
| Study | General Study | see chapter 9.1.1.1.2 | always |
| | Patient Study | see chapter 9.1.1.1.3 | always |
| Series | General Series | see chapter 9.1.1.1.4 | always |
| | Presentation Series | see chapter 9.1.1.8.1 | always |
| Equipment | General Equipment | see chapter 9.1.1.1.7 | always |
| Presentation State | Presentation State Identification | see chapter 9.1.1.8.2 | always |
| | Presentation State Relationship | see chapter 9.1.1.8.3 | always |
| | Presentation State Shutter | see chapter 9.1.1.8.4 | always |
| | Displayed Area | see chapter 9.1.1.8.69.1.1.8.4 | always |

| IE | Module | Reference | Usage |
|---|---|---|---|
| | Graphic Annotation | see chapter 9.1.1.8.79.1.1.8.7 | in case of Graphic Annotations |
| | Spatial Transformation | see chapter 9.1.1.8.89.1.1.8.8 | always |
| | Graphic Layer | see chapter 9.1.1.8.99.1.1.8.9 | in case of Graphic Annotations |
| | ICC Profile | see chapter 9.1.1.1.21 | always |
| | SOP Common | see chapter 9.1.1.1.22 | always (with SOP Class UID for Color Softcopy Presentation State) |
| | SIEMENS MR Common | see chapter 9.2.1.7 | always |

#### 9.1.1.10 Pseudo-color Softcopy Presentation State

For some use cases Pseudo-color Softcopy Presentation State instances are created referencing Enhanced MR Image or Multi-frame Grayscale Word SC Image instances e. g. if a palette color LUT has to be applied to the images. The following table lists the modules created by the *syngo*® MR XA80A.

| IE | Module | Reference | Usage |
|---|---|---|---|
| Patient | Patient | see chapter 9.1.1.1.1 | always |
| Study | General Study | see chapter 9.1.1.1.2 | always |
| | Patient Study | see chapter 9.1.1.1.3 | always |
| Series | General Series | see chapter 9.1.1.1.4 | always |
| | Presentation Series | see chapter 9.1.1.8.1 | always |
| Equipment | General Equipment | see chapter 9.1.1.1.7 | always |
| Presentation State | Presentation State Identification | see chapter 9.1.1.8.2 | always |
| | Presentation State Relationship | see chapter 9.1.1.8.3 | always |
| | Presentation State Shutter | see chapter 9.1.1.8.4 | always |
| | Presentation State Mask | see chapter 9.1.1.8.5 | always |
| | Displayed Area | see chapter 9.1.1.8.6 | always |
| | Graphic Annotation | see chapter 9.1.1.8.7 | in case of Graphic Annotations |
| | Spatial Transformation | see chapter 9.1.1.8.8 | always |
| | Graphic Layer | see chapter 9.1.1.8.9 | in case of Graphic Annotations |
| | Modality LUT | see chapter 9.1.1.7.1 | always |
| | Softcopy VOI LUT | see chapter 9.1.1.8.11 | always |
| | Palette Color Lookup Table | see chapter 9.1.1.10.1 | always |
| | ICC Profile | see chapter 9.1.1.1.21 | always |
| | SOP Common | see chapter 9.1.1.1.22 | always (with SOP Class UID for Pseudo-color Softcopy Presentation State) |

| IE | Module | Reference | Usage |
|---|---|---|---|
| | SIEMENS MR Common | see chapter 9.2.1.7 | always |

#### 9.1.1.10.1 Palette Color Lookup Table Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Red Palette Color Lookup Table Descriptor | (0028,1101) | set by creator |
| Green Palette Color Lookup Table Descriptor | (0028,1102) | set by creator |
| Blue Palette Color Lookup Table Descriptor | (0028,1103) | set by creator |
| Red Palette Color Lookup Table Data | (0028,1201) | set by creator |
| Green Palette Color Lookup Table Data | (0028,1202) | set by creator |
| Blue Palette Color Lookup Table Data | (0028,1203) | set by creator |

### 9.1.1.11 Enhanced and Comprehensive SR IOD

Enhanced and Comprehensive SR SOP Classes are used by applications e. g. cardiac analysis to store evaluated results in an Evidence Document.

| IE | Module | Reference | Usage |
|---|---|---|---|
| Patient | Patient | see chapter 9.1.1.1.1 | always |
| Study | General Study | see chapter 9.1.1.1.2 | always |
| | Patient Study | see chapter 9.1.1.1.3 | always |
| Series | SR Document Series | see chapter 9.1.1.11.1 | always |
| Frame of Reference | Frame of Reference | see chapter 9.1.1.1.6 | always |
| Equipment | General Equipment | see chapter 9.1.1.1.7 | always |
| Document | SR Document General | see chapter 9.1.1.11.2 | always |
| | SR Document Content | see chapter 9.1.1.11.3 | always |
| | SOP Common | see chapter 9.1.1.1.22 | always (with SOP Class UID for Enhanced SR or Comprehensive SR) |
| | SIEMENS MR Common | see chapter 9.2.1.7 | always |

#### 9.1.1.11.1 SR Document Series Module

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Modality | (0008,0060) | SR |
| Series Instance UID | (0020,000E) | set by creator |

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Series Number | (0020,0011) | set by creator |
| Series Date | (0008,0021) | set by creator |
| Series Time | (0008,0031) | set by creator |
| Protocol Name | (0018,1030) | set by creator |
| Series Description | (0008,103E) | set by creator |
| Referenced Performed Procedure Step Sequence | (0008,1111) | set by creator |
| >Referenced SOP Class UID | (0008,1150) | set by creator |
| >Referenced SOP Instance UID | (0008,1155) | set by creator |

#### 9.1.1.11.2 **SR Document General Module**

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Series Number | (0020,0011) | set by creator |
| Preliminary Flag | (0040,A496) | set by creator (PRELIMINARY/FINAL) |
| Completion Flag | (0040,A491) | set by creator (PARTIAL/FINAL) |
| Completion Flag Description | (0040,A492) | set by creator |
| Verification Flag | (0040,A493) | set by creator (UNVERIFIED) |
| Content Date | (0008,0023) | set by creator |
| Content Time | (0008,0033) | set by creator |

#### 9.1.1.11.3 **SR Document Content Module**

| Attribute Name | Tag | Supported Values |
|---|---|---|
| *Include Table 85: Document Content Macro Attributes* | | With a Value Type (0040,A040) of CONTAINER |
| *Include Table 86: Document Relationship Macro Attributes* | | |

Table 85: Document Content Macro Attributes

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Value Type | (0040,A040) | AUTO |

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Concept Name Code Sequence | (0040,A043) | AUTO |
| *>Include* Table 87: Code Sequence Macro Attributes | | |
| Text Value | (0040,A160) | if Value Type is TEXT; AUTO |
| DateTime | (0040,A120) | if Value Type is DATETIME; AUTO |
| Date | (0040,A121) | if Value Type is DATE; AUTO |
| Time | (0040,A122) | if Value Type is TIME; AUTO |
| Person Name | (0040,A123) | if Value Type is PNAME; AUTO |
| Measured Value Sequence | (0040,A300) | if Value Type is NUM |
| >Numeric Value | (0040,A30A) | set by creator |
| >Floating Point Value | (0040,A161) | set by creator |
| >Rational Numerator Value | (0040,A162) | set by creator |
| >Rational Denominator Value | (0040,A163) | set by creator |
| >Measurement Units Code Sequence | (0040,08EA) | if Value Type is NUM |
| *>>Include* Table 87: Code Sequence Macro Attributes | | |
| Concept Code Sequence | (0040,A168) | if Value Type is CODE |
| *>Include* Table 87: Code Sequence Macro Attributes | | |
| Referenced SOP Sequence | (0008,1199) | if Value Type is COMPOSITE or IMAGE |
| >Referenced SOP Class UID | (0008,1150) | |
| >Referenced SOP Instance UID | (0008,1155) | |
| >Referenced Frame Number | (0008,1160) | if Value Type is IMAGE |
| Graphic Data | (0070,0022) | if Value Type is SCOORD |
| Graphic Type | (0070,0023) | if Value Type is SCOORD |
| Pixel Origin Interpretation | (0048,0301) | if Value Type is SCOORD |
| Referenced Frame of Referenced UID | (3006,0024) | if Value Type is SCOORD3D |
| Graphic Data | (0070,0022) | if Value Type is SCOORD3D |
| Graphic Type | (0070,0023) | if Value Type is SCOORD3D |
| Temporal Range Type | (0040,A130) | if Value Type is TCOORD |
| Referenced Sample Positions | (0040,A132) | if Value Type is TCOORD |
| Referenced Time Offsets | (0040,A138) | if Value Type is TCOORD |
| Referenced DateTime | (0040,A13A) | if Value Type is TCOORD |
| *Include Table 88: Container Macro Attributes if Value Type is CONTAINER* | | |

Table 86: Document Relationship Macro Attributes

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Observation DateTime | (0040,A032) | AUTO (if different from Content Date (0008,0023) and Content Time (0008,0033)) |
| Content Sequence | (0040,A730) | set by creator |
| >Relationship Type | (0040,A010) | set by creator |
| *>Include Table 85: Document Content Macro Attributes* | | |
| *>Include Table 86: Document Relationship Macro Attributes* | | |
| >Referenced Content Item Identifier | (0040,DB73) | AUTO |

Table 87: Code Sequence Macro Attributes

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Code Value | (0008,0100) | AUTO |
| Coding Scheme Designator | (0008,0102) | AUTO |
| Coding Scheme Version | (0008,0103) | AUTO |
| Code  Meaning | (0008,0104) | AUTO |

Table 88: Container Macro Attributes

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Continuity of Content | (0008,A050) | AUTO (SEPARATE/CONTINUOUS) |
| Content Template Sequence | (0040,A504) | set by creator |
| >Mapping Resource | (0008,0105) | set by creator |
| >Mapping Resource UID | (0008,0118) | set by creator |
| >Template Identifier | (0040,DB00) | set by creator |

Table 89: Table Content Item Macro Attributes

| Attribute Name | Tag | Supported Values |
|---|---|---|
| Tabulated Values Sequence | (0040,A801) | |
| >Number of Table Rows | (0040,A802) | set by creator |
| >Number of Table Columns | (0040,A803) | set by creator |

| Attribute Name | Tag | Supported Values |
|---|---|---|
| >Table Row Definition Sequence | (0040,A806) | set by creator |
| >>Table Row Number | (0040,A804) | |
| >>Concept Name Code | (0040,A043) | |
| *>>>Include Table 87: Code Sequence Macro Attributes* | | |
| >>Measurement Units Code Sequence | (0040,08EA) | |
| *>>>Include Table 87: Code Sequence Macro Attributes* | | |
| >Table Column Definition Sequence | (0040,A807) | set by creator |
| >>Table Column Number | (0040,A805) | |
| >>Concept Name Code Sequence | (0040,A043) | |
| *>>>Include Table 87: Code Sequence Macro Attributes* | | |
| >>Measurement Units Code Sequence | (0040,08EA) | |
| *>>>Include Table 87: Code Sequence Macro Attributes* | | |
| >Cell Values Sequence | (0040,A808) | |
| >>Table Row Number | (0040,A804) | |
| >>Table Column Number | (0040,A805) | |
| >>Referenced Content Item Identifier | (0040,DB73) | |
| >>Selector DS Value | (0072,0072) | |
| >>Selector DT Value | (0072,0063) | |
| >>Selector FD Value | (0072,0074) | |
| >>Selector FL Value | (0072,0076) | |
| >>Selector IS Value | (0072,0064) | |
| >>Selector SL Value | (0072,007C) | |
| >>Selector SS Value | (0072,007E) | |
| >>Selector SV Value | (0072,0082) | |
| >>Selector UC Value | (0072,006F) | |
| >>Selector UL Value | (0072,0078) | |
| >>Selector US Value | (0072,007A) | |
| >>Concept Code Sequence | (0040,A168) | |
| *>>>Include Table 87: Code Sequence Macro Attributes* | | |
| >>Measurement Units Code Sequence | (0040,08EA) | |
| *>>>Include Table 87: Code Sequence Macro Attributes* | | |
| >>Numeric Value Quantifier Code Sequence | (0040,A301) | |
| *>>>Include Table 87: Code Sequence Macro Attributes* | | |

#### 9.1.1.11.4 Evidence Document Templates

The finding related results of applications are stored into the Content Sequence of a Structured Evidence Document. The Content Items of a Content Sequence are specified in Structured Reporting Templates.

Examples of Structured Reporting Templates are:

- BI-RADS reporting
- Cardiac reporting
- PI-RADS 2 reporting
- PhoenixZip documentation.

#### 9.1.1.11.5 99_3000 Phoenix ZIP Document Template

Table 90: 99_3000 Phoenix ZIP Document Parameters

| | NL | Rel. with Parent | Value Type | Concept Name | VM | Req. Type | Condition | Value Set Constraint |
|---|---|---|---|---|---|---|---|---|
| 1 | | HAS CONCEPT MOD | CODE | 113011, DCM, Document Title Modifier | 1 | M | | MR-20, 99SMS_CTMR, “Phoenix ZIP Document” |
| 2 | | HAS CONCEPT MOD | CODE | 121049, DCM, Language of Content Item and Descendents | 1 | M | | |
| 3 | | HAS OBS CONTEXT | CODE | 121005, DCM, Observer Type | 1 | M | | 121006, DCM, Person |
| 4 | | HAS OBS CONTEXT | PNAME | 121008, DCM, Observer Name | 1 | M | | |
| 5 | | CONTAINS | CONTAINER | 121064, DCM, Current Procedure Description | 1 | M | | |
| 6 | > | CONTAINS | CODE | 111004, DCM, Modality | 1 | M | | MR, DCM, Magnetic Resonance |
| 7 | > | CONTAINS | TEXT | 113016, DCM, Performed Procedure Step | 1 | M | | |
| 8 | > | CONTAINS | CONTAINER | 125203, DCM, Acquisition Protocol | 1 | M | | |
| 9 | >> | CONTAINS | CONTAINER | A-30, 99SMS_CTMR, Protocol Header | 1 | M | | |
| 10 | >>> | CONTAINS | TEXT | A-92, 99SMS_CTMR, System Type | 1 | M | | |
| 11 | >>> | CONTAINS | TEXT | A-90, 99SMS_CTMR, Software Version | 1 | M | | |
| 12 | >>> | CONTAINS | TEXT | A-84, 99SMS_CTMR, Field Strength | 1 | M | | |
| 13 | >>> | CONTAINS | TEXT | A-86, 99SMS_CTMR, Protocol Name | 1 | M | | |
| 14 | >>> | CONTAINS | TEXT | A-88, 99SMS_CTMR, Sequence Name | 1 | M | | |

| | NL | Rel. with Parent | Value Type | Concept Name | VM | Req. Type | Condition | Value Set Constraint |
|---|---|---|---|---|---|---|---|---|
| 14 | >>> | CONTAINS | TEXT | A-80, 99SMS_CTMR, Acquisition Time | 1 | M | | |
| 15 | >>> | CONTAINS | TEXT | A-98, 99SMS_CTMR, Orientation | 1 | M | | |
| 16 | >>> | CONTAINS | TEXT | A.100, 99SMS_CTMR, Resolution Matrix | 1 | M | | |
| 17 | >>> | CONTAINS | NUM | A-76, 99SMS_CTMR, Number Of Slices | 1 | M | | UNITS = unary, no units |
| 18 | >>> | CONTAINS | NUM | A-78, 99SMS_CTMR, FoV Read | 1 | M | | UNITS = millimeter |
| 19 | >>> | CONTAINS | NUM | A-70, 99SMS_CTMR, FoV Phase | 1 | M | | UNITS = millimeter |
| 20 | >>> | CONTAINS | NUM | A-94, 99SMS_CTMR, Slice Thickness | 1 | M | | UNITS = millimeter |
| 21 | >>> | CONTAINS | NUM | A-96, 99SMS_CTMR, Slice Gap | 1 | M | | UNITS = percent |
| 22 | >>> | CONTAINS | NUM | A-74, 99SMS_CTMR, Repetition Time | 1 | M | | UNITS = milliseconds |
| 23 | >>> | CONTAINS | NUM | A-72, 99SMS_CTMR, Echo Time | 1 | M | | UNITS = milliseconds |
| 24 | >>> | CONTAINS | NUM | A-82, 99SMS_CTMR, Flip Angle | 1 | M | | UNITS = degree |
| 25 | >>> | CONTAINS | TEXT | A-102, 99SMS_CTMR, Fat Suppression | 1 | M | | |
| 26 | >>> | CONTAINS | TEXT | A-104, 99SMS_CTMR, Flow Compensation | 1 | M | | |
| 27 | >>> | CONTAINS | TEXT | A-106, 99SMS_CTMR, Water Suppression | 1 | M | | |
| 28 | >>> | CONTAINS | TEXT | A-108, 99SMS_CTMR, Subtraction | 1 | M | | |
| 29 | >>> | CONTAINS | TEXT | A-110, 99SMS_CTMR, First Signal Mode | 1 | M | | |
| 30 | >>> | CONTAINS | TEXT | A-112, 99SMS_CTMR, Contrast Agent | 1 | M | | |
| 31 | >> | CONTAINS | CONTAINER | 121138, DCM, Image Acquired | 1 | M | | |
| 32 | >>> | HAS ACQ CONTEXT | TEXT | 121141, DCM, Image Type | 1 | M | | |

### 9.1.2 Usage of Attributes from received IODs

N/A

### 9.1.3 Attribute mapping

The following table describes the mapping from attributes received in DICOM Modality Worklist to attributes of the created SOP instances:

| Attribute Name | Tag | Mapped attribute / Notes |
|---|---|---|
| **SOP Common** | | |
| Specific Character Set | (0008,0005) | |
| **Scheduled Procedure Step** | | |
| Scheduled Procedure Step Sequence | (0040,0100) | Request Attributes Sequence (0040,0275) |
| >Scheduled Performing Physician's Name | (0040,0006) | default for "Performing Physician's Name" (0008,1050) |
| >Scheduled Procedure Step Description | (0040,0007) | Scheduled Procedure Step Description,<br>default for "Performed Procedure Step Description" (0040,0254) |
| >Scheduled Procedure Step ID | (0040,0009) | "Scheduled Procedure Step ID"<br>default for "Performed Procedure Step ID" (0040,0253) |
| >Scheduled Procedure Step Location | (0040,0011) | "Scheduled Procedure Step Location" is taken as default for "Performed Location" |
| **Requested Procedure** | | |
| Referenced Study Sequence | (0008,1110) | Referenced Study Sequence (0008,1110) |
| >Referenced SOP Class UID | (0008,1150) | >Referenced SOP Class UID (0008,1150) |
| Study Instance UID | (0020,000D) | Study Instance UID |
| Requested Procedure Description | (0032,1060) | Requested Procedure Description in Request Attributes Sequence (0040,0275).<br>Used to preselect examination program in scheduler (favourite list). |
| Requested Procedure Code Sequence | (0032,1064) | "Requested Procedure Code Sequence" in Request Attributes Sequence (0040,0275).<br>Default for "Procedure Code Sequence"<br>Used to preselect examination program in scheduler (favourite list). |
| >Code Value | (0008,0100) | mapped |
| >Coding Scheme Designator | (0008,0102) | mapped |
| >Coding Scheme Version | (0008,0103) | mapped |
| >Code Meaning | (0008,0104) | mapped |
| Requested Procedure ID | (0040,1001) | "Requested Procedure ID" in Request Attributes Sequence (0040,0275)<br>default for "Study ID" |
| Reason for the Requested Procedure | (0040,1002) | Reason for the Requested Procedure |
| Reporting Priority | (0040,1009) | Reporting Priority |
| Requested Procedure Comments | (0040,1400) | Requested Procedure Comments |
| **Imaging Service Request** | | |

| Attribute Name | Tag | Mapped attribute / Notes |
|---|---|---|
| Accession Number | (0008,0050) | mapped |
| Referring Physician's Name | (0008,0090) | mapped |
| Requesting Physician | (0032,1032) | mapped |
| Placer Order Number / Imaging Service Request | (0040,2016) | mapped |
| Filler Order Number / Imaging Service Request | (0040,2017) | mapped |
| **Visit Identification** | | |
| Admission ID | (0038,0010) | mapped |
| Institution Name | (0008,0080) | default for Institution Name |
| Institution Address | (0008,0081) | default for Institution Address |
| **Visit Status** | | |
| Visit Status ID | (0038,0008) | mapped |
| Institution Address | (0008,0081) | mapped |
| Current Patient Location | (0038,0300) | mapped |
| Patient's Institution Residence | (0038,0400) | mapped |
| **Visit Admission** | | |
| Admitting Diagnosis Description | (0008,1080) | mapped |
| Admitting Date | (0038,0020) | mapped |
| **Patient Identification** | | |
| Patient's Name | (0010,0010) | mapped |
| Patient ID | (0010,0020) | mapped |
| Issuer of Patient ID | (0010,0021) | mapped |
| Other Patient IDs | (0010,1000) | mapped |
| Other Patient Names | (0010,1001) | mapped |
| **Patient Demographic** | | |
| Patient's Birth Date | (0010,0030) | mapped |
| Patient's Birth Time | (0010,0032) | mapped |
| Patient's Sex | (0010,0040) | mapped |
| Patient's Size | (0010,1020) | mapped |
| Patient's Weight | (0010,1030) | mapped |
| Patient's Address | (0010,1040) | mapped |
| Military Rank | (0010,1080) | mapped |
| Ethnic Group | (0010,2160) | mapped |
| Patient Comments | (0010,4000) | mapped |
| **Patient Medical** | | |
| Medical Alerts | (0010,2000) | mapped |
| Allergies | (0010,2110) | mapped |
| Pregnancy Status | (0010,21C0) | mapped |

| Attribute Name | Tag | Mapped attribute / Notes |
|---|---|---|
| Smoking Status | (0010,21A0) | mapped |
| Special Needs | (0038,0050) | mapped |

#### 9.1.4 Coerced / Modified fields

N/A

## 9.2 Data Dictionary of Private Attributes

### 9.2.1 MR Related Private Attributes

#### 9.2.1.1 SIEMENS MR Shared Macro

The private SIEMENS MR Shared Macro contains attributes that are shared by a set of frames, i.e. there values are constant for all frames of all images within a series or within the whole acquisition.

Table 91: Attributes of SIEMENS MR Shared Macro

| DICOM Tag | Name | VR | VM |
|---|---|---|---|
| (0021, SIEMENS MR SDS 01, FE) | Siemens MR SDS Sequence | SQ | 1 |
| *> Include Table 92: Attributes of SIEMENS MR Series and Shared Macro* | | | |

#### 9.2.1.2 SIEMENS MR Series Module

| DICOM Tag | Name | VR | VM |
|---|---|---|---|
| *> Include Table 92: Attributes of SIEMENS MR Series and Shared Macro* | | | |

#### 9.2.1.3 SIEMENS MR Series and Shared Macro

Table 92: Attributes of SIEMENS MR Series and Shared Macro

| DICOM Tag | Name | VR | VM |
|---|---|---|---|
| (0021, SIEMENS MR SDS 01, 04) | SliceArrayConcatenations | DS | 1 |
| (0021, SIEMENS MR SDS 01, 05) | RelTablePosition | IS | 3 |
| (0021, SIEMENS MR SDS 01, 06) | CoilForGradient | LO | 1 |
| (0021, SIEMENS MR SDS 01, 07) | LongModelName | LO | 1 |
| (0021, SIEMENS MR SDS 01, 08) | GradientMode | SH | 1 |

| DICOM Tag | Name | VR | VM |
|---|---|---|---|
| (0021, SIEMENS MR SDS 01, 09) | PATModeText | LO | 1 |
| (0021, SIEMENS MR SDS 01, 0A) | SW_korr_faktor | DS | 1 |
| (0021, SIEMENS MR SDS 01, 0B) | RfPowerErrorIndicator | DS | 1 |
| (0021, SIEMENS MR SDS 01, 0C) | PositivePCSDirections | SH | 1 |
| (0021, SIEMENS MR SDS 01, 0D) | ProtocolChangeHistory | US | 1 |
| (0021, SIEMENS MR SDS 01, 0F) | Stim_lim | DS | 3 |
| (0021, SIEMENS MR SDS 01, 10) | MrProtocolVersion | IS | 1 |
| (0021, SIEMENS MR SDS 01, 11) | PhaseGradientAmplitude | DS | 1 |
| (0021, SIEMENS MR SDS 01, 12) | ReadoutOS | FD | 1 |
| (0021, SIEMENS MR SDS 01, 13) | t_puls_max | DS | 1 |
| (0021, SIEMENS MR SDS 01, 14) | NumberOfPrescans | IS | 1 |
| (0021, SIEMENS MR SDS 01, 16) | dBdt_thresh | DS | 1 |
| (0021, SIEMENS MR SDS 01, 17) | SelectionGradientAmplitude | DS | 1 |
| (0021, SIEMENS MR SDS 01, 18) | RFSWDMostCriticalAspect | SH | 1 |
| (0021, SIEMENS MR SDS 01, 19) | MrPhoenixProtocol | OB | 1 |
| (0021, SIEMENS MR SDS 01, 1A) | CoilString | LO | 1 |
| (0021, SIEMENS MR SDS 01, 1B) | SliceResolution | DS | 1 |
| (0021, SIEMENS MR SDS 01, 1C) | Stim_max_online | DS | 3 |
| (0021, SIEMENS MR SDS 01, 1D) | Operation_mode_flag | IS | 1 |
| (0021, SIEMENS MR SDS 01, 22) | SequenceFileOwner | SH | 1 |
| (0021, SIEMENS MR SDS 01, 23) | RfWatchdogMask | IS | 1 |
| (0021, SIEMENS MR SDS 01, 25) | TablePositionOrigin | SL | 3 |
| (0021, SIEMENS MR SDS 01, 26) | MiscSequenceParam | IS | 1-n |
| (0021, SIEMENS MR SDS 01, 27) | Isocentered | US | 1 |
| (0021, SIEMENS MR SDS 01, 2A) | CoilId | IS | 1-n |
| (0021, SIEMENS MR SDS 01, 2B) | PatReinPattern | ST | 1 |
| (0021, SIEMENS MR SDS 01, 2C) | Sed | DS | 3 |
| (0021, SIEMENS MR SDS 01, 2D) | SARMostCriticalAspect | DS | 3 |
| (0021, SIEMENS MR SDS 01, 2E) | Stim_mon_mode | IS | 1 |
| (0021, SIEMENS MR SDS 01, 2F) | GradientDelayTime | DS | 3 |
| (0021, SIEMENS MR SDS 01, 30) | ReadoutGradientAmplitude | DS | 1 |
| (0021, SIEMENS MR SDS 01, 31) | AbsTablePosition | IS | 3 |
| (0021, SIEMENS MR SDS 01, 32) | RFSWDOperationMode | SS | 1 |
| (0021, SIEMENS MR SDS 01, 33) | CoilForGradient2 | SH | 1 |
| (0021, SIEMENS MR SDS 01, 34) | Stim_faktor | DS | 1 |
| (0021, SIEMENS MR SDS 01, 35) | Stim_max_ges_norm_online | DS | 1 |

| DICOM Tag | Name | VR | VM |
|---|---|---|---|
| (0021, SIEMENS MR SDS 01, 36) | dBdt_max | DS | 1 |
| (0021, SIEMENS MR SDS 01, 37) | FlowCompensation | SH | 1 |
| (0021, SIEMENS MR SDS 01, 38) | TransmitterCalibration | DS | 1 |
| (0021, SIEMENS MR SDS 01, 3D) | PhaseSliceOversampling | CS | 1 |
| (0021, SIEMENS MR SDS 01, 44) | B1rms | DS | 2 |
| (0021, SIEMENS MR SDS 01, 45) | B1rmsSupervision | CS | 1 |
| (0021, SIEMENS MR SDS 01, 46) | TalesReferencePower | DS | 1 |
| (0021, SIEMENS MR SDS 01, 48) | DICOMImageFlavor | CS | 1 |
| (0021, SIEMENS MR SDS 01, 49) | DICOMAcquisitionContrast | CS | 1 |
| (0021, SIEMENS MR SDS 01, 50) | RFEchoTrainLength | US | 1 |
| (0021, SIEMENS MR SDS 01, 51) | GradientEchoTrainLength | US | 1 |
| (0021, SIEMENS MR SDS 01, 53) | Laterality4MF | CS | 1 |
| (0021, SIEMENS MR SDS 01, 5A) | ScanningSequence | CS | 1-n |
| (0021, SIEMENS MR SDS 01, 5B) | SequenceVariant | CS | 1-n |
| (0021, SIEMENS MR SDS 01, 5C) | MeasurementOptions | CS | 1-n |
| (0021, SIEMENS MR SDS 01, 5D) | ScanRegionPositionIso | SL | 1 |
| (0021, SIEMENS MR SDS 01, 5E) | FieldOfViewText | LO | 1 |
| (0021, SIEMENS MR SDS 01, 5F) | RelativeTablePositionText | SH | 1 |
| (0021, SIEMENS MR SDS 01, 60) | MeasurementStartDateTime | DT | 1 |
| (0021, SIEMENS MR SDS 01, 61) | ExtendedPositionInfo | SH | 1 |
| (0021, SIEMENS MR SDS 01, 62) | RFPulseAmplitude | FL | 1-n |
| (0021, SIEMENS MR SDS 01, 63) | CNS_Stim_max_online | DS | 3 |
| (0021, SIEMENS MR SDS 01, 64) | CNS_Stim_Limit | FD | 3 |
| (0021, SIEMENS MR SDS 01, 65) | CNS_Stim_max_ges_norm_online | FD | 1 |
| (0021, SIEMENS MR SDS 01, 66) | CNS_Gradient_Output | FD | 1-n |
| (0021, SIEMENS MR SDS 01, 67) | PNS_Gradient_Output | FD | 1-n |
| (0021, SIEMENS MR SDS 01, 68) | AbsTablePositionHighPrecision | FD | 3 |

#### 9.2.1.4 SIEMENS MR Frame Macro

The private SIEMENS MR Frame Macro contains attributes that are specific for a frame.

Table 93: Attributes of SIEMENS MR Frame Macro

| DICOM Tag | Name | VR | VM |
|---|---|---|---|
| (0021, SIEMENS MR SDI 02, FE) | Siemens MR SDI Sequence | SQ | 1 |
| *> Include Table 94: Attributes of SIEMENS MR Image/Frame Macro* | | | |

#### 9.2.1.5 SIEMENS MR Image/Frame Module

| DICOM Tag | Name | VR | VM |
|---|---|---|---|
| *> Include Table 94: Attributes of SIEMENS MR Image/Frame Macro* | | | |

#### 9.2.1.6 SIEMENS MR Image/Frame Macro

Table 94: Attributes of SIEMENS MR Image/Frame Macro

| DICOM Tag | Name | VR | VM |
|---|---|---|---|
| (0021, SIEMENS MR SDI 02, 03) | SliceMeasurementDuration | DS | 1 |
| (0021, SIEMENS MR SDI 02, 04) | TimeAfterStart | DS | 1 |
| (0021, SIEMENS MR SDI 02, 06) | ICE_Dims | LO | 1 |
| (0021, SIEMENS MR SDI 02, 1A) | RFSWDDataType | SH | 1 |
| (0021, SIEMENS MR SDI 02, 1B) | PhaseEncodingDirectionPositive | IS | 1 |
| (0021, SIEMENS MR SDI 02, 22) | VoxelThickness | DS | 1 |
| (0021, SIEMENS MR SDI 02, 24) | MultistepIndex | IS | 1 |
| (0021, SIEMENS MR SDI 02, 33) | EchoColumnPosition | IS | 1 |
| (0021, SIEMENS MR SDI 02, 41) | GSWDDataType | SH | 1 |
| (0021, SIEMENS MR SDI 02, 42) | RealDwellTime | IS | 1 |
| (0021, SIEMENS MR SDI 02, 45) | ImaAbsTablePosition | SL | 3 |
| (0021, SIEMENS MR SDI 02, 48) | EchoPartitionPosition | IS | 1 |
| (0021, SIEMENS MR SDI 02, 49) | EchoLinePosition | IS | 1 |
| (0021, SIEMENS MR SDI 02, 4F) | ImaCoilString | LO | 1 |
| (0021, SIEMENS MR SDI 02, 51) | SequenceMask | UL | 1 |
| (0021, SIEMENS MR SDI 02, 56) | ImaPATModeText | LO | 1 |
| (0021, SIEMENS MR SDI 02, 58) | AcquisitionMatrixText | SH | 1 |
| (0021, SIEMENS MR SDI 02, 59) | ImaRelTablePosition | IS | 3 |
| (0021, SIEMENS MR SDI 02, 5B) | SlicePosition_PCS | IS | 3 |
| (0021, SIEMENS MR SDI 02, 5E) | ProtocolSliceNumber | IS | 1 |
| (0021, SIEMENS MR SDI 02, 67) | ExamDataRole | ST | 1 |
| (0021, SIEMENS MR SDI 02, 70) | DataSetInfo | OB | 1 |
| (0021, SIEMENS MR SDI 02, 71) | UsedChannelString | UT | 1 |
| (0021, SIEMENS MR SDI 02, 75) | ImageType4MF | CS | 1-n |
| (0021, SIEMENS MR SDI 02, 76) | ImageHistory | LO | 1-n |
| (0021, SIEMENS MR SDI 02, 77) | SequenceInfo | LO | 1 |
| (0021, SIEMENS MR SDI 02, 78) | ImageTypeVisible | CS | 1-n |

| DICOM Tag | Name | VR | VM |
|---|---|---|---|
| (0021, SIEMENS MR SDI 02, 79) | DistortionCorrectionType | CS | 1 |
| (0021, SIEMENS MR SDI 02, 88) | SliceCenterDistancefromIsoCenter | DS | 1 |
| (0021, SIEMENS MR SDI 02, 89) | FrameInversionTime | DS | 1 |
| (0021, SIEMENS MR SDI 02, 8A) | FrameNumberInSeries | IS | 1 |
| (0021, SIEMENS MR SDI 02, 8B) | SlicePositionText | SH | 1 |
| (0021, SIEMENS MR SDI 02, 8C) | MorphoQCThreshold | FD | 1 |
| (0021, SIEMENS MR SDI 02, 8D) | MorphoQCIndex | FD | 1 |
| (0021, SIEMENS MR SDI 02, 8E) | DICOM_Dims | LO | 1 |

#### 9.2.1.7 SIEMENS MR Common Module

The SIEMENS MR Common Module is intended to specify the creating component of the SOP instance. The SOP instances can be created during acquisition (Creator Identifier “ACQUSITION”) or by a post-processing application (Creator Identifier “APPLICATION”). The creating application shall be specified in attribute Application Identifier (SOP instances created during acquisition shall be tagged with “ACQUISITION”).

Table 95: Attributes of SIEMENS MR Common Module

| DICOM Tag | Name | VR | VM | Supported Values |
|---|---|---|---|---|
| (0021, SIEMENS MR SDR 01, 01) | Creator Identifier | LO | 1 | Enumerated values: ACQUISITION, APPLICATION |
| (0021, SIEMENS MR SDR 01, 02) | Application Identifier | LO | 1-n | Defined terms: ACQUISITION, ModalityViewer, MRBasic, MRBreast, MRBreastBiopsy, MRNeuro3D, MRCardiacAnalysis |
| (0021, SIEMENS MR SDR 01, 03) | Cause Identifier | LO | 1 | set by creator |

#### 9.2.1.8 SIEMENS MR HEADER Module

The intention of the private attributes of SIEMENS MR HEADER in private group 51 is to support image text related information to DICOM viewers to display it directly and do not need to calculate it from several DICOM attributes.

Table 96: Attributes of private group SIEMENS MR HEADER

| DICOM Tag | Name | VR | VM |
|---|---|---|---|
| (0051, SIEMENS MR HEADER, 08) | Header Type | CS | 1 |
| (0051, SIEMENS MR HEADER, 09) | Header Version | LO | 1 |
| (0051, SIEMENS MR HEADER, 0A) | Meas Duration | LO | 1 |
| (0051, SIEMENS MR HEADER, 0C) | Field Of View | LO | 1 |
| (0051, SIEMENS MR HEADER, 0D) | Slice Position | SH | 1 |

| DICOM Tag | Name | VR | VM |
|---|---|---|---|
| (0051, SIEMENS MR HEADER, 12) | Rel Table Position | SH | 1 |
| (0051, SIEMENS MR HEADER, 13) | Positive PCS Directions | SH | 1 |

#### 9.2.1.9 SIEMENS MR Raw Data Module

Table 97: Attributes of private SIEMENS MR Raw Data Module

| DICOM Tag | Name | VR | VM |
|---|---|---|---|
| (7FE1,SIEMENS MR IMA, 10) | Siemens MR Raw Data | OB/OF | 1 |

## 9.3 Coded Terminology and Templates

### 9.3.1 Context Groups

N/A

### 9.3.2 Template Specifications

N/A

### 9.3.3 Private Code definitions

N/A

## 9.4 Grayscale Image Consistency

The high resolution TFT display monitor option of syngo® MR XA80A comes with a DICOM Grayscale Standard Display Function (GSDF) compliant factory pre-setting. A typical working environment setup is assumed for ambient light.

## 9.5 Standard Extended / Specialized / Private SOP Classes

### 9.5.1 Enhanced MR Image Storage SOP Class

| DICOM Tag | Attribute Name | VR | VM |
|---|---|---|---|
| (0018,0086) | Echo Numbers (s) | IS | 1-n |

## 9.6 Private Transfer Syntaxes

No private Transfer Syntaxes are defined for or requested by syngo® MR XA80A DICOM application.

## 9.7 DICOM Print SCU – detailed status displays

The following tables document the behavior of the *syngo®* MR XA80A DICOM Print AE in response to messages received for the printer SOP class and the print job SOP class.
Definitions of camera symbols:

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

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

### 9.7.1 Common Status Information

Table 98: Common Printer Status Information

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

| Printer Status Info / Execution Status Info | Description | Message string visible in 'Status Bar' | Other action for UI / 'camera symbol' |
|---|---|---|---|
| ELEC DOWN | Printer is not operating due to some unspecified electrical hardware problem. | Camera electrical hardware Problem. | <None>/interact |
| ELEC SW ERROR | Printer not operating for some unspecified software error. | Camera software problem. Queue stopped. | Queue for this camera will be STOPPED/ Queue stopped |
| EMPTY 8X10 | The 8x10 inch film supply magazine is empty. | 8x10 film supply empty. | <None>/interact |
| EMPTY 8X10 BLUE | The 8x10 inch blue film supply magazine is empty. | 8x10 blue film supply empty. | <None>/interact |
| EMPTY 8X10 CLR | The 8x10 inch clear film supply magazine is empty. | 8x10 clear film supply empty. | <None>/interact |
| EMPTY 8X10 PAPR | The 8x10 inch paper supply magazine is empty. | 8x10 paper supply empty. | <None>/interact |
| EMPTY 10X12 | The 10x12 inch film supply magazine is empty. | 10x12 film supply empty. | <None>/interact |
| EMPTY 10X12 BLUE | The 10x12 inch blue film supply magazine is empty. | 10x12 blue film supply empty. | <None>/interact |
| EMPTY 10X12 CLR | The 10x12 inch clear film supply magazine is empty. | 10x12 clear film supply empty. | <None>/interact |
| EMPTY 10X12 PAPR | The 10x12 inch paper supply magazine is empty. | 10x12 paper supply empty. | <None>/interact |
| EMPTY 10X14 | The 10x14 inch film supply magazine is empty. | 10x14 film supply empty. | <None>/interact |
| EMPTY 10X14 BLUE | The 10x14 inch blue film supply magazine is empty. | 10x14 blue film supply empty. | <None>/interact |
| EMPTY 10X14 CLR | The 10x14 inch clear film supply magazine is empty. | 10x14 clear film supply empty. | <None>/interact |
| EMPTY 10X14 PAPR | The 10x14 inch paper supply magazine is empty. | 10x14 paper supply empty. | <None>/interact |
| EMPTY 11X14 | The 11x14 inch film supply magazine is empty. | 11x14 film supply empty. | <None>/interact |
| EMPTY 11X14 BLUE | The 11x14 inch blue film supply magazine is empty. | 11x14 blue film supply empty. | <None>/interact |
| EMPTY 11X14 CLR | The 11x14 inch clear film supply magazine is empty. | 11x14 clear film supply empty. | <None>/interact |
| EMPTY 11X14 PAPR | The 11x14 inch paper supply magazine is empty. | 11x14 paper supply empty. | <None>/interact |
| EMPTY 14X14 | The 14x14 inch film supply magazine is empty. | 14x14 film supply empty. | <None>/interact |
| EMPTY 14X14 BLUE | The 14x14 inch blue film supply magazine is empty. | 14x14 blue film supply empty. | <None>/interact |
| EMPTY 14X14 CLR | The 14x14 inch clear film supply magazine is empty. | 14x14 clear film supply empty. | <None>/interact |
| EMPTY 14X14 PAPR | The 14x14 inch paper supply magazine is empty. | 14x14 paper supply empty. | <None>/interact |
| EMPTY 14X17 | The 14x17 inch film supply magazine is empty. | 14x17 film supply empty. | <None>/interact |

| Printer Status Info / Execution Status Info | Description | Message string visible in 'Status Bar' | Other action for UI / 'camera symbol' |
|---|---|---|---|
| EMPTY 14X17 BLUE | The 14x17 inch blue film supply magazine is empty. | 14x17 blue film supply empty. | <None>/interact |
| EMPTY 14X17 CLR | The 14x17 inch clear film supply magazine is empty. | 14x17 clear film supply empty. | <None>/interact |
| EMPTY 14X17 PAPR | The 14x17 inch paper supply magazine is empty. | 14x17 paper supply empty. | <None>/interact |
| EMPTY 24X24 | The 24x24 inch film supply magazine is empty. | 24x24 film supply empty. | <None>/interact |
| EMPTY 24X24 BLUE | The 24x24 inch blue film supply magazine is empty. | 24x24 blue film supply empty. | <None>/interact |
| EMPTY 24X24 CLR | The 24x24 inch clear film supply magazine is empty. | 24x24 clear film supply empty. | <None>/interact |
| EMPTY 24X24 PAPR | The 24x24 inch paper supply magazine is empty. | 24x24 paper supply empty | <None>/interact |
| EMPTY 24X30 | The 24x30 inch film supply magazine is empty. | 24x30 film supply empty. | <None>/interact |
| EMPTY 24X30 BLUE | The 24x30 inch blue film supply magazine is empty. | 24x30 blue film supply empty. | <None>/interact |
| EMPTY 24X30 CLR | The 24x30 inch clear film supply magazine is empty. | 24x30 clear film supply empty. | <None>/interact |
| EMPTY 24X30 PAPR | The 24x30 inch paper supply magazine is empty. | 24x30 paper supply empty. | <None>/interact |
| EMPTY A4 PAPR | The A4 paper supply magazine is empty. | A4 paper supply empty | <None>/interact |
| EMPTY A4 TRANS | The A4 transparency supply magazine is empty. | A4 transparency supply empty. | <None>/interact |
| EXPOSURE FAILURE | The exposure device has failed due to some unspecified reason. | Exposure device has failed. | <None>/interact |
| FILM JAM | A film transport error has occurred and a film is jammed in the printer or processor. | Film jam. | <None>/interact |
| FILM TRANSP ERR | There is a malfunction with the film transport, there may or may not be a film jam. | Film transport problem. | <None>/interact |
| FINISHER EMPTY | The finisher is empty. | Finisher is empty. | <None>/interact |
| FINISHER ERROR | The finisher is not operating due to some unspecified reason | Finisher problem. | <None>/interact |
| FINISHER LOW | The finisher is low on supplies. | Finisher low. | <None>/interact |
| LOW 8X10 | The 8x10 inch film supply magazine is low. | 8x10 film supply low. | <None>/interact |
| LOW 8X10 BLUE | The 8x10 inch blue film supply magazine is low. | 8x10 blue film supply low. | <None>/interact |
| LOW 8X10 CLR | The 8x10 inch clear film supply magazine is low. | 8x10 clear film supply low. | <None>/interact |
| LOW 8X10 PAPR | The 8x10 inch paper supply magazine is low. | 8x10 paper supply low. | <None>/interact |
| LOW 10X12 | The 10x12 inch film supply magazine is low. | 10x12 film supply low. | <None>/interact |

| Printer Status Info / Execution Status Info | Description | Message string visible in 'Status Bar' | Other action for UI / 'camera symbol' |
|---|---|---|---|
| LOW 10X12 BLUE | The 10x12 inch blue film supply magazine is low. | 10x12 blue film supply low. | <None>/interact |
| LOW 10X12 CLR | The 10x12 inch clear film supply magazine is low. | 10x12 clear film supply low. | <None>/interact |
| LOW 10X12 PAPR | The 10x12 inch paper supply magazine is low. | 10x12 paper supply low. | <None>/interact |
| LOW 10X14 | The 10x14 inch film supply magazine is low. | 10x14 film supply low. | <None>/interact |
| LOW 10X14 BLUE | The 10x14 inch blue film supply magazine is low. | 10x14 blue film supply low. | <None>/interact |
| LOW 10X14 CLR | The 10x14 inch clear film supply magazine is low. | 10x14 clear film supply low. | <None>/interact |
| LOW 10X14 PAPR | The 10x14 inch paper supply magazine is low. | 10x14 paper supply low. | <None>/interact |
| LOW 11X14 | The 11x14 inch film supply magazine is low. | 11x14 film supply low. | <None>/interact |
| LOW 11X14 BLUE | The 11x14 inch blue film supply magazine is low. | 11x14 blue film supply low. | <None>/interact |
| LOW 11X14 CLR | The 11x14 inch clear film supply magazine is low. | 11x14 clear film supply low. | <None>/interact |
| LOW 11X14 PAPR | The 11x14 inch paper supply magazine is low. | 11x14 paper supply low. | <None>/interact |
| LOW 14X14 | The 14x14 inch film supply magazine is low. | 14x14 film supply low. | <None>/interact |
| LOW 14X14 BLUE | The 14x14 inch blue film supply magazine is low. | 14x14 blue film supply low. | <None>/interact |
| LOW 14X14 CLR | The 14x14 inch clear film supply magazine is low. | 14x14 clear film supply low. | <None>/interact |
| LOW 14X14 PAPR | The 14x14 inch paper supply magazine is low. | 14x14 paper supply low. | <None>/interact |
| LOW 14X17 | The 14x17 inch film supply magazine is low. | 14x17 film supply low. | <None>/interact |
| LOW 14X17 BLUE | The 14x17 inch blue film supply magazine is low. | 14x17 blue film supply low. | <None>/interact |
| LOW 14X17 CLR | The 14x17 inch clear film supply magazine is low. | 14x17 clear film supply low. | <None>/interact |
| LOW 14X17 PAPR | The 14x17 inch paper supply magazine is low. | 14x17 paper supply low. | <None>/interact |
| LOW 24X24 | The 24x24 inch film supply magazine is low. | 24x24 film supply low. | <None>/interact |
| LOW 24X24 BLUE | The 24x24 inch blue film supply magazine is low. | 24x24 blue film supply low. | <None>/interact |
| LOW 24X24 CLR | The 24x24 inch clear film supply magazine is low. | 24x24 clear film supply low. | <None>/interact |
| LOW 24X24 PAPR | The 24x24 inch paper supply magazine is low. | 24x24 paper supply low. | <None>/interact |
| LOW 24X30 | The 24x30 inch film supply magazine is low. | 24x30 film supply low. | <None>/interact |
| LOW 24X30 BLUE | The 24x30 inch blue film supply magazine is low. | 24x30 blue film supply low. | <None>/interact |
| LOW 24X30 CLR | The 24x30 inch clear film supply magazine is low. | 24x30 clear film supply low. | <None>/interact |

| Printer Status Info / Execution Status Info | Description | Message string visible in 'Status Bar' | Other action for UI / 'camera symbol' |
|---|---|---|---|
| LOW 24X30 PAPR | The 24x30 inch paper supply magazine is low. | 24x30 paper supply low. | <None>/interact |
| LOW A4 PAPR | The A4 paper supply magazine is low. | A4 paper supply low. | <None>/interact |
| LOW A4 TRANS | The A4 transparency supply magazine is low. | A4 transparency supply low. | <None>/interact |
| NO RECEIVE MGZ | The film receive magazine is not available. | Film receiver not available. | <None>/interact |
| NO RIBBON | The ribbon cartridge needs to be replaced. | Replace ribbon cartridge. | <None>/interact |
| NO SUPPLY MGZ | The film supply magazine is not available. | Film supply not available. | <None>/interact |
| CHECK PRINTER | The printer is not ready at this time, operator intervention is required to make the printer available. | Check camera. | <None>/interact |
| CHECK PROC | The processor is not ready at this time, operator intervention is required to make the printer available. | Check processor. | <None>/interact |
| PRINTER DOWN | The printer is not operating due to some unspecified reason. | Camera down. | <None>/interact |
| PRINTER INIT | The printer is not ready at this time, it is expected to become available without intervention. For example, it may be in a normal warm-up state. | Camera initializing. | <None>/Idle |
| PRINTER OFFLINE | The printer has been disabled by an operator or service person. | Camera off-line. | <None>/interact |
| PROC DOWN | The processor is not operating due to some unspecified reason. | Processor down. | <None>/interact |
| PROC INIT | The processor is not ready at this time, it is expected to become available without intervention. For example, it may be in a normal warm-up state. | Processor initializing. | <None>/Idle |
| PROC OVERFLOW FL | Processor chemicals are approaching the overflow full mark. | Processor chemicals near overflow. | <None>/interact |
| PROC OVERFLOW HI | Processor chemicals have reached the overflow full mark. | Processor chemicals overflow. | <None>/interact |
| QUEUED | Print job in Queue | -- | <None>/Idle |
| RECEIVER FULL | The film receive magazine is full. | Receiver full. | <None>/interact |
| REQ MED NOT INST | The requested film, paper, or other media supply magazine is installed in the printer but may be available with operator intervention. | Install media supply. | <None>/interact |
| REQ MED NOT AVAI | The requested film, paper, or other media requested is not available on this printer. | Media supply not available on this camera. Queue stopped. Change camera. | Queue for this camera will be STOPPED/ Queue stopped |
| RIBBON ERROR | There is an unspecified problem with the print ribbon. | Error with print ribbon. | <None>/interact |
| SUPPLY EMPTY | The printer is out of film. | Camera out of film. | <None>/interact |
| SUPPLY LOW | The film supply is low. | Film supply low. | <None>/interact |

| Printer Status Info / Execution Status Info | Description | Message string visible in 'Status Bar' | Other action for UI / 'camera symbol' |
|---|---|---|---|
| UNKNOWN | There is an unspecified problem. | Unspecified problem with camera. | <None>/interact |

### 9.7.2 Additional DICOM Execution Status Information

Printer Status Info and Execution Status Info are defined terms and can therefore be extended or reduced by camera manufacturers. Therefore *syngo®* MR XA80A shall be flexible.

If any other printer status info or execution status info is received (as described in Table Table 99, *syngo®* MR XA80A will react as shown in the following table:

Table 99: Additional Printer Status Information

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

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