Siemens Magnetom Jazz
DICOM3 Conformance Statement
revision 1.1G

1. Introduction

1.1 General information and copyright

This document contains the description of the DICOM 3 implementation for the MR Image Storage SOP Class (SCU) and for the Basic Grayscale Print Management Meta SOP Class (SCU) on the Magnetom Jazz system.

Please note that this document can be changed at any time without notice. Siemens provides this documentation without warranty of any kind.

1.2 Document revision

Date	Revision	Diffusion
Apr. 11, 2002	1.1G	regular

This revision of the document is valid for MAGNETOM Jazz with Software Version Numaris Ortho up to VA22A.

1.3 Related documents

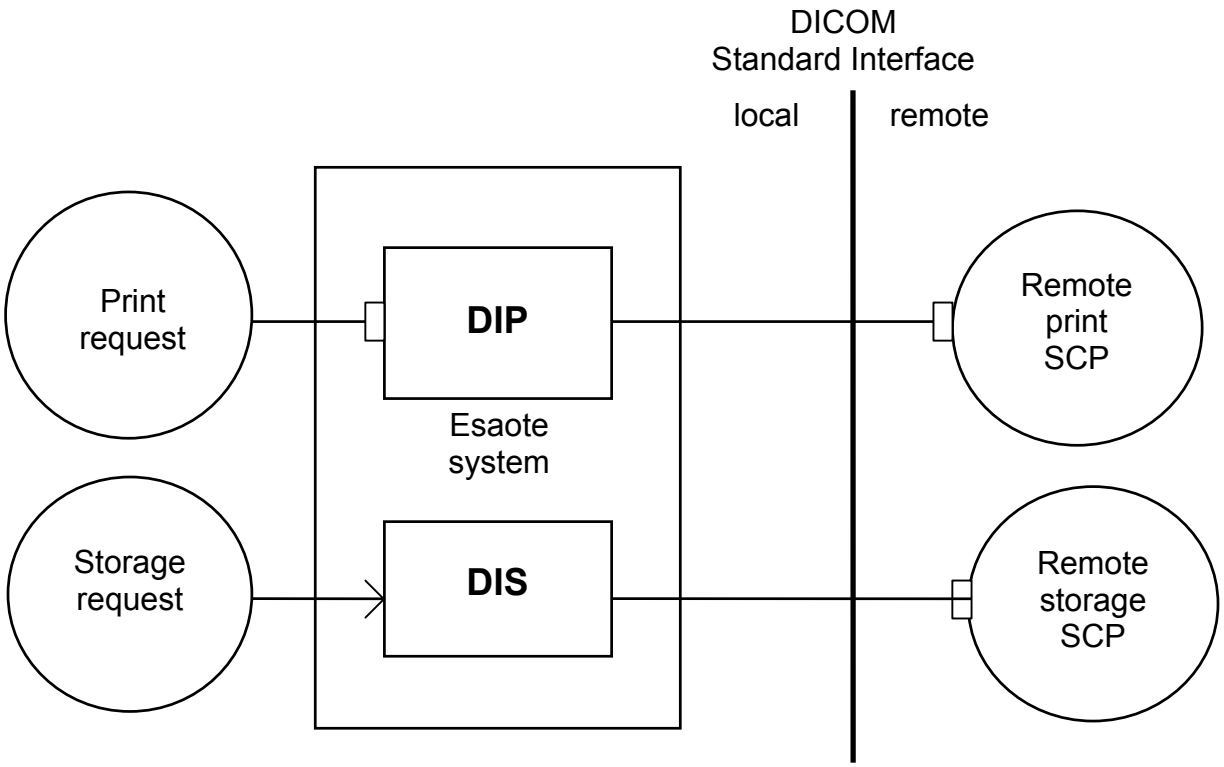
This implementation is based on the Digital Imaging and Communications in Medicine (DICOM) standard, parts 1-8 (NEMA PS 3.1-8, 1993 and following editions).

For the configuration and operation of the Magnetom Jazz see the User's and Service Manuals.

2. Implementation model

2.1 Application Data Flow Diagram

From the Operator Interface of the Magnetom Jazz the images can be given to an application called DIP (for *Dicom Image Print*) or to another called DIS (for *Dicom Image Store*) which respectively will take care of sending the image, or the images, to a printer or to a storage device. Both application when starting will look at some configuration files in order to get the needed information about network configuration, remote application data, etc.



2.2 Functional definitions of AE's

DIP will act as SCU sending images for printing to a remote SCP.
DIS will act as SCU sending images for storage to a remote SCP.

2.3 Sequencing of Real World Activities

A visualized image (or whatever contained in the left area of the screen, including the surrounding frame in case of single image display) can be frozen by the User; the User's Interface will queue it. When the number of images for the current Image Display Format is reached (or when the User requests this) DIP will send the images to the remote AE (a DICOM print device) and request to print the film (one sheet per session, in one or more copies).

A pool of images can be selected from the database of the system; DIS will send them to the remote AE (a DICOM storage device) to be stored.

3. AE specifications

3.1 Class Name - Specification

DIP provides Standard Conformance to the following DICOM V3.0 SOP Classes as SCU:

SOP Class Name	SOP Class UID
Basic Grayscale Print Management Meta SOP Class	**1.2.840.10008.5.1.1.9**
Basic Film Session SOP Class	**1.2.840.10008.5.1.1.1**
Basic Film Box SOP Class	**1.2.840.10008.5.1.1.2**
Basic Grayscale Image Box SOP Class	**1.2.840.10008.5.1.1.4**
Printer SOP Class	**1.2.840.10008.5.1.1.16**

DIS provides Standard Conformance to the following DICOM V3.0 SOP Class as SCU:

SOP Class Name	SOP Class UID
MR Image Storage SOP Class	**1.2.840.10008.5.1.4.1.1.4**

3.1.1 Association Establishment Policies

3.1.1.1 General

DIP during a session will perform the following actions:

```
A-ASSOCIATE-RQ
N-CREATE-RQ (BASIC FILM SESSION SOP Instance)
N-CREATE-RQ (BASIC FILM BOX SOP Instance)
for (each image of the film)
(
   N-SET-RQ (BASIC GRAYSCALE IMAGE BOX SOP Instance)
)
N-ACTION-RQ (PRINT, BASIC FILM BOX SOP Instance)
A-RELEASE-RQ
```

DIS during a session will perform the following actions:

```
A-ASSOCIATE-RQ
for (each image of list)
(
   C-STORE-RQ (MR Image Storage SOP Instance)
)
A-RELEASE-RQ
```

The maximum PDU size accepted by DIP and DIS is 65280 bytes. The maximum PDU size offered by DIP and DIS is 65536 bytes.

3.1.1.2 Number of Associations

DIP and DIS will attempt only one association establishment at a time.

3.1.1.3 Asynchronous nature

DIP will only send the images for a single Film Box on an association.
DIS will send one or more images on an association.

3.1.1.4 Implementation Identifying Information

Both DIP and DIS will have the same Implementation Identifying Information: the following table contains the information for the various software releases.

Software releases	**Conformance Statement revision**	**Implementation Class UID**	**Implementation Version Name**
VA12A	1.1B	1.3.76.2.1.1.1.5	EOB_MRI_SOL_6.1C
VA13A	1.1D	1.3.76.2.1.1.1.7	EOB_MRI_SOL_6.3
VA21A	1.1F	1.3.76.2.1.1.1.9	EOB_MRI_SOL_7.1
VA22A	1.1G	1.3.76.2.1.1.1.9	EOB_MRI_SOL_7.3

3.1.2 Association initiation policy

DIP will attempt to initiate a new association for each film to be printed (in one or more copies).
DIS will attempt to initiate a new association for each group of selected MR images to be stored.

3.1.2.1 Image encoded with Implicit VR

Transfer of the image for printing or storing is encoded with implicit VR little endian.

3.1.2.1.1 Associated Real World Activity

The associated Real-World activity is the attempt to transfer a file which is encoded with implicit VR.

3.1.2.1.2 Proposed Presentation Contexts for AE

DIP and DIS will only propose a single Presentation Context as shown in the table below. The Presentation Context will use the SOP Class UID specified in the header of the file as the proposed Abstract Syntax and the DICOM Implicit VR as the proposed Transfer Syntax.

Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	*UID*	*Name List*	*UID List*		
See Above	See Above	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

3.1.2.1.3 Storage Service Class SCU Conformance

See section 8 (Annex A) for optional elements of the MR Image IOD. Extended negotiation is not supported.

In case of unsuccessful C-STORE response or in case of warning status received in response to a C-STORE request, the following images will be sent anyway; the User will be warned that some problem occurred in the image sending to the Dicom Workstation, and the system log file will contain the Service Status Reply for each failed C-STORE request.

3.1.2.1.4 Print Management Classes SCU Conformance

See section 9 (Annex B) for the list of the supported SOP Class Attributes and range of values.

In case of unsuccessful responses or warnings the following data will be sent anyway; the User will be warned that some problem occurred in the image sending to the Dicom Printer, and the system log file will contain the Service Status Reply for each failed message.

When receiving an N-EVENT-REPORT for the Printer SOP Class with Event Type ID 2 (Warning) or 3 (Failure) the User will be warned that some problem occurred with the Dicom Printer, and the system log file will contain the data from the received message.

4. Communication profiles

4.1 Supported Communication Stacks

Both DIP and DIS provide DICOM V3.0 TCP/IP Network Communication Support.

4.1.1 API

DIP and DIS inherit the TCP/IP stack from the Unix Operating System of the machine, upon which they execute.

4.1.2 Physical media support

Ethernet 10-BASE 2 (thin wire), Ethernet 10-BASE T (unshielded twisted pair) or PPP modem connection.

5. Extensions/Specializations/Privatizations

5.1 AE Title

The following table provides, for the different software releases, the default Calling and Called AE Titles of DIP and DIS included in the A-ASSOCIATE-Request. The AE Titles can be configured.

Rel.	DIP Calling AE Title	DIS Calling AE Title	DIP Called AE Title	DIS Called AE Title
VA12A	E-MRI_SCANNER		PRINT_SCP	STORE_SCP
VA13A, VA21A, VA22A	E_MRI_SCANNER		PRINT_SCP	STORE_SCP

6. Configuration

6.1 Configurable Parameters

DIP and DIS will obtain information about network, printer, etc. from configuration files. These files can be modified by the Service Engineers, from the Service Operator Interface. Some parameters can be altered directly by the User from the Operator Interface. See the User's and the Service Manual of the machine.

7. Support of extended character set

None.

8. Annex A: MR Image IOD elements

This annex details the Information Object Definition attributes provided with the MR Image associated with the C-STORE-RQ operation for DIS.

The column "Type" is given for convenience only: its values are taken from PS 3.3. The column "AVM" (actual value multiplicity) shows the Value Multiplicity actually provided by DIS. Some attributes may have "0" (zero) in the AVM column (normally because these attributes are not known to our application): in this case

- type 2 attributes will be encoded with zero Value Length and no Value;
- type 3 attributes will not be included in the data.

For Type 2C attributes the value in the AVM column is for the case when the attribute is needed; otherwise the attribute will not be included in the data. All Type 2 and Type 3 attributes with AVM greater than 0 (unless noted) will be included in the data, even if their values are empty because the User did not filled this field for that particular image or scan or patient. The column "Values" gives the details on the values put in the various fields: words in italic are put verbatim in the fields.

The items indicated with ([1]) are present (or not null if type 2) from the software release VA13A; the items indicated with ([2]) are present (or not null if type 2) from the software release VA21A.

8.1 Patient module attributes

Attribute Name	Tag	Type	AVM	Values
Patient's Name	(0010,0010)	2	1	From the Patient Registration.
Patient ID	(0010,0020)	2	1	The patient code, from the Patient Registration.
Patient's Birth Date	(0010,0030)	2	1	From the Patient Registration.
Patient's Sex	(0010,0040)	2	1	*M* or *F*, from the Patient Registration.

8.2 General study module attributes

Attribute Name	Tag	Type	AVM	Values
Study Instance UID	(0020,000D)	1	1	
Study Date	(0008,0020)	2	1	The patient registration date.
Study Time	(0008,0030)	2	1	The patient registration time.
Referring Physician Name	(0008,0090)	2	0	Normally not known.
Study ID ([1])	(0020,0010)	2	0-1	A number uniquely identifying the study in the Jazz that produced it. It could be null for images acquired by older releases.
Accession Number ([2])	(0008,0050)	2	0	From the Patient Registration.
Name of Physician(s) Read.	(0008,1060)	3	0	Normally not known.

8.3 Patient study module attributes

Attribute Name	Tag	Type	AVM	Values
Admitting Diagnoses Descr.	(0008,1080)	3	0	Normally not known.

8.4 General series module attributes

Attribute Name	Tag	Type	AVM	Values
Modality	(0008,0060)	1	1	*MR*
Series Instance UID	(0020,000E)	1	1	
Series Number	(0020,0011)	2	1	The series number, starting from 1.
Laterality	(0020,0060)	2C	1	*L* or *R*, from the Patient Registration.
Series Date	(0008,0021)	3	1	
Series Description	(0008,103E)	3	1	
Body Part Examined	(0018,0015)	3	1	*ELBOW*, *KNEE*, *ANKLE*, *HAND*, *FOOT*, *LEG*, *SHOULDER*, *HIP*, *ARM* (defined terms); *THIGH*, *WRIST*, *FOREARM*, *OTHER* (implementation-defined terms).
Patient Position	(0018,5100)	2C	1	From the Patient Registration.

8.5 Frame of reference module attributes

Attribute Name	Tag	Type	AVM	Values
Frame of Ref. UID	(0020,0052)	1	1	
Position Reference Indicator	(0020,1040)	2	0	Not known.

8.6 General equipment module attributes

Attribute Name	Tag	Type	AVM	Values
Manufacturer	(0008,0070)	2	1	*ESAOTE*.
Institution Name	(0008,0080)	3	1	The Institute, from the Service Configuration.
Station Name	(0008,1010)	3	1	The System Name, from the Service Configuration.
Institutional Dept. Name	(0008,1040)	3	1	The Department, from the Service Configuration.
Manufacturer's Model	(0008,1090)	3	1	*MAGNETOM Jazz*.
Device Serial Num.	(0018,1000)	3	1	The System Code, from the Service Configuration.
Software Version(s)	(0018,1020)	3	1	The official software version.

8.7 General image module attributes

Attribute Name	Tag	Type	AVM	Values
Image Number	(0020,0013)	2	1	The image number shown in the system interface.
Acquisition Date	(0008,0022)	3	1	
Acquisition Time	(0008,0032)	3	1	
Derivation Description	(0008,2111)	3	0-1	Present for derived images that have been compressed with a JPEG lossy algorithm and then decompressed: *JPEG lossy compression (quantization factor = 200)*; this quantization factor corresponds to a mean compression factor of 95%.
Images in Acquisition	(0020,1002)	3	1	
Image Comments	(0020,4000)	3	1	
Lossy Image Compression	(0028,2110)	3	1	*00* or *01*.

8.8 Image plane module attributes

Attribute Name	Tag	Type	AVM	Values
Pixel Spacing	(0028,0030)	1	2	
Image Orientation	(0020,0037)	1	6	
Image Position	(0020,0032)	1	3	
Slice Thickness	(0018,0050)	2	1	
Slice Location	(0020,1041)	3	1	

8.9 Image pixel module attributes

Attribute Name	Tag	Type	AVM	Values
Rows	(0028,0010)	1	1	*256*.
Columns	(0028,0011)	1	1	*256*.
Bits Stored	(0028,0101)	1	1	*12*.
High Bit	(0028,0102)	1	1	*11*.
Pixel Representation	(0028,0103)	1	1	*0*.
Pixel Data	(7FE0,0010)	1	1	

8.10 Contrast/bolus module attributes (conditional)

Attribute Name	Tag	Type	AVM	Values
Contrast/Bolus Agent	(0018,0010)	2	1	*YES* if any, from the Patient Registration. Otherwise the entire module is not present.

8.11 MR image module attributes

Attribute Name	Tag	Type	AVM	Values
Image Type	(0008,0008)	1	2-3	The only defined term used for the third element (if present) is *MPR*.
Samples per Pixel	(0028,0002)	1	1	*1*.
Photometric Interpr.	(0028,0004)	1	1	*MONOCHROME2*.
Bits Allocated	(0028,0100)	1	1	*16*.
Scanning Sequence	(0018,0020)	1	1	According to the sequence.
Sequence Variant	(0018,0021)	1	1	According to the sequence.
Scan Options	(0018,0022)	2	0	Never present.
MR Acquisit. Type	(0018,0023)	2	1	
Repetition Time	(0018,0080)	2C	1	
Echo Time	(0018,0081)	2	1	
Echo Train Length	(0018,0091)	2	0	Not known.
Inversion Time	(0018,0082)	2C	1	
Trigger Time	(0018,1060)	2C	1	
Sequence Name	(0018,0024)	3	1	
Number of Averages	(0018,0083)	3	1	
Imaging Frequency	(0018,0084)	3	1	
Imaged Nucleus	(0018,0085)	3	1	*1H*.

Attribute Name	Tag	Type	AVM	Values
Echo Number(s)	(0018,0086)	3	1	
Spacing Between Slices	(0018,0088)	3	1	
Acquisition Matrix	(0018,1310)	3	4	
Flip Angle	(0018,1314)	3	1	
dB/dt	(0018,1318)	3	0-1	Present only if above the threshold value.

8.12 VOI LUT module attributes

Attribute Name	Tag	Type	AVM	Values
Window Center	(0028,1050)	3	1	
Window Width	(0028,1051)	1C	1	

8.13 SOP Common module attributes

Attribute Name	Tag	Type	AVM	Values
SOP Class UID	(0008,0016)	1	1	MR Image Storage SOP Class
SOP Instance UID	(0008,0018)	1	1	

9. Annex B: Print Management Attributes

This annex details the attributes provided with the IOD associated with the Print Management Meta SOP Class.

The column “Values” gives the details on the possible values that can be sent for the various fields: italic words are sent verbatim. The items indicated with ([A]) can be omitted from the IOD if their configuration tool is set to the “Not sent” conventional value (they are not mandatory for the SCU). For configurable values the column “Default” shows the default value.

9.1 Basic Grayscale Film Session N-CREATE attributes

Attribute Name	Tag	Values	Default
Number of Copies	(2000,0010)	Can be set by the User from *1* to *999*.	1
Print Priority	(2000,0020)	*MED*	
Medium Type ([A])	(2000,0030)	Set by the Service. If empty it means “Not sent”.	Not sent (CLEAR FILM before release VA13A).
Film Destination ([A])	(2000,0040)	Set by the Service. If empty it means “Not sent”.	Not sent (PROCESSOR before release VA13A).
Film Session Label ([A])	(2000,0050)	Set by the Service. If empty it means “Not sent”.	Not sent (“E-MRI Scanner” before release VA13A)

9.2 Basic Grayscale Film Box N-CREATE attributes

Attribute Name	Tag	Values	Default
Image Display Format	(2010,0010)	Set by the User among *STANDARD\2,3*; *STANDARD\3,3*; *STANDARD\3,4*; *STANDARD\4,4*; *STANDARD\4,5*.	STANDARD\3,4
Referenced Film Session Sequence	(2010,0500)	Calculated by the application.	
> Referenced SOP Class UID	(0008,1150)	Calculated by the application.	
> Referenced SOP Instance UID	(0008,1155)	Calculated by the application.	
Referenced Image Box Sequence	(2010,0510)	Calculated by the application.	
> Referenced SOP Class UID	(0008,1150)	Calculated by the application.	

Attribute Name	Tag	Values	Default
> Referenced SOP Instance UID	(0008,1155)	Calculated by the application.	
Film Orientation (^{A})	(2010,0040)	Set by the Service among *PORTRAIT* and *LANDSCAPE*. Starting with the release VA13A it can be also set to “Not sent”.	Not sent (PORTRAIT before release VA13A)
Film Size ID (^{A})	(2010,0050)	Set by the User among *8INX10IN*, *14INX17IN* and a custom value set by the Service. If the custom value is empty it means “Not sent”.	14INX17IN
Magnification Type (^{A})	(2010,0060)	Set by the Service. If empty it means “Not sent”.	Not sent (BILINEAR before release VA13A)
Smoothing Type (^{A})	(2010,0080)	Set by the Service. If empty it means “Not sent”.	Not sent (NORMAL before release VA13A)
Border Density (^{A})	(2010,0100)	Set by the Service. If empty it means “Not sent”.	Not sent (BLACK before release VA13A)
Empty Image Density (^{A})	(2010,0110)	Set by the Service. If empty it means “Not sent”.	Not sent (BLACK before release VA13A)
Min Density (^{A})	(2010,0120)	Set by the Service from 0 to 65535. Starting with the release VA13A it can be also set to “-1” to mean “Not sent”.	Not sent (10 before release VA13A)
Max Density (^{A})	(2010,0130)	Set by the Service from 0 to 65535. Starting with the release VA13A it can be also set to “-1” to mean “Not sent”.	Do not send (400 before release VA13A)
Trim (^{A})	(2010,0140)	Set by the Service among *YES* and *NO*[1]. Starting with the release VA13A it can be also set to “Not sent”.	Not sent (NO before release VA13A)
Configuration Information (^{A})	(2010,0150)	Set by the Service. If empty it means “Not sent”.	Not sent

[1] Even when the Trim is set to “NO” the not empty images will have a surrounding frame, because they are produced freezing the left part of the screen, that includes the white border.

9.3 Basic Grayscale Image Box N-SET attributes

Attribute Name	Tag	Values	Default
Image Position	(2020,0010)	Calculated by the application from upper left to lower right.	
Preformatted Grayscale Image Sequence	(2020,0110)	Calculated by the application.	
> Samples per pixel	(0028,0002)	*1*	
> Photometric Interpretation	(0028,0004)	*MONOCHROME2*	
> Rows	(0028,0010)	*480*	
> Columns	(0028,0011)	*512*	
> Pixel Aspect Ration	(0028,0034)	*1\1*	
> Bits Allocated	(0028,0100)	*8*	
> Bits Stored	(0028,0101)	*8*	
> High Bit	(0028,0102)	*7*	
> Pixel Representation	(0028,0103)	*7*	
> Pixel Data	(7FE0,0010)	Calculated by the application.	