



DICOM Conformance Statement

MEL 90

Version 4.3

Carl Zeiss Meditec AG

Goeschwitzer Strasse 51-52

07745 Jena

Germany

www.zeiss.com/med

1 Conformance Statement Overview

The MEL 90 by Carl Zeiss Meditec was developed for use in refractive surgery based upon corneal tissue ablation using a short-pulsed excimer laser with a wavelength of 193 nm.

The primary intended use is to alter the form of the cornea by removing corneal tissue to achieve an improvement in visual acuity.

The MEL 90 is designed for refractive corneal surgery using LASIK (Laser (-assisted) in Situ Keratomileusis) and PRK (PhotoRefractive Keratectomy) treatment techniques. It can also be used to carry out superficial therapeutic PTK (PhotoTherapeutic Keratectomy). LASIK and PRK treatments can be used to correct myopia within a range of 0 D to -12 D plus up to -3 D astigmatism and hyperopia within a range of 0 D to +3 D including +3 D astigmatism.

The MEL 90 Application Software consists of one application entity which allows to:

- create new patient entries
- query patients and studies
- create new refractive surgery planning data
- import refractive surgery planning data
- perform refractive surgery
- archive refractive surgery planning data
- archive refractive surgery evidence data

This document is structured as suggested in the DICOM Standard (PS 3.2: Conformance).

Table 1-1 Network Services Supported

| SOP Classes | User of Service (SCU) | Provider of Service (SCP) |
|--|-----------------------|---------------------------|
| Transfer | | |
| Raw Data Storage | Yes | Yes |
| Video Photographic Image Storage | Yes | No |
| Encapsulated PDF Storage | Yes | No |
| Workflow Management | | |
| Verification | Yes | Yes |
| Storage Commitment Push Model SOP Class | Yes | No |
| Query / Retrieve | | |
| Patient Root Query/Retrieve Information Model – FIND | Yes | No |
| Study Root Query/Retrieve Information Model – MOVE | Yes | No |

The MEL 90 Application does not support Media Interchange.

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3 Introduction

3.1 Revision History

| Document Version | Date | Changes |
|----------------------|------------|------------------|
| Software version 4.3 | | |
| 0000062992-01 | 2021-06-21 | Initial revision |

3.2 Audience

This document is written for the people that need to understand how MEL 90 will integrate into their healthcare facility. This includes both those responsible for overall imaging network policy and architecture, as well as integrators who need to have a detailed understanding of the DICOM features of the product. This document contains some basic DICOM definitions so that any reader may understand how this product implements DICOM features. However, integrators are expected to fully understand all the DICOM terminology, how the tables in this document relate to the product's functionality, and how that functionality integrates with other devices that support compatible DICOM features.

3.3 Remarks

The scope of this DICOM Conformance Statement is to facilitate integration between MEL 90 and other DICOM products. The Conformance Statement should be read and understood in conjunction with the DICOM Standard. DICOM by itself does not guarantee interoperability. The Conformance Statement does, however, facilitate a first-level comparison for interoperability between different applications supporting compatible DICOM functionality.

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

- The comparison of different Conformance Statements is just the first step towards assessing interconnectivity and interoperability between the product 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.

3.4 Definitions and Terms

Informal definitions are provided for the following terms used in this Conformance Statement. The DICOM Standard is the authoritative source for formal definitions of these terms.

Abstract Syntax

The information agreed to be exchanged between applications, generally equivalent to a Service/Object Pair (SOP) Class.

Examples: Verification SOP Class, Modality Worklist Information Model Find SOP Class, Computed Radiography Image Storage SOP Class.

Application Entity (AE)

An end point of a DICOM information exchange, including the DICOM network or media interface software; i.e., the software that sends or receives DICOM information objects or messages. A single device may have multiple Application Entities.

Application Entity Title

The externally known name of an Application Entity used to identify a DICOM application to other DICOM applications on the network.

Application Context

The specification of the type of communication used between Application Entities.

Example: DICOM network protocol.

Association

A network communication channel set up between Application Entities.

Attribute

A unit of information in an object definition; a data element identified by a tag. The information may be a complex data structure (Sequence), itself composed of lower level data elements.

Examples: Patient ID (0010,0020), Accession Number (0008,0050), Photometric Interpretation (0028,0004), Procedure Code Sequence (0008,1032).

Information Object Definition (IOD)

The specified set of Attributes that comprise a type of data object; does not represent a specific instance of the data object, but rather a class of similar data objects that have the same properties. The Attributes may be specified as Mandatory (Type 1), Required but possibly unknown (Type 2), or Optional (Type 3), and there may be conditions associated with the use of an Attribute (Types 1C and 2C).

Examples: MR Image IOD, CT Image IOD, Print Job IOD.

Joint Photographic Experts Group (JPEG)

A set of standardized image compression techniques, available for use by DICOM applications.

Media Application Profile

The specification of DICOM information objects and encoding exchanged on removable media (e.g., CDs)

Module

A set of Attributes within an Information Object Definition that are logically related to each other.

Example: Patient Module includes Patient Name, Patient ID, Patient Birth Date, and Patient Sex.

Negotiation

First phase of Association establishment that allows Application Entities to agree on the types of data to be exchanged and how that data will be encoded.

Presentation Context

The set of DICOM network services used over an Association, as negotiated between Application Entities; includes Abstract Syntaxes and Transfer Syntaxes.

Protocol Data Unit (PDU)

A packet (piece) of a DICOM message sent across the network. Devices must specify the maximum size packet they can receive for DICOM messages.

Query Key

An input value for a query process. Query Keys denote the set of DICOM tags that are sent from the SCU to SCP and thus control the query result.

Security Profile

A set of mechanisms, such as encryption, user authentication, or digital signatures, used by an Application Entity to ensure confidentiality, integrity, and/or availability of exchanged DICOM data

Service Class Provider (SCP)

Role of an Application Entity that provides a DICOM network service; typically, a server that performs operations requested by another Application Entity (Service Class User).

Examples: Picture Archiving and Communication System (image storage SCP, and image query/retrieve SCP), Radiology Information System (modality worklist SCP).

Service Class User (SCU)

Role of an Application Entity that uses a DICOM network service; typically, a client.

Examples: imaging modality (image storage SCU, and modality worklist SCU), imaging workstation (image query/retrieve SCU)

Service/Object Pair (SOP) Class

The specification of the network or media transfer (service) of a particular type of data (object); the fundamental unit of DICOM interoperability specification.

Examples: Ultrasound Image Storage Service, Basic Grayscale Print Management.

Service/Object Pair (SOP) Instance

An information object; a specific occurrence of information exchanged in a SOP Class.

Examples: a specific x-ray image.

Tag

A 32-bit identifier for a data element, represented as a pair of four digit hexadecimal numbers, the “group” and the “element”. If the “group” number is odd, the tag is for a private (manufacturer-specific) data element.

Examples: (0010,0020) [Patient ID], (07FE,0010) [Pixel Data], (0019,0210) [private data element]

Transfer Syntax

The encoding used for exchange of DICOM information objects and messages.

Examples: JPEG compressed (images), little endian explicit value representation.

Unique Identifier (UID)

A globally unique “dotted decimal” string that identifies a specific object or a class of objects; an ISO-8824 Object Identifier.

Examples: Study Instance UID, SOP Class UID, SOP Instance UID.

Value Representation (VR)

The format type of an individual DICOM data element, such as text, an integer, a person’s name, or a code. DICOM information objects can be transmitted with either explicit identification of the type of each data element (Explicit VR), or without explicit identification (Implicit VR); with Implicit VR, the receiving application must use a DICOM data dictionary to look up the format of each data element.

3.5 Abbreviations

Table 3-1 Abbreviations used in this document

| Abbreviation | Definition |
|--------------|---|
| ANAP | Attribute is not always present – Applicable for Type 3 |
| AE | Application Entity |
| AET | Application Entity Title |
| APP | Application |
| ARTIM | Association Request/Reject/Release Timer |
| AUTO | Automatically generated, cannot be modified by the operator |
| BRQ | Broad Query mode of Modality Worklist Query |
| CONFIG | Configurable parameter |
| CZM | Carl Zeiss Meditec |
| DEF | Default value |
| DICOM | Digital Imaging and Communications in Medicine |
| ELE | Explicit Little Endian |
| ILE | Implicit Little Endian |
| IM | Information Model |
| IOD | Information Object Definition |
| JPG-1 | JPEG Coding Process 1 transfer syntax; JPEG Baseline; ISO 10918-1 |

| | |
|-------------|--|
| JPG-LL | JPEG Lossless |
| J2K | JPEG 2000 Image Compression |
| J2K-LL | JPEG 2000 Image Compression (Lossless Only) |
| RLE-LL | Run Length Encoding Lossless |
| MPPS | Modality Performed Procedure Step |
| MWL | Modality Worklist |
| MPG2 | Motion Picture Expert Group 2; Abbreviation and synonym for video encoding and compression transfer syntax. |
| MPG2 – ML | MPEG2 Main Profile @ Main Level |
| MPG2 – HL | MPEG2 Main Profile @ High Level |
| MPEG4-HL4.1 | MPEG4 AVC/H.264 High Profile / Level 4.1 |
| OD | Oculus Dexter, the right eye |
| OS | Oculus Sinister, the left eye |
| OU | Oculus Uterque, both eyes |
| OP | Ophthalmic Photography |
| PBQ | Patient Based Query mode of Modality Worklist Query |
| PL | Pick list |
| PLD | Pick list item details |
| PRQ | Patient Root Query |
| RIS | Radiology Information System |
| RNG | Range of values |
| SCP | Service Class Provider |
| SCU | Service Class User |
| SEL | Selection from a list of values |
| SOP | Service Object Pair, union of a specific DICOM service and related IOD. |
| SRQ | Study Root Query |
| TCP/IP | Transmission Control Protocol / Internet Protocol |
| UID | Unique Identifier |
| USER | User input |
| VNAP | Value Not Always Present (attribute sent zero length if no value is present) – Applicable for Type 2, 2C. |

3.6 References

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

Integrating the Healthcare Enterprise (IHE) EYECARE Technical Framework, rev 4.0, 2016 (available free at http://www.ihe.net/Technical_Framework/index.cfm).

4 Networking

4.1 Implementation Model

4.1.1 Application Data Flow

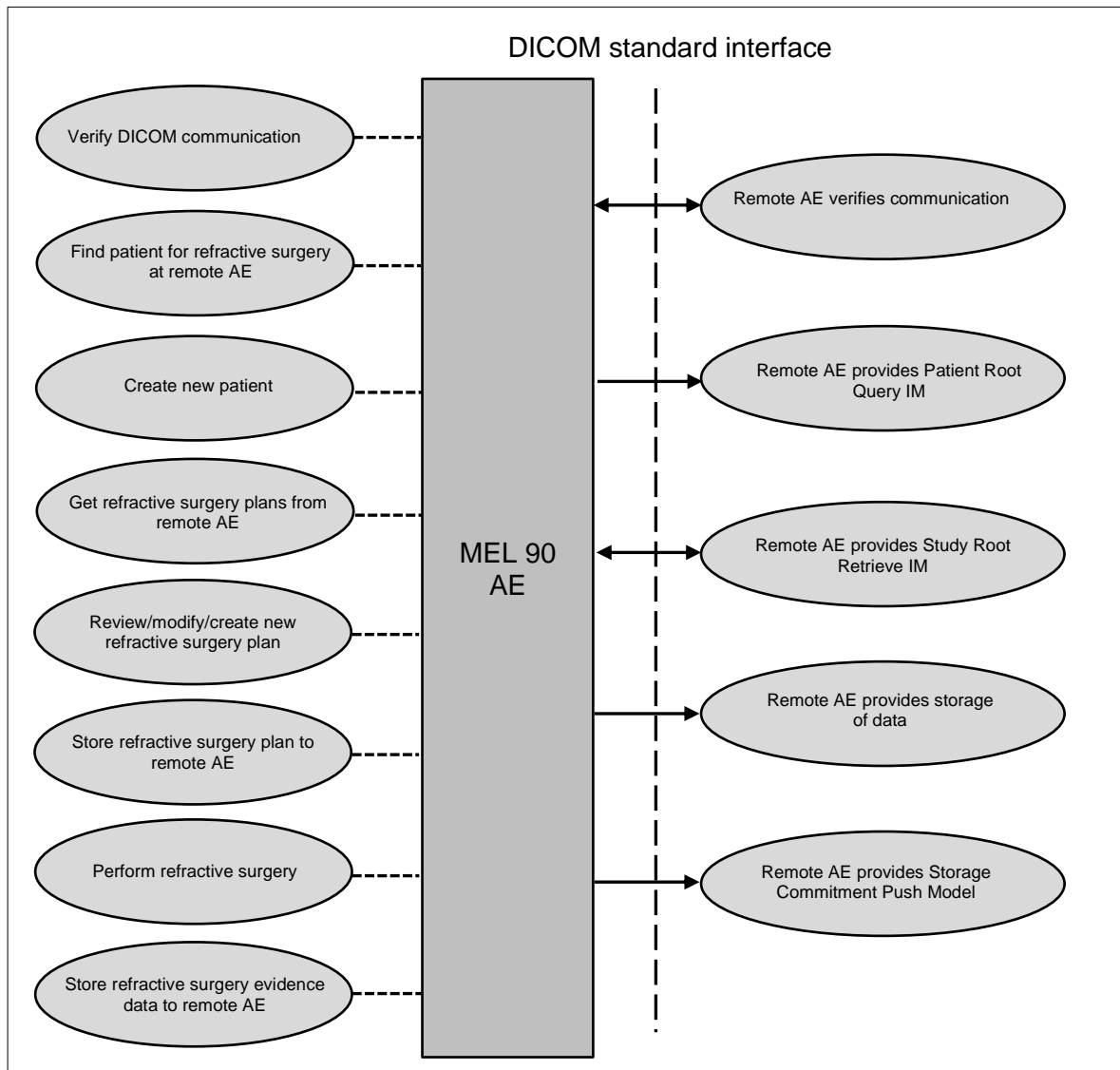


Figure 4-1 Application Data Flow

4.1.2 Functional Definition of AEs

4.1.2.1 Functional Definition of MEL 90

The MEL 90 by Carl Zeiss Meditec was developed for use in refractive surgery based upon corneal tissue ablation using a short-pulsed excimer laser with a wavelength of 193 nm.

The primary intended use is to alter the form of the cornea by removing corneal tissue to achieve an improvement in visual acuity.

The MEL 90 is designed for refractive corneal surgery using LASIK (Laser (-assisted) in Situ Keratomileusis) and PRK (PhotoRefractive Keratectomy) treatment techniques. It can also be used to carry out superficial therapeutic PTK (PhotoTherapeutic Keratectomy). LASIK and PRK treatments can

be used to correct myopia within a range of 0 D to -12 D plus up to -3 D astigmatism and hyperopia within a range of 0 D to +3 D including +3 D astigmatism.

The MEL 90 Application Software consists of one application entity which allows to:

- create new patient entries
- query patients and studies
- create new refractive surgery planning data
- import refractive surgery planning data
- perform refractive surgery
- archive refractive surgery planning data
- archive refractive surgery evidence data

MEL 90 implements a Service Class User (SCU) for the following DICOM Services:

- Verification
- Patient Root Query/Retrieve Information Model – FIND
- Study Root Query/Retrieve Information Model – MOVE
- Raw Data Storage
- Video Photographic Image Storage
- Encapsulated PDF Storage
- Storage Commitment Push Model

MEL 90 implements a Service Class Provider (SCP) for the following DICOM Services:

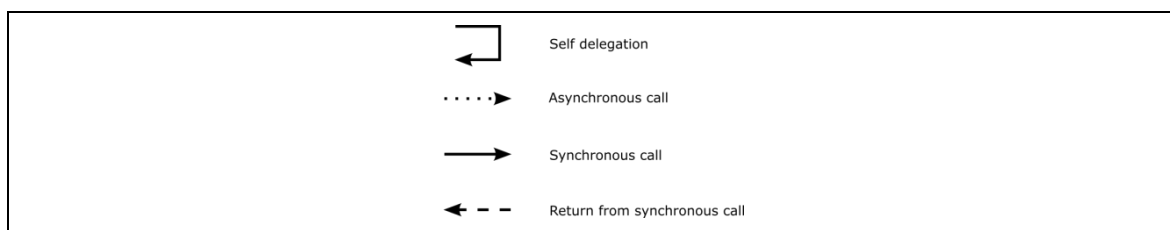
- Verification
- Raw Data Storage

All DICOM functionalities have been integrated into the application user interface and will not require any manual invoking of DICOM specific user interface.

The MEL 90 Application Software logs extensive information about the DICOM operations to its log file.

4.1.3 Sequencing of Real-World Activities

To realize the real-world activities, the different entities work together. The sequence diagrams shall depict the intended workflow.



The diagrams use slightly modified UML symbols. The asynchronous call is not depicted as suggested in UML. Some objects do have more than one dashed line. It symbolizes more than one thread.

4.1.3.1 MEL 90 Activities

Find patient for refractive surgery at remote AE

The operator can search patients stored at a remote AE and can enter search criteria for patient's name and ID as well as date of birth and performing physician. Furthermore, the operator can limit the results to those patients for which surgery plans are available at the remote AE that are appropriate for the MEL 90 and not have been performed yet. The MEL 90 application performs a Patient Root Query accordingly and displays a picklist with the results.

The operator can select one or more patients to be imported for refractive surgery with MEL 90.

Create new patient

Optionally, the operator might decide to create a new patient entry for refractive surgery. The MEL 90 application provides a UI for entering patient identification and demographic data and stores the entered data locally. This new patient entry is then selected for refractive surgery.

This activity has no direct relation to DICOM messaging.

Import patient(s) for refractive surgery from remote AE

After selecting one or more patients from the pick list, the operator can press "Import" to trigger this activity. For each selected patient, the MEL 90 application searches remote AE for any existing refractive surgery planning and summary data associated with the selected patient. Based on the query responses, the MEL 90 application tries to identify the most recent planning that has no related surgery summary for each eye side. If such surgery planning instance exists, these will get imported automatically from the remote AE by performing a DICOM retrieve operation.

Retrieved patient and, if available, surgery planning data is then stored to the local database.

Review/modify/create new refractive surgery plan

The operator can then select a locally stored patient for refractive surgery. Depending on whether an appropriate surgery plan has been retrieved, the operator can review and optionally modify the planned surgery parameters. Alternatively, the operator can create a new surgery plan. The MEL 90 application software supports the operator by instantly validating the clinical correctness of any surgery parameter. If done, the operator can either choose to store the plan or to discard the entered parameters.

This activity creates a refractive surgery plan for each modified or new planning which might become subject of the activity "Store refractive surgery plan to remote AE".

This activity has no direct relation to DICOM messaging.

Store refractive surgery plan to remote AE

This activity can be invoked manually by the operator by pressing "Save" from the planning screen. The application software transfers for each eye side planned for refractive surgery one single Raw Data SOP instance to the configured remote Storage AE.

After successful storage these instances become subject of a subsequent request to the configured Storage Commitment Provider to take over responsibility on data persistence.

Depending on the type of surgery such planning SOP instance might have a direct relationship to another planning SOP instance. The application software keeps track of these relationships by utilizing Study, Series, Referenced Instances and Related Series attributes as follows.

- a) Planning predecessors are referenced by using the same Study and Series information and a Referenced Instance Sequence Item with the Purpose of Reference Code "REPLACEDPLAN" (see Figure 4-2 Single eye planning with predecessor)

- b) Combined plans (both eye sides have a strong relationship in terms of surgery parameters) are referenced by using the same Study information and a Referenced Instance Sequence Item with the Purpose of Reference Code "COMBINEDPLAN" (see Figure 4-3 Combined eye planning)
- c) In case a patient's eye is undergoing multiple types of surgery all planning instances using the same study information and referencing each other with a Related Series Sequence Item with the Purpose of Reference Code "COMBINEDSERIES" (see Figure 4-4 Multi-type surgery planning)

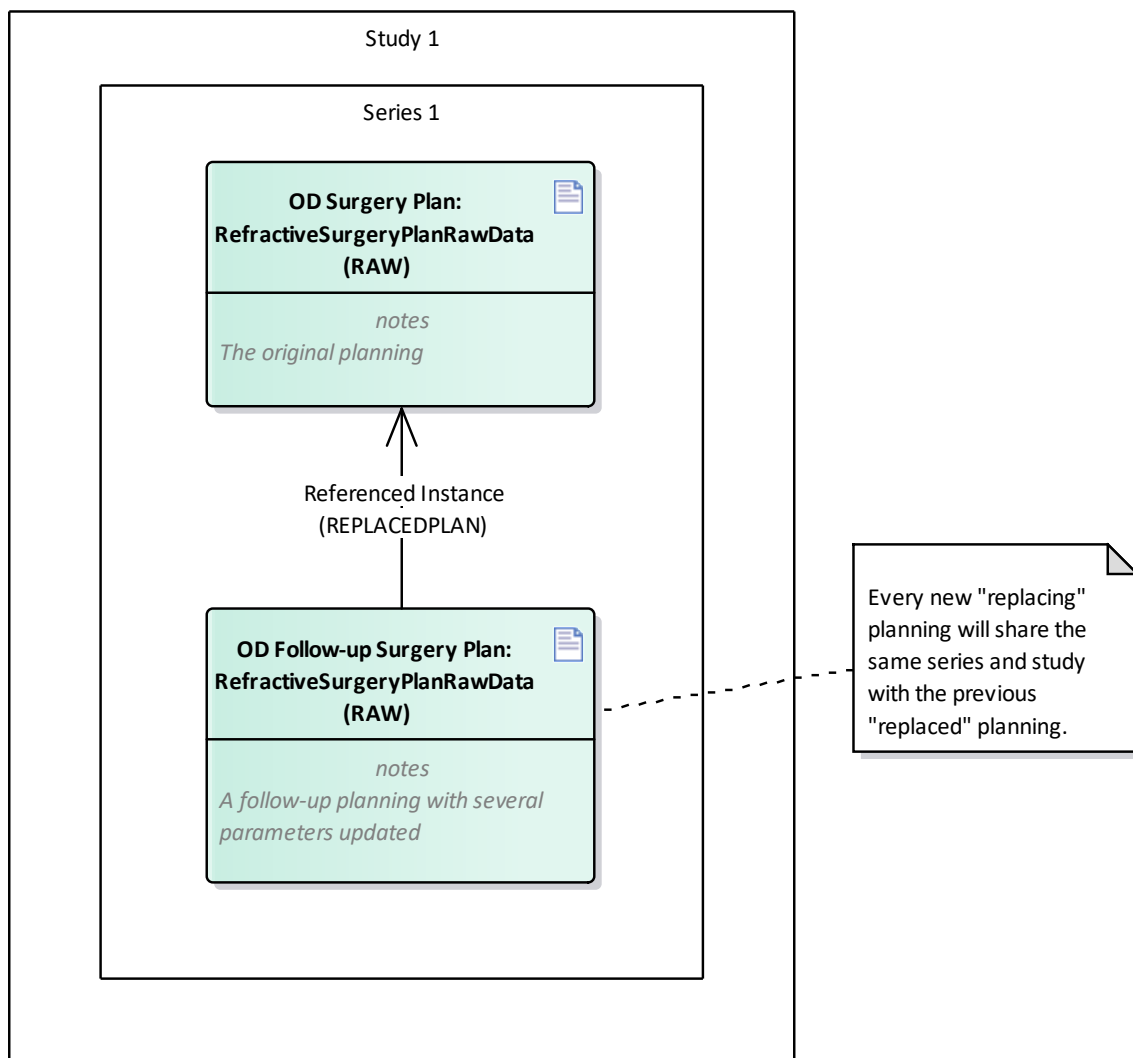


Figure 4-2 Single eye planning with predecessor

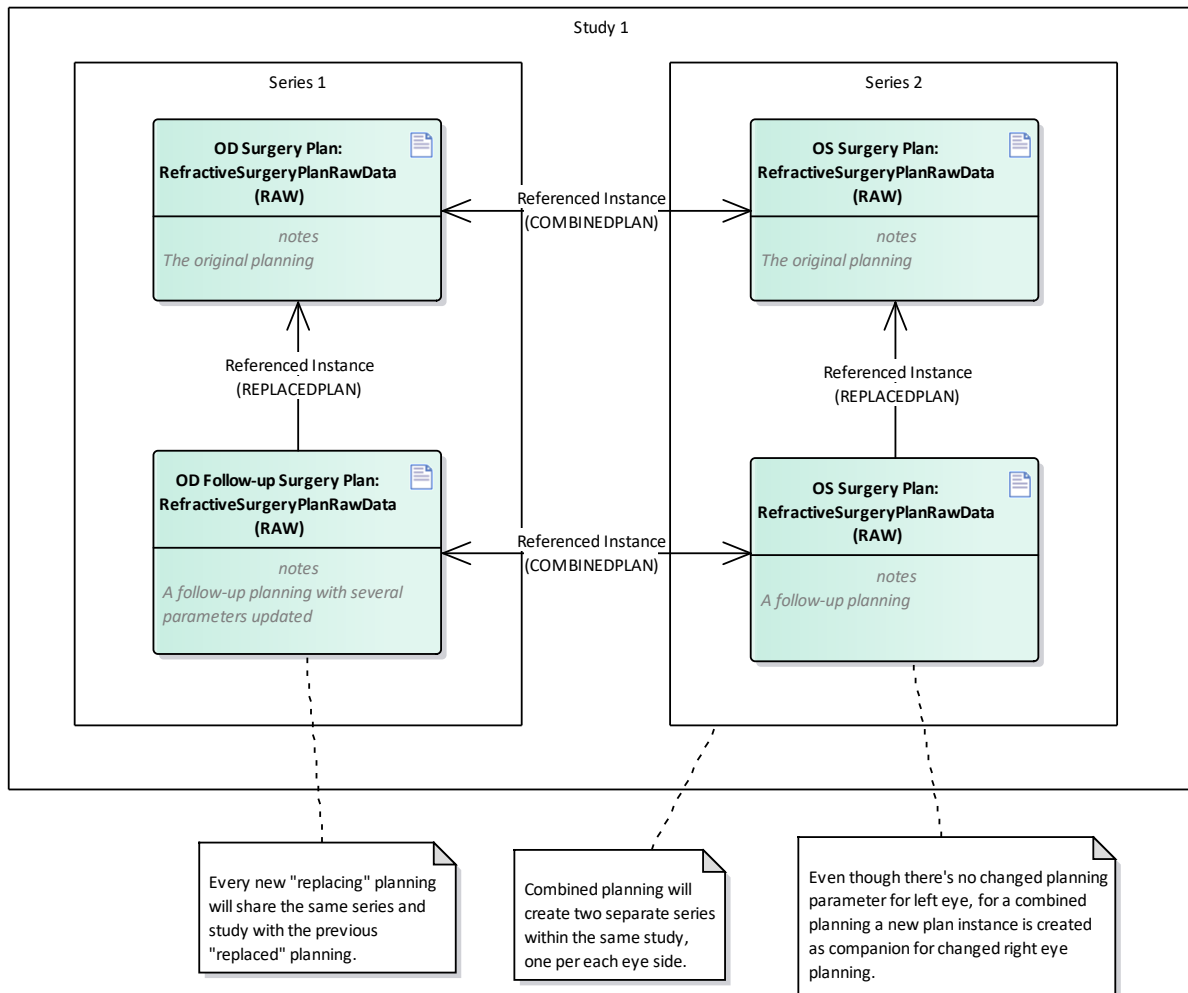


Figure 4-3 Combined eye planning

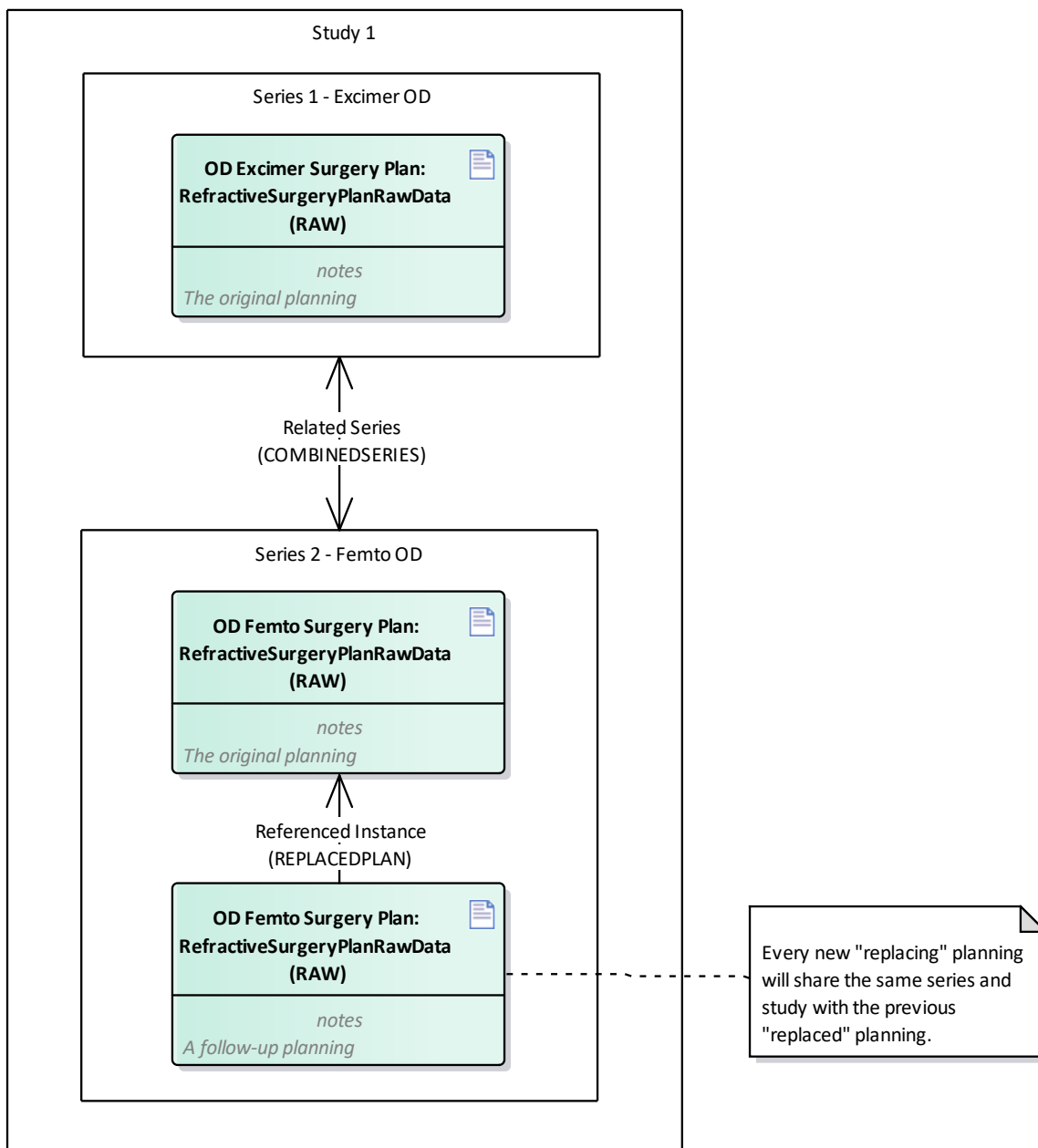


Figure 4-4 Multi-type surgery planning

Perform refractive surgery

Once all parameters are set and validated the operator can start a refractive surgery for either one or both patient's eyes. During this activity MEL 90 application creates surgery evidence data which might become subject of the activity "Export refractive surgery evidence data to remote AE".

This activity has no direct relation to DICOM messaging.

Export refractive surgery evidence data to remote AE

This activity can be invoked either manually by the operator by launching the "Patient export" screen or, if configured, automatically by the MEL 90 application at finishing the surgery.

Depending on user selection and configuration the application software transfers the data created during activity "Perform refractive surgery" to the configured remote Storage AE.

This includes

- 1..2 Refractive Surgery Summary Raw Data instances containing summary information for the performed refractive surgery (one per each eye side)
- 0..2 Encapsulated Pdf instances containing a refractive surgery report (one per each eye side)
- 0..n Video Photographic Image instances containing observation videos of the performed refractive surgery

After successful storage these instances become subject of a subsequent request to the configured Storage Commitment Provider to take over responsibility on data persistence.

The application software keeps track of relationship between evidence data SOP instances and surgery planning SOP instances belonging to the same procedure by utilizing Study, Series, Referenced Instances and Related Series attributes as follows.

- a) Associated planning SOP instances are referenced by using the same Study information and a Referenced Instance Sequence Item with the Purpose of Reference Code "APPLIEDPLAN" (see Figure 4-5 Combined eye surgery summary)
- b) Associated surgery report SOP instances are referenced by using the same Study information and a Referenced Instance Sequence Item with the Purpose of Reference Code "LVCREPORT" (see Figure 4-5 Combined eye surgery summary)
- c) Associated surgery report SOP instances are referenced by using the same Study information and a Referenced Instance Sequence Item with the Purpose of Reference Code "LVCVIDEO" (see Figure 4-5 Combined eye surgery summary)
- d) Combined eye surgery (both eye sides are undergoing surgery at the same session) might share the same evidence video (see Figure 4-5 Combined eye surgery summary)

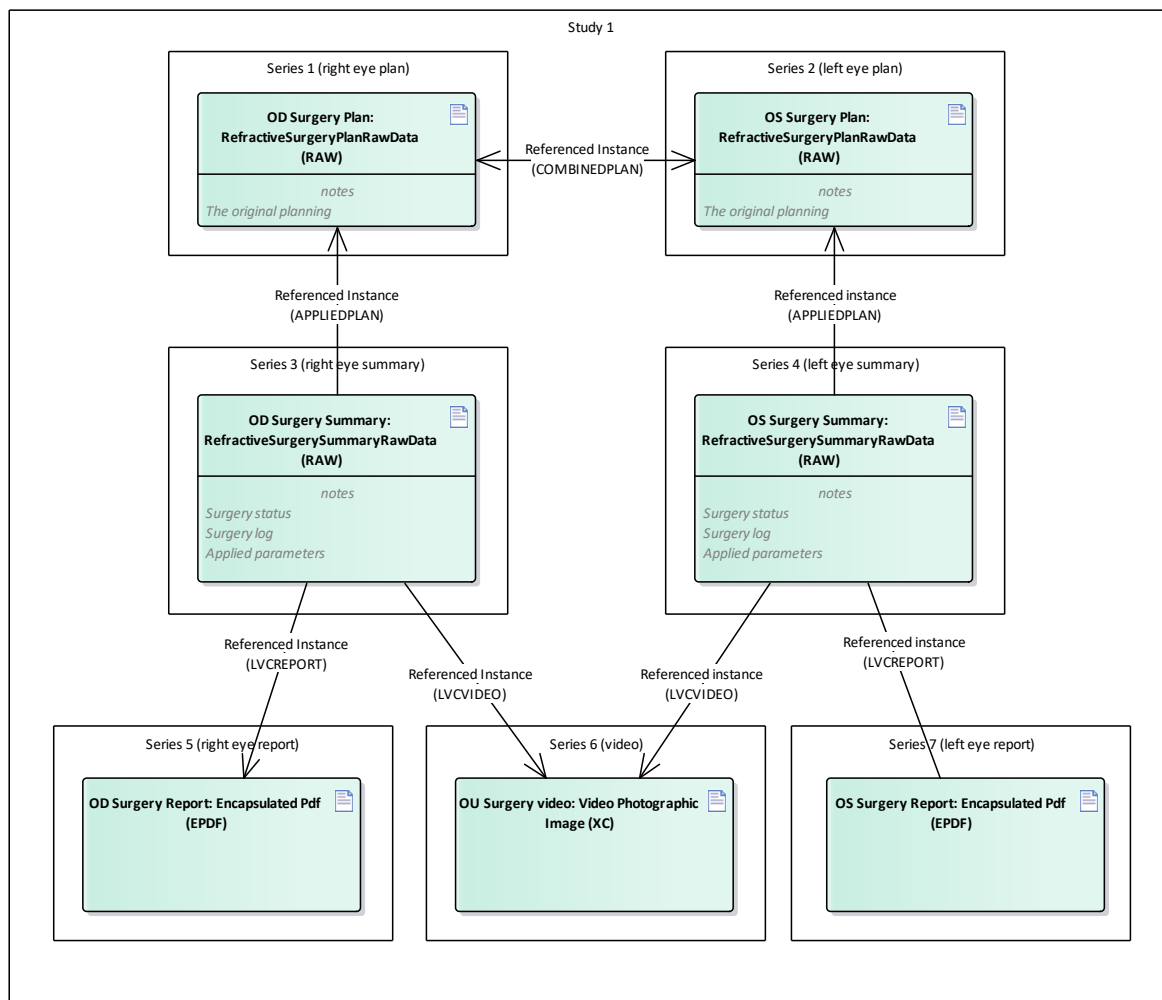


Figure 4-5 Combined eye surgery summary

4.1.3.2 Standard workflow

In the standard workflow the patient arrives at the MEL 90 while patient demographic data and, optionally, refractive surgery plans for one or both eyes are available at the remote AE. Patient can be searched by DICOM query and picked from patient result list by the operator. All patient identification and demographics as well as surgery planning data is queried and retrieved from the remote AE. Surgery planning parameters must be reviewed and can be modified before refractive surgery will be performed. After refractive surgery all created evidence data can be transferred to remote AE. This is the standard case for MEL 90.

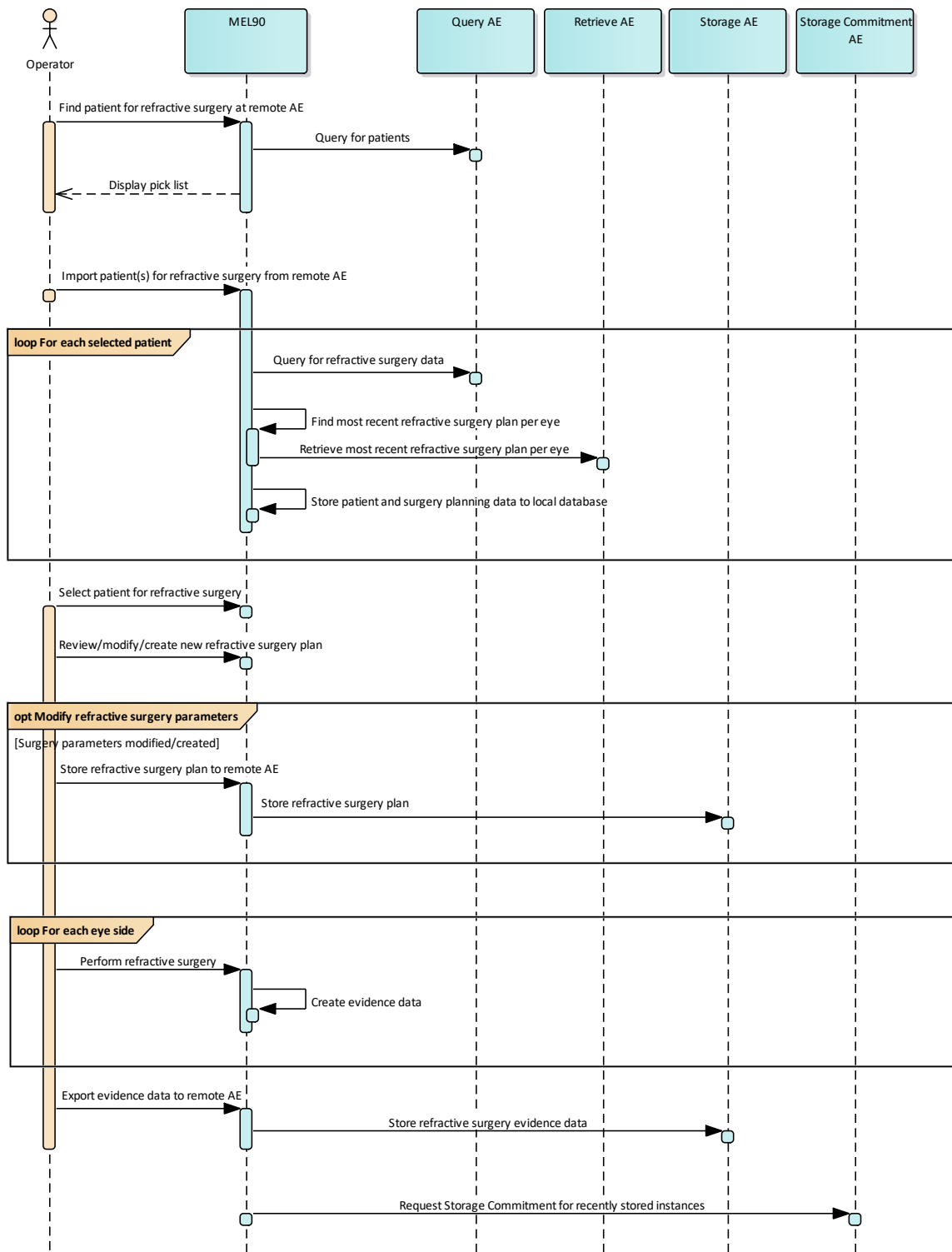


Figure 4-6 Standard workflow

4.2 AE Specifications

4.2.1 MEL 90 AE Specification

4.2.1.1 SOP Classes

Table 4-1 SOP Classes for MEL 90 AE

| SOP Class Name | SOP Class UID | SCU | SCP |
|---|----------------------------------|-----|-----|
| Verification | 1.2.840.10008.1.1 | Yes | Yes |
| Storage Commitment Push Model SOP Class | 1.2.840.10008.1.20.1 | Yes | No |
| Raw Data Storage | 1.2.840.10008.5.1.4.1.1.66 | Yes | Yes |
| Video Photographic Image Storage | 1.2.840.10008.5.1.4.1.1.77.1.4.1 | Yes | No |
| Encapsulated PDF Storage | 1.2.840.10008.5.1.4.1.1.104.1 | Yes | No |
| Patient Root Query/Retrieve Information Model - FIND | 1.2.840.10008.5.1.4.1.2.1.1 | Yes | No |
| Study Root Query/Retrieve Information Model - MOVE | 1.2.840.10008.5.1.4.1.2.2.2 | Yes | No |

4.2.1.2 Associations Policies

4.2.1.2.1 General

The DICOM standard Application Context Name for DICOM 3.0 is always proposed:

Table 4-2 DICOM Application Context

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

4.2.1.2.2 Number of Associations

The number of simultaneous associations depends on the usage profile. At a certain point of time there might be active simultaneously:

- 1 association for Verification
- 1 association for Storage
- 1 association for Storage Commitment
- 1 association for Query/Retrieve – FIND
- 1 association for Query/Retrieve – MOVE

Table 4-3 Number of associations

| | |
|---|----|
| Maximum number of simultaneous associations | 50 |
|---|----|

4.2.1.2.3 Asynchronous Nature

MEL 90 Application Software does not support asynchronous communication (multiple outstanding transactions over a single Association).

4.2.1.2.4 Implementation Identifying Information

Table 4-4 DICOM implementation class and version

| | |
|-----------------------------|---------------------|
| Implementation Class UID | 1.2.276.0.75.2.5.20 |
| Implementation Version Name | NIM-2.12.0 |

4.2.1.3 Association Initiation Policy

4.2.1.3.1 Activity - Verify Communication

4.2.1.3.1.1 Description and Sequencing of Activities

This activity is available during the configuration phase. It facilitates the setup and management of the DICOM Application Entities.

The user can test the application level communication between instrument's software Application Entity and its peer DICOM Application Entities. During one test call, all configured peer DICOM Application Entities are contacted.

In the association request MEL 90 Application Software proposes not only Verification SOP Class, but also all other SOP Classes as supported by the instrument's DICOM interface.

The association is established when the peer DICOM entity accepts the verification related presentation context. In a sub-subsequent step a C-ECHO message is exchanged.

The results of the "Verify Communication" activity are shown to the user as success or failure. For e. g. a Storage Provider not only the Verification information is evaluated, but also the acceptance of the proposed presentation context comprising the respective Storage SOP Classes.

4.2.1.3.1.2 Proposed Presentation Contexts

Following presentation contexts are offered for each initiated association. During this activity the Application Software uses only

- Verification with Transfer Syntax ILE as SCU

Table 4-5 Proposed Presentation Contexts for Activity Verify Communication

| Presentation Context Table | | | | | |
|---------------------------------------|---------------------------|-----------------|--------------------------------|-------------------|------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Ext. Neg. |
| Name | UID 1.2.840.10008. ... | Name List | UID List 1.2.840.10008. ... | | |
| Verification | 1.1 | ILE | 1.2 | BOTH | None |
| Storage Commitment Push Model | 1.20.1 | ILE | 1.2 | SCU | None |
| Raw Data Storage | 5.1.4.1.1.66 | ILE | 1.2 | BOTH ² | None |
| | | ELE | 1.2.1 | BOTH ² | None |
| Video Photographic Image Storage | 5.1.4.1.1.77.1.4.1 | MPG2-ML | 1.2.4.100 | SCU | None |
| Encapsulated PDF Storage | 5.1.4.1.1.104.1 | ILE | 1.2 | SCU | None |
| | | ELE | 1.2.1 | SCU | None |
| Patient Root Query/Retrieve IM – FIND | 5.1.4.1.2.1.1 | ILE | 1.2 | SCU | Yes ¹ |
| Study Root Query/Retrieve IM – MOVE | 5.1.4.1.2.2.2 | ILE | 1.2 | SCU | No |

Note 1: C-FIND extended negotiation is offered. Relational-query support is required by the SCP.

Note 2: Only acts as SCP when a C-Move-RQ was initiated first and this association is still open.

Table 4-6 Extended Negotiation as a SCU

| SOP Class Name | SOP Class UID | Extended Negotiation |
|---------------------------------------|-----------------------------|----------------------|
| Patient Root Query/Retrieve IM – FIND | 1.2.840.10008.5.1.4.1.2.1.1 | See Note 1 |

Note 1: Extended negotiation for relational queries is offered. Relational-query support by the SCP is required for successful Patient Root Queries issued by the MEL 90 AE.

4.2.1.3.1.3 SOP Specific Conformance for Verification SOP Class

The MEL 90 Application Software provides standard conformance.

4.2.1.3.2 Activity – Find patient for refractive surgery at remote AE

The operator can search patients stored at a remote AE to get imported for refractive surgery with MEL 90.

This activity is triggered by the operator by launching the “Import Patient” screen of the MEL 90 application. This screen provides options to enter search criteria for patient’s name and identification, patient’s date of birth and whether to search only for patients with refractive surgery plans stored at the remote AE. The MEL 90 application performs a Patient Root Query accordingly and displays a picklist with the results.

The operator can select one or more patients to get imported for refractive surgery with MEL 90.

4.2.1.3.2.1 Description and Sequencing of Activities

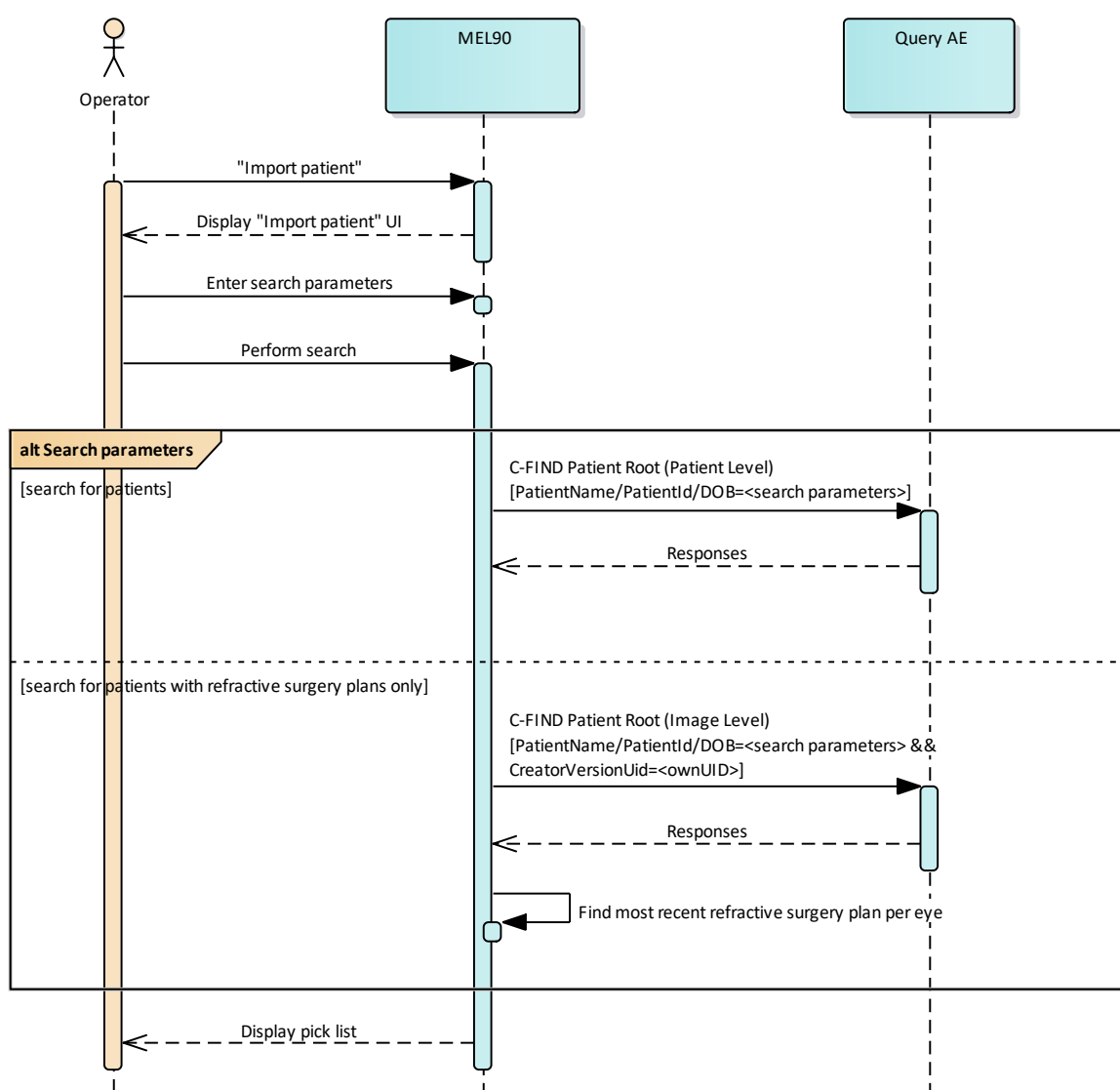


Figure 4-7 Find patient for refractive surgery at remote AE

Enter search parameters

Once the "Import patients" screen is launched, the operator can enter search criteria for patient's name, patient's ID and patient's date of birth as well as performing physician. Furthermore, the operator can select to limit the results to only those patients for which surgery plans are available at the remote AE that are appropriate for the MEL 90 and not have been performed yet.

Perform search

When the operator triggers "Perform search" the MEL 90 application software sends 3 consecutive Patient Root based DICOM C-FIND requests to the remote AE with the query keys used as follows.

Search for patient's last name (user entered "abc" to the Patient Name / ID search field):

- (0010,0010) Patient's Name [embedded in leading and trailing wildcards, here abc*]
- (0010,0030) Patient's Birth Date [as entered by operator]
- (0008,1050) Performing Physician's Name [as entered by operator]

Search for patient's first name (user entered "abc" to the Patient Name / ID search field):

- (0010,0010) Patient's Name [embedded in leading and trailing wildcards, here *^abc*]
- (0010,0030) Patient's Birth Date [as entered by operator]
- (0008,1050) Performing Physician's Name [as entered by operator]

Search for patient's ID (user entered "abc" to the Patient Name / ID search field):

- (0010,0020) Patient ID [embedded in leading and trailing wildcards, here abc*]
- (0010,0030) Patient's Birth Date [as entered by operator]
- (0008,1050) Performing Physician's Name [as entered by operator]

If operator enabled option to search for patients with surgery plans only the following query keys will be added to each query:

- (0008,0016) SOP Class UID [= "1.2.840.10008.5.1.4.1.1.66"]
- (0008,002A) Acquisition DateTime [as entered by operator]
- (0008,9123) Creator-Version UID [= "1.2.276.0.75.2.1.100.1.6.4.3"]

The MEL 90 application software waits for the response from the Query AE and prepares a list of patient items accordingly. In case, operator enabled the option to include only patients with appropriate surgery plans available, the MEL 90 application software tries to identify for each eye side the most recent refractive surgery planning instance which has no associated surgery summary instance. This identification is based on following return keys

- (0008,002A) Acquisition DateTime
- (0008,0060) Modality
- (0008,114A) Referenced Instance Sequence
- (0020,0013) Instance Number
- (0020,0062) Image Laterality

The result list will be limited to such patients only and displayed to the operator.

4.2.1.3.2.2 Proposed Presentation Contexts

Following presentation contexts are offered for each initiated association. During this activity the Application Software uses only

- "Patient Root Query/Retrieve Information Model - FIND" with Transfer Syntax ILE as SCU

Important note: For this activity it is required that the SCP supports the Relational query model since Application Software does not use the Hierarchical model.

Table 4-7 Proposed Presentation Contexts for Activity Find patient for refractive surgery at remote AE

| Presentation Context Table | | | | | |
|---------------------------------------|---------------------------|-----------------|--------------------------------|-------------------|------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Ext. Neg. |
| Name | UID 1.2.840.10008. ... | Name List | UID List 1.2.840.10008. ... | | |
| Verification | 1.1 | ILE | 1.2 | BOTH | None |
| Storage Commitment Push Model | 1.20.1 | ILE | 1.2 | SCU | None |
| Raw Data Storage | 5.1.4.1.1.66 | ILE | 1.2 | BOTH ² | None |
| | | ELE | 1.2.1 | BOTH ² | None |
| Video Photographic Image Storage | 5.1.4.1.1.77.1.4.1 | MPG2-ML | 1.2.4.100 | SCU | None |
| Encapsulated PDF Storage | 5.1.4.1.1.104.1 | ILE | 1.2 | SCU | None |
| | | ELE | 1.2.1 | SCU | None |
| Patient Root Query/Retrieve IM – FIND | 5.1.4.1.2.1.1 | ILE | 1.2 | SCU | Yes ¹ |
| Study Root Query/Retrieve IM – MOVE | 5.1.4.1.2.2.2 | ILE | 1.2 | SCU | No |

Note 1: C-FIND extended negotiation is offered. Relational-query support is required by the SCP.

Note 2: Only acts as SCP when a C-Move-RQ was initiated first and this association is still open.

Table 4-8 Extended Negotiation as a SCU

| SOP Class Name | SOP Class UID | Extended Negotiation |
|---------------------------------------|-----------------------------|----------------------|
| Patient Root Query/Retrieve IM – FIND | 1.2.840.10008.5.1.4.1.2.1.1 | See Note 1 |

Note 1: Extended negotiation for relational queries is offered. Relational-query support by the SCP is required for successful Patient Root Queries issued by the MEL 90 AE.

4.2.1.3.2.3 SOP Specific Conformance for Patient Root Query/Retrieve SOP Class as SCU

Table 4-9 Query C-FIND Response Status Handling Behavior

| Service Status | Further Meaning | Error Code | Behavior |
|----------------|---|------------|--|
| Failure | Refused: Out of Resources | A700 | Log message and display user alert. |
| Failure | Identifier does not match SOP Class | A900-A9FF | Log message and display user alert. |
| Failure | Unable to process | C000-CFFF | Log message and display user alert. |
| Failure | Refused: SOP class not supported | 0122 | Log message and display user alert. |
| Cancel | Matching terminated due to Cancel request | FE00 | Log message. |
| Success | Matching is complete – No final Identifier is supplied | 0000 | The Software Application stops receiving worklist items. It finally updates the pick list. |
| Pending | Matches are continuing – Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys | FF00 | Log message. The Application Software checks whether the number of received worklist items overstepped the configurable limit. If the number of received worklist items overstepped the limit, then the Application Software sends a C-CANCEL-RQ, then an A-RELEASE-RQ to the service provider and a message is displayed. |

| | | | |
|---------|---|------|--|
| Pending | Matches are continuing – Warning that one or more Optional Keys were not supported for existence and / or matching for this Identifier. | FF01 | Log message. The Application Software checks whether the number of received worklist items overstepped the configurable limit. If the number of received worklist items overstepped the limit, then the Application Software sends a C-CANCEL-RQ, then an A-RELEASE-RQ to the service provider and a message is displayed. |
| Unknown | All other responses with unknown code meaning | xxxx | Log message and display user alert. |

Table 4-10 Query C-FIND Communication Failure Behavior

| Exception | Behavior |
|--|---|
| DIMSE response timeout | The Association is aborted using A-ABORT. The reason is written to the log file. A user alert message is displayed. |
| Network Timeout | The Application Software is unable to connect to the remote Application Entity. The reason is written to the log file. A user alert message is displayed. |
| Maximum Association Idle Time exceeded | The Artim timer expires and the socket is closed. The reason is written to the log file. |

The following tables lists attributes, which are in use during this activity. The table also explains how the attributes are involved.

Table 4-11 PATIENT level keys for the Patient Root Query/Retrieve Information Model (request and response)

| Tag | Tag Name | Query Key Matching | Query Key Return | Imported | Displayed | Copied into SOP Instance |
|-------------|-----------------------------|--------------------|------------------|----------|-----------|--------------------------|
| (0010,0010) | Patient's Name ¹ | X | X | X | X | X |
| (0010,0020) | Patient ID | X | X | X | X | X |
| (0010,0021) | Issuer of Patient ID | | | X | | X |
| (0010,0030) | Patient's Birth Date | X | X | X | X | X |
| (0010,0040) | Patient's Sex | | | X | X | X |
| (0010,1000) | Other Patient IDs | | | X | | X |
| (0010,4000) | Patient Comments | | | | | X |

Note 1: The MEL 90 application does not support multicomponent group name representation and only use the Alphabetic representation group.

Table 4-12 STUDY level keys for the Patient Root Query/Retrieve Information Model (request and response)

| Tag | Tag Name | Query Keys Matching | Query Keys Return | Imported | Displayed | Copied into SOP Instance |
|-------------|------------------|---------------------|-------------------|----------|-----------|--------------------------|
| (0008,0020) | Study Date | | | | | |
| (0008,0030) | Study Time | | | | | |
| (0008,0050) | Accession Number | | | | | |

| | | | | | | |
|-------------|--------------------|--|--|--|--|--|
| (0008,0090) | Study Description | | | | | |
| (0020,0010) | Study ID | | | | | |
| (0020,000D) | Study Instance UID | | | | | |

Table 4-13 SERIES level keys for the Patient Root Query/Retrieve Information Model (request and response) - Only if operator enabled option to search for patients with surgery plans

| Tag | Tag Name | Query Keys Matching | Query Keys Return | Imported | Displayed | Copied into SOP Instance |
|-------------|-----------------------------|---------------------|-------------------|----------|-----------|--------------------------|
| (0008,0021) | Series Date | | | | | |
| (0008,0031) | Series Time | | | | | |
| (0008,0060) | Modality | | X | X | | |
| (0008,103E) | Series Description | | | | | |
| (0008,1050) | Performing Physician's Name | X | | | | |
| (0008,1090) | Manufacturer's Model Name | | | | | |
| (0020,000E) | Series Instance UID | | | | | |
| (0020,0011) | Series Number | | | | | |

Table 4-14 INSTANCE level keys for the Patient Root Query/Retrieve Information Model (request and response) - Only if operator enabled option to search for patients with surgery plans

| Tag | Tag Name | Query Keys Matching | Query Keys Return | Imported | Displayed | Copied into SOP Instance |
|---------------|------------------------------------|---------------------|-------------------|----------|-----------|--------------------------|
| (0008,0016) | SOP Class UID | AUTO | X | X | | |
| (0008,0018) | SOP Instance UID | | X | X | | |
| (0008,002A) | Acquisition DateTime | X | X | X | | |
| (0008,114A) | Referenced Instance Sequence | | X | X | | |
| >(0008,1150) | Referenced SOP Class UID | | X* | X | | |
| >(0008,1155) | Referenced SOP Instance UID | | X* | X | | |
| >(0040,A170) | Purpose of Reference Code Sequence | | X* | X | | |
| >>(0008,0100) | Code Value | | X* | X | | |
| >>(0008,0102) | Coding Scheme Designator | | X* | X | | |
| (0008,9123) | Creator-Version UID | AUTO | X | X | | |
| (0020,0013) | Instance Number | | X | X | | |
| (0020,0062) | Image Laterality | | X | X | | X |

Values of column "Query Key Matching":

RNG

The operator can apply a range as value for the query key.

SEL

The operator can select a value from a given list of values.

X

The value is included in the query request if not empty.

AUTO

The value cannot be modified by the operator.

Values of column "Query Keys Return":

X

The tag shall be present in the Patient Root Query/Retrieve C-FIND response. If any required tag is missing the relevant Patient Root Query/Retrieve C-FIND response item will be ignored and not imported by the application software.

X*

The tag shall be present in the Patient Root Query/Retrieve C-FIND response if its enclosing sequence is present. If any required tag is missing the relevant Patient Root Query/Retrieve C-FIND response item will be ignored and not imported by the application software.

Values of column "Imported":

X

The value gets imported in the application. Thus this value may have influence in Information Objects which will be created as a result of the performed examination.

Values of column "Displayed":

X

Values of this tag are instantly visible in the pick list.

Values of column "Copied into SOP Instance":

X

Values of marked tags will be stored in created SOP Instances. See section "mapping of attributes" in 8.1.3 Attribute Mapping.

4.2.1.3.3 Activity – Create new patient

This activity has no direct relation to DICOM messaging.

The operator has the option to create a new patient entry. This might be necessary in case of emergency surgery or when no refractive surgery planning has been performed in advance.

This activity adds a new patient entry to the local database which then might become subject of further activities.

4.2.1.3.4 Activity – Import patients for refractive surgery from remote AE

After selecting one or more patients from the pick list, the operator can press "Import" to trigger this activity.

For each selected patient, the MEL 90 application searches remote AE for any existing refractive surgery planning and summary data associated with the selected patient. Based on the query responses, the MEL 90 application tries to identify the most recent planning that has no related surgery summary for each eye side. This search will be omitted, if the particular patient entity is already associated with an appropriate planning instance by previous activity "Find patients for refractive surgery at remote AE".

If such surgery planning instances exists, these will get imported automatically from the remote AE by performing a DICOM retrieve operation.

Retrieved patient and, if available, surgery planning data is then stored to the local database.

4.2.1.3.4.1 Description and Sequencing of Activities

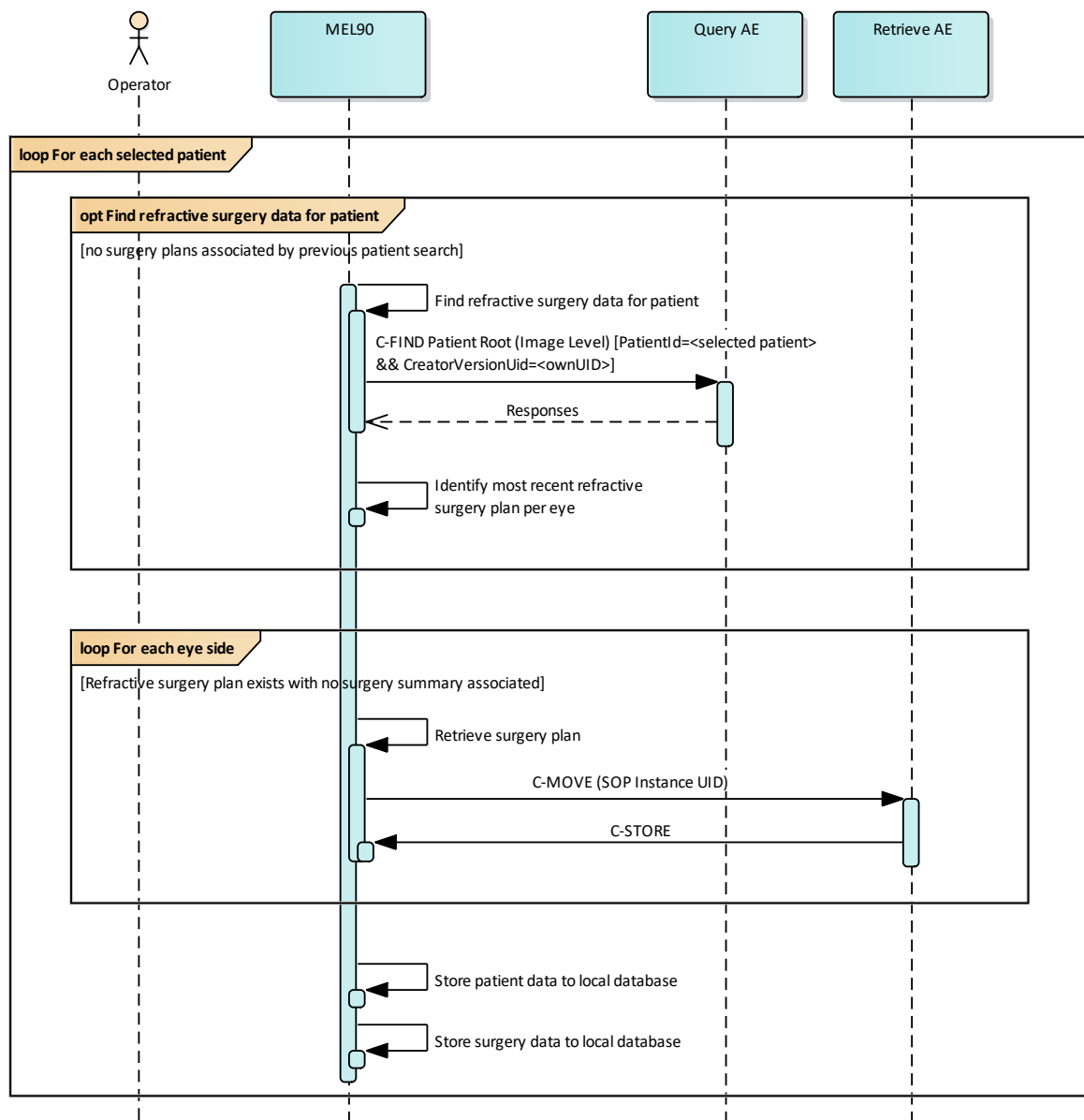


Figure 4-8 Import patients for refractive surgery from remote AE

Find refractive surgery data for patient

The MEL 90 application searches for any refractive surgery data for the particular patient at the remote AE. Therefore, it sends a Patient Root based DICOM C-FIND request at Image level to the remote Query AE with the given information applied to the following query keys

- (0008,0016) SOP Class UID [= "1.2.840.10008.5.1.4.1.1.66"]
- (0008,9123) Creator-Version UID [= "1.2.276.0.75.2.1.100.1.6.4.3"]
- (0010,0010) Patient's Name [= as provided by activity "Find patient"]
- (0010,0020) Patient ID [= as provided by activity "Find patient"]
- (0010,0021) Issuer of Patient ID [= as provided by activity "Find patient"]
- (0010,0030) Patient's Birth Date [= as provided by activity "Find patient"]
- (0010,0040) Patient's Sex [= as provided by activity "Find patient"]

Identify most recent refractive surgery plan per eye

The Application Software waits for the response from the Query AE and tries to identify for each eye side the most recent refractive surgery planning instance which has no associated surgery summary instance. This identification is based on following return keys

- (0008,002A) Acquisition DateTime
- (0008,0060) Modality
- (0008,114A) Referenced Instance Sequence
- (0020,0013) Instance Number
- (0020,0062) Image Laterality

Retrieve surgery plan

In case such planning instances have been identified these will become subject of a subsequent retrieve request and the respective SOP instances are retrieved from the remote AE. The surgery planning UI is pre-populated with the retrieved surgery planning parameters.

Store patient and surgery data to local database

All data retrieved from remote AE will be stored to local database and might become subject of further activities.

4.2.1.3.4.2 Proposed Presentation Contexts

Following presentation contexts are offered for each initiated association. During this activity the Application Software uses only

- "Patient Root Query/Retrieve Information Model - FIND" with Transfer Syntax ILE as SCU
- "Study Root Query/Retrieve Information Model - MOVE" with Transfer Syntax ILE as SCU
- "Raw Data Storage" with Transfer Syntax ELE or ILE as SCP

Important note: For this activity it is required that the SCP supports the Relational query model since Application Software does not use the Hierarchical model.

Table 4-15 Proposed Presentation Contexts for Activity Import patients from remote AE

| Presentation Context Table | | | | | |
|---------------------------------------|---------------------------|-----------------|--------------------------------|-------------------|------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Ext. Neg. |
| Name | UID 1.2.840.10008. ... | Name List | UID List 1.2.840.10008. ... | | |
| Verification | 1.1 | ILE | 1.2 | BOTH | None |
| Storage Commitment Push Model | 1.20.1 | ILE | 1.2 | SCU | None |
| Raw Data Storage | 5.1.4.1.1.66 | ILE | 1.2 | BOTH ² | None |
| | | ELE | 1.2.1 | BOTH ² | None |
| Video Photographic Image Storage | 5.1.4.1.1.77.1.4.1 | MPG2-ML | 1.2.4.100 | SCU | None |
| Encapsulated PDF Storage | 5.1.4.1.1.104.1 | ILE | 1.2 | SCU | None |
| | | ELE | 1.2.1 | SCU | None |
| Patient Root Query/Retrieve IM – FIND | 5.1.4.1.2.1.1 | ILE | 1.2 | SCU | Yes ¹ |
| Study Root Query/Retrieve IM – MOVE | 5.1.4.1.2.2.2 | ILE | 1.2 | SCU | No |

Note 1: C-FIND extended negotiation is offered. Relational-query support is required by the SCP.

Note 2: Only acts as SCP when a C-Move-RQ was initiated first and this association is still open.

Table 4-16 Extended Negotiation as a SCU

| SOP Class Name | SOP Class UID | Extended Negotiation |
|---------------------------------------|-----------------------------|----------------------|
| Patient Root Query/Retrieve IM – FIND | 1.2.840.10008.5.1.4.1.2.1.1 | See Note 1 |

Note 1: Extended negotiation for relational queries is offered. Relational-query support by the SCP is required for successful Patient Root Queries issued by the MEL 90 AE.

4.2.1.3.4.3 SOP Specific Conformance for Patient Root Query/Retrieve SOP Class as SCU

Table 4-17 Query C-FIND Response Status Handling Behavior

| Service Status | Further Meaning | Error Code | Behavior |
|----------------|---|------------|--|
| Failure | Refused: Out of Resources | A700 | Log message and display user alert. |
| Failure | Identifier does not match SOP Class | A900-A9FF | Log message and display user alert. |
| Failure | Unable to process | C000-CFFF | Log message and display user alert. |
| Failure | Refused: SOP class not supported | 0122 | Log message and display user alert. |
| Cancel | Matching terminated due to Cancel request | FE00 | Log message. |
| Success | Matching is complete – No final Identifier is supplied | 0000 | The Software Application stops receiving worklist items. It finally updates the pick list. |
| Pending | Matches are continuing – Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys | FF00 | Log message. The Application Software checks whether the number of received worklist items overstepped the configurable limit. If the number of received worklist items overstepped the limit, then the Application Software sends a C-CANCEL-RQ, then an A-RELEASE-RQ to the service provider and a message is displayed. |
| Pending | Matches are continuing – Warning that one or more Optional Keys were not supported for existence and / or matching for this Identifier. | FF01 | Log message. The Application Software checks whether the number of received worklist items overstepped the configurable limit. If the number of received worklist items overstepped the limit, then the Application Software sends a C-CANCEL-RQ, then an A-RELEASE-RQ to the service provider and a message is displayed. |
| Unknown | All other responses with unknown code meaning | xxxx | Log message and display user alert. |

Table 4-18 Query C-FIND Communication Failure Behavior

| Exception | Behavior |
|--|---|
| DIMSE response timeout | The Association is aborted using A-ABORT. The reason is written to the log file. A user alert message is displayed. |
| Network Timeout | The Application Software is unable to connect to the remote Application Entity. The reason is written to the log file. A user alert message is displayed. |
| Maximum Association Idle Time exceeded | The Artim timer expires and the socket is closed. The reason is written to the log file. |

Table 4-19 Retrieve C-MOVE Response Status Handling Behavior

| Service Status | Further Meaning | Error Code | Behavior |
|----------------|--|------------|---|
| Success | Sub-operations Complete No Failures | 0000 | Patient data and planning data is imported to the Application Software. The Application Software returns from this activity. |

| | | | |
|---------|---|-----------------------|--|
| Success | Sub-operations Complete One or more Failures | B000 | Patient data is imported to the Application Software. No planning data is imported. |
| Pending | Sub-operations are continuing | FF00 | This is not expected since the Application Software calls C-MOVE instance by instance. |
| Refused | Out of Resources Unable to calculate number of matches | A701 | An error message is shown to the operator. The Application Software logs this event. No patient data nor any planning data is imported to the Application Software. |
| Refused | Out of Resources Unable to perform sub-operations | A702 | |
| Refused | Move Destination unknown | A801 | |
| Failure | Identifier does not match SOP Class | A900 | |
| Failure | Unable to process | C000 - CFFF | |
| Cancel | Sub-operations terminated due to Cancel Indication | FE00 | |
| * | * | Any other status code | |

The following tables lists attributes, which are in use during this activity. The tables also explain how the attributes are involved.

Table 4-20 PATIENT level keys for the Patient Root Query/Retrieve Information Model (request and response)

| Tag | Tag Name | Query Key Matching | Query Key Return | Imported | Displayed | Copied into SOP Instance |
|-------------|-----------------------------|--------------------|------------------|----------|-----------|--------------------------|
| (0010,0010) | Patient's Name ¹ | AUTO | X | | | |
| (0010,0020) | Patient ID | AUTO | X | | | |
| (0010,0021) | Issuer of Patient ID | AUTO | X | | | |
| (0010,0030) | Patient's Birth Date | AUTO | X | | | |
| (0010,0040) | Patient's Sex | AUTO | X | | | |
| (0010,1000) | Other Patient IDs | | | | | |
| (0010,4000) | Patient Comments | | | | | |

Note 1: The MEL 90 application does not support multicomponent group name representation and only use the Alphabetic representation group.

Table 4-21 STUDY level keys for the Patient Root Query/Retrieve Information Model (request and response)

| Tag | Tag Name | Query Keys Matching | Query Keys Return | Imported | Displayed | Copied into SOP Instance |
|-------------|----------------------------|---------------------|-------------------|----------|-----------|--------------------------|
| (0008,0020) | Study Date | | | | | |
| (0008,0030) | Study Time | | | | | |
| (0008,0050) | Accession Number | | | | | |
| (0008,0090) | Referring Physician's Name | | | | | |
| (0008,1030) | Study Description | | | | | |
| (0020,0010) | Study ID | | | | | |
| (0020,000D) | Study Instance UID | | | | | |

Table 4-22 SERIES level keys for the Patient Root Query/Retrieve Information Model (request and response)

| Tag | Tag Name | Query Keys Matching | Query Keys Return | Imported | Displayed | Copied into SOP Instance |
|-------------|-----------------------------|---------------------|-------------------|----------|-----------|--------------------------|
| (0008,0021) | Series Date | | | | | |
| (0008,0031) | Series Time | | | | | |
| (0008,0060) | Modality | | X | X | | |
| (0008,103E) | Series Description | | | | | |
| (0008,1050) | Performing Physician's Name | | | | | |
| (0008,1090) | Manufacturer's Model Name | | | | | |
| (0020,000E) | Series Instance UID | | | | | |
| (0020,0011) | Series Number | | | | | |

Table 4-23 INSTANCE level keys for the Patient Root Query/Retrieve Information Model (request and response)

| Tag | Tag Name | Query Keys Matching | Query Keys Return | Imported | Displayed | Copied into SOP Instance |
|--------------|------------------------------------|---------------------|-------------------|----------|-----------|--------------------------|
| (0008,0016) | SOP Class UID | AUTO | X | | | |
| (0008,0018) | SOP Instance UID | | X | X | | |
| (0008,002A) | Acquisition DateTime | | X | | | |
| (0008,114A) | Referenced Instance Sequence | | X | | | |
| >(0008,1150) | Referenced SOP Class UID | | X* | | | |
| >(0008,1155) | Referenced SOP Instance UID | | X* | | | |
| >(0040,A170) | Purpose of Reference Code Sequence | | X* | | | |

| | | | | | | |
|---------------|--------------------------|------|----|---|--|---|
| >>(0008,0100) | Code Value | | X* | | | |
| >>(0008,0102) | Coding Scheme Designator | | X* | | | |
| (0008,9123) | Creator-Version UID | AUTO | X | | | |
| (0020,0013) | Instance Number | | | | | |
| (0020,0062) | Image Laterality | | X | X | | X |

Values of column "Query Key Matching":

RNG

The operator can apply a range as value for the query key.

SEL

The operator can select a value from a given list of values.

X

The value is included in the query request if not empty.

AUTO

The value cannot be modified by the operator.

Values of column "Query Keys Return":

X

The tag shall be present in the Patient Root Query/Retrieve C-FIND response. If any required tag is missing the relevant Patient Root Query/Retrieve C-FIND response item will be ignored and not imported by the application software.

X*

The tag shall be present in the Patient Root Query/Retrieve C-FIND response if its enclosing sequence is present. If any required tag is missing the relevant Patient Root Query/Retrieve C-FIND response item will be ignored and not imported by the application software.

Values of column "Imported":

X

The value gets imported in the application. Thus this value may have influence in Information Objects which will be created as a result of the performed examination.

Values of column "Displayed":

X

Values of this tag are instantly visible in the pick list.

Values of column "Copied into SOP Instance":

X

Values of marked tags will be stored in created SOP Instances. See section "mapping of attributes" in 8.1.3 Attribute Mapping.

Table 4-24 Query key details

| Tag | Tag Name | Description |
|-------------|-----------------------------|--|
| (0010,0010) | Patient's Name ¹ | The value is used as provided from the previous activity "Select Patient". This is a DICOM Standard query key on Patient level. |
| (0010,0020) | Patient ID | The value is used as provided from the previous activity "Select Patient". This is a DICOM Standard query key on Patient level. |

| | | |
|-------------|----------------------|---|
| (0010,0021) | Issuer of Patient ID | The value is used as provided from the previous activity "Select Patient". This is a DICOM Optional query key on Patient level, thus the effect of this query key on the query depends on Service Provider implementation. |
| (0010,0030) | Patient's Birth Date | The value is used as provided from the previous activity "Select Patient". This is a DICOM Optional query key on Patient level, thus the effect of this query key on the query depends on Service Provider implementation. |
| (0010,0040) | Patient's Sex | The value is used as provided from the previous activity "Select Patient". This is a DICOM Optional query key on Patient level, thus the effect of this query key on the query depends on Service Provider implementation. |
| (0008,0016) | SOP Class UID | The value is "1.2.840.10008.5.1.4.1.1.66" for Raw Data SOP Class. This is a DICOM Optional query key on Instance level, thus the effect of this query key on the query depends on Service Provider implementation. |
| (0008,9123) | Creator-Version UID | The value is "1.2.276.0.75.2.1.100.1.6.4.3". This is a DICOM Optional query key on Instance level, thus the effect of this query key on the query depends on Service Provider implementation. |

Note 1: Only Alphabetic part of the multicomponent group name is used as query key

4.2.1.3.5 Activity – Review/modify/create new refractive surgery plan

This activity has no direct relation to DICOM messaging.

Once a patient is selected the operator can start either review an existing or create a new surgery planning for each eye of the patient. In any case, the operator can modify surgery parameters. The MEL 90 application software supports the operator by instantly validating the clinical correctness of any surgery parameter. If done, the operator can either choose to store the plan or to discard the entered parameters.

In case of new or modified parameters this activity creates a refractive surgery plan for each edited eye side which then might become subjects of the activity "Store refractive surgery plan to remote AE".

4.2.1.3.6 Activity - Store refractive surgery plan to remote AE

This activity can be invoked manually by the operator by pressing the "Save" button from the "Surgery planning" screen of the MEL 90 application.

If new or modified surgery planning data has been created for a patient's eye during the workflow this will be transferred to the configured remote Storage AE.

The transfer includes the following SOP Class instances:

- 1.2 Raw Data SOP instances containing refractive surgery parameters planned for a single eye

In case the planning data to be transferred is based on a previously retrieved planning instance some attributes of this retrieved instance will get copied into the new SOP instance. A detailed list of these attributes can be found in chapter 8.1.3 Attribute Mapping.

4.2.1.3.6.1 Description and Sequencing of Activities

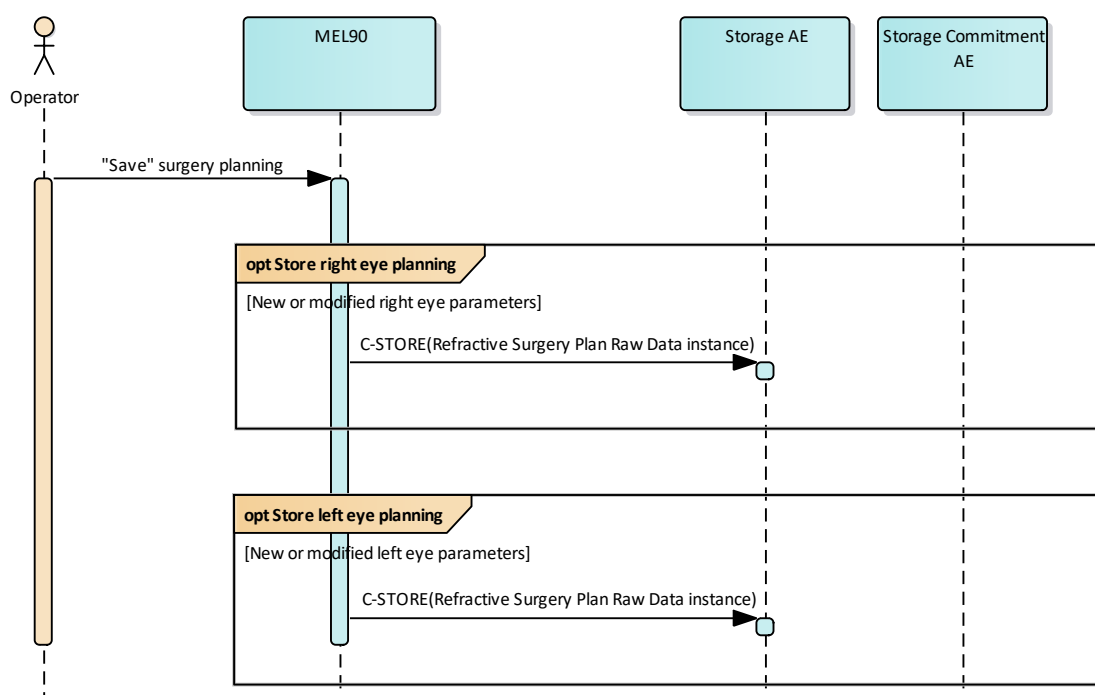


Figure 4-9 Store refractive surgery plan to remote AE

Store right/left eye planning

This activity can be invoked manually by the operator by pressing “Save” after creating a plan for a refractive surgery of a patient’s eye.

Once triggered, the application software transfers eye surgery planning data that has been created during the workflow and is subject of storage to the configured Storage AE.

4.2.1.3.6.2 Proposed Presentation Contexts

Following presentation contexts are offered for each initiated association. During this activity the Application Software uses only

- Raw Data Storage with Transfer Syntax ELE (Transfer Syntax ILE as fallback) as SCU

Table 4-25 Proposed Presentation Contexts for Activity Store refractive surgery plan to remote AE

| Presentation Context Table | | | | | |
|----------------------------------|---------------------------|-----------------|--------------------------------|-------------------|-----------|
| Abstract Syntax | | Transfer Syntax | | Role | Ext. Neg. |
| Name | UID 1.2.840.10008. ... | Name List | UID List 1.2.840.10008. ... | | |
| Verification | 1.1 | ILE | 1.2 | BOTH | None |
| Storage Commitment Push Model | 1.20.1 | ILE | 1.2 | SCU | None |
| Raw Data Storage | 5.1.4.1.1.66 | ILE | 1.2 | BOTH ² | None |
| | | ELE | 1.2.1 | BOTH ² | None |
| Video Photographic Image Storage | 5.1.4.1.1.77.1.4.1 | MPG2-ML | 1.2.4.100 | SCU | None |
| Encapsulated PDF Storage | 5.1.4.1.1.104.1 | ILE | 1.2 | SCU | None |
| | | ELE | 1.2.1 | SCU | None |

| | | | | | |
|---------------------------------------|---------------|-----|-----|-----|------------------|
| Patient Root Query/Retrieve IM – FIND | 5.1.4.1.2.1.1 | ILE | 1.2 | SCU | Yes ¹ |
| Study Root Query/Retrieve IM – MOVE | 5.1.4.1.2.2.2 | ILE | 1.2 | SCU | No |

Note 1: C-FIND extended negotiation is offered. Relational-query support is required by the SCP.

Note 2: Only acts as SCP when a C-Move-RQ was initiated first and this association is still open.

Table 4-26 Extended Negotiation as a SCU

| SOP Class Name | SOP Class UID | Extended Negotiation |
|---------------------------------------|-----------------------------|----------------------|
| Patient Root Query/Retrieve IM – FIND | 1.2.840.10008.5.1.4.1.2.1.1 | See Note 1 |

Note 1: Extended negotiation for relational queries is offered. Relational-query support by the SCP is required for successful Patient Root Queries issued by the MEL 90 AE.

4.2.1.3.6.3 SOP Specific Conformance for Storage SOP Classes

Table 4-27 Storage C-STORE Response Status Handling Behavior

| Service Status | Further Meaning | Status Code | Behavior |
|----------------|--|-------------|---|
| Failure | Refused: Out of Resources | A700-A7FF | Log message and retry c-store. |
| Failure | Error: Data Set does not match SOP Class | A900-AFF | Log message and do not retry. |
| Failure | Error: Cannot understand | C000-CFFF | Log message and do not retry. |
| Failure | Duplicate SOP Instance | 0111 | Log message and no retry. |
| Failure | Refused: SOP class not supported | 0122 | Log message. |
| Warning | Coercion of data Elements | B000 | The Application Software logs this event. |
| Warning | Data Set does not match SOP Class | B007 | The Application Software logs this event. |
| Warning | Elements Discarded | B006 | The Application Software logs this event. |
| Success | Successful Storage | 0000 | None |
| Unknown | All other responses with unknown code | xxxx | Log message and do not retry. |

Table 4-28 C-STORE Communication Failure Behavior

| Exception | Behavior |
|--|---|
| DIMSE response timeout | The Association is aborted using A-ABORT. The reason is written to the log file. A user alert message is displayed. |
| Network Timeout | The Application Software is unable to connect to the remote Application Entity. The reason is written to the log file. A user alert message is displayed. |
| Maximum Association Idle Time exceeded | The Artim timer expires and the socket is closed. The reason is written to the log file. |

4.2.1.3.7 Activity – Perform refractive surgery

This activity has no direct relation to DICOM messaging.

Once all parameters are set and validated the operator can start a refractive surgery for either one or both patient's eyes. During this activity MEL 90 application creates surgery evidence data which might become subject of the activity "Store refractive surgery evidence data to remote AE".

4.2.1.3.8 Activity – Export refractive surgery evidence data to remote AE

This activity can be invoked either manually by the operator by launching the "Patient export" screen or, if configured, automatically by the MEL 90 application at finishing the surgery.

Depending on user selection and configuration the application software transfers the data created during activity "Perform refractive surgery" to the configured remote Storage AE.

This includes

- 1..2 Refractive Surgery Summary Raw Data instances containing summary information for the performed refractive surgery (one per each eye side)
- 0..2 Encapsulated Pdf instances containing a refractive surgery report (one per each eye side)
- 0..n Video Photographic Image instances containing observation videos of the performed refractive surgery

After successful storage these instances become subject of a subsequent request to the configured Storage Commitment Provider to take over responsibility on data persistence.

4.2.1.3.8.1 Description and Sequencing of Activities

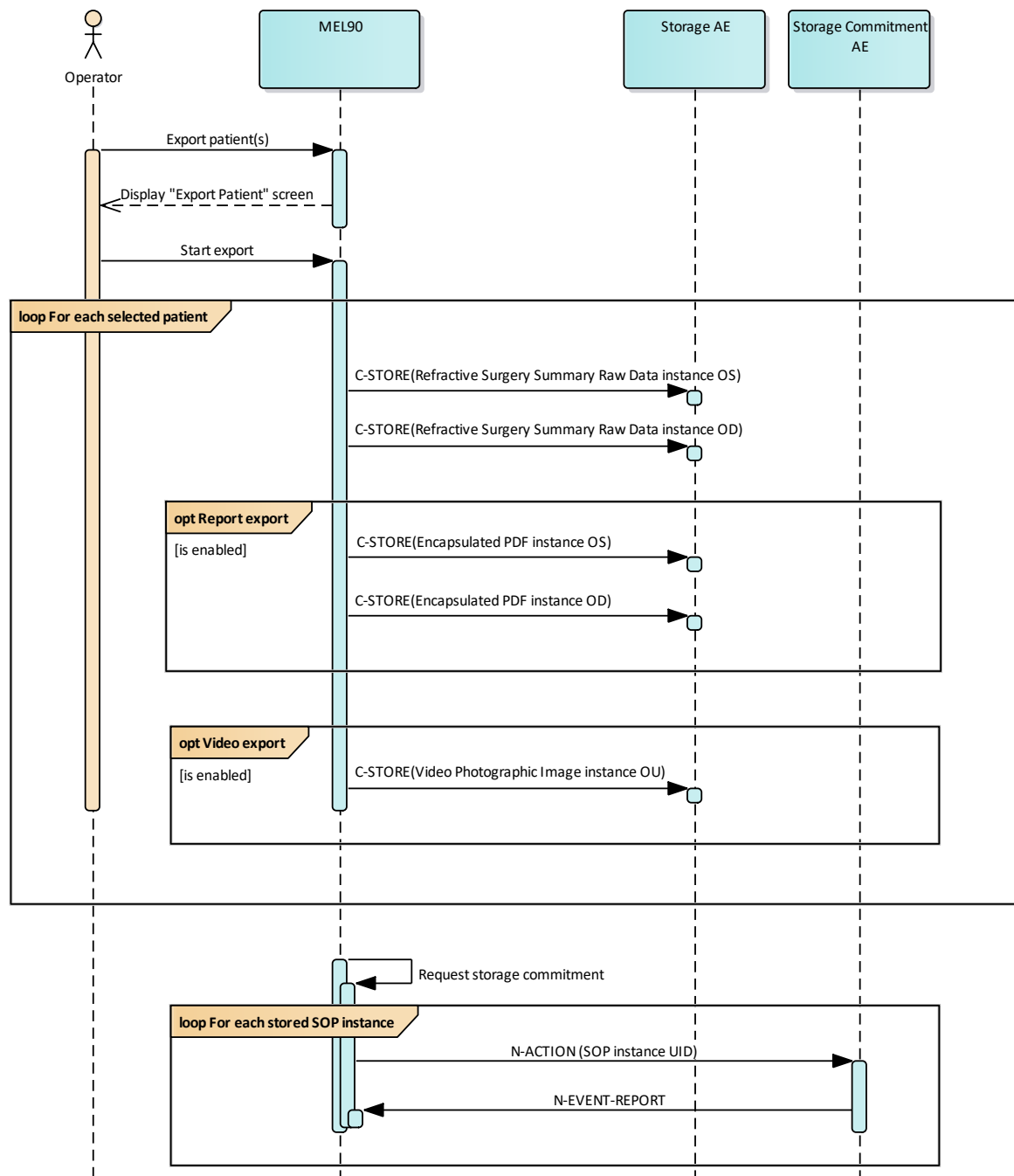


Figure 4-10 Store refractive surgery evidence data to remote AE

Export patient(s)

This activity can be invoked manually by the operator by selecting one or more patients from the patient list and pressing “Export”.

Once triggered, the application software launches the “Patient Export” screen which allows the operator to configure the amount of data and content to be exported.

Start export

This activity can be invoked manually by the operator when pressing the “Export” button from the “Patient Export” screen. Depending on user selection and configuration the application software

performs several DICOM C-STORE requests to transfer all relevant data created during activity “Perform refractive surgery” to the configured remote Storage AE.

Request Storage Commitment

To verify that the data has been safely archived, the Application Software can be set up to request the configured Storage Commitment AE in a configurable interval to commit the storage of instances.

4.2.1.3.8.2 Proposed Presentation Contexts

Following presentation contexts are offered for each initiated association. During this activity the Application Software uses only

- Raw Data Storage with Transfer Syntax ELE (Transfer Syntax ILE as fallback) as SCU
- Video Photographic Image Storage with Transfer Syntax MPEG4 AVC/H.264 High Profile / Level 4.1
- Storage Commitment Push Model with Transfer Syntax ILE as SCU

Table 4-29 Proposed Presentation Contexts for Activity Store refractive surgery plan to remote AE

| Presentation Context Table | | | | | |
|---------------------------------------|---------------------------|-----------------|--------------------------------|-------------------|------------------|
| Abstract Syntax | | Transfer Syntax | | Role | Ext. Neg. |
| Name | UID 1.2.840.10008. ... | Name List | UID List 1.2.840.10008. ... | | |
| Verification | 1.1 | ILE | 1.2 | BOTH | None |
| Storage Commitment Push Model | 1.20.1 | ILE | 1.2 | SCU | None |
| Raw Data Storage | 5.1.4.1.1.66 | ILE | 1.2 | BOTH ² | None |
| | | ELE | 1.2.1 | BOTH ² | None |
| Video Photographic Image Storage | 5.1.4.1.1.77.1.4.1 | MPG2-ML | 1.2.4.100 | SCU | None |
| Encapsulated PDF Storage | 5.1.4.1.1.104.1 | ILE | 1.2 | SCU | None |
| | | ELE | 1.2.1 | SCU | None |
| Patient Root Query/Retrieve IM – FIND | 5.1.4.1.2.1.1 | ILE | 1.2 | SCU | Yes ¹ |
| Study Root Query/Retrieve IM – MOVE | 5.1.4.1.2.2.2 | ILE | 1.2 | SCU | No |

Note 1: C-FIND extended negotiation is offered. Relational-query support is required by the SCP.

Note 2: Only acts as SCP when a C-Move-RQ was initiated first and this association is still open.

Table 4-30 Extended Negotiation as a SCU

| SOP Class Name | SOP Class UID | Extended Negotiation |
|---------------------------------------|-----------------------------|----------------------|
| Patient Root Query/Retrieve IM – FIND | 1.2.840.10008.5.1.4.1.2.1.1 | See Note 1 |

Note 1: Extended negotiation for relational queries is offered. Relational-query support by the SCP is required for successful Patient Root Queries issued by the MEL 90 AE.

4.2.1.3.8.3 SOP Specific Conformance for Storage SOP Classes

Table 4-31 Storage C-STORE Response Status Handling Behavior

| Service Status | Further Meaning | Status Code | Behavior |
|----------------|--|-------------|--|
| Failure | Refused: Out of Resources | A700-A7FF | Log message and retry c-store. If error persists then message to user. |
| Failure | Error: Data Set does not match SOP Class | A900-AFF | Log message and do not retry. Message to user. |

| | | | |
|---------|---------------------------------------|-----------|--|
| Failure | Error: Cannot understand | C000-CFFF | Log message and do not retry. Message to user. |
| Failure | Duplicate SOP Instance | 0111 | Log message and no retry. |
| Failure | Refused: SOP class not supported | 0122 | Log message and show user alert. |
| Warning | Coercion of data Elements | B000 | The Application Software logs this event. |
| Warning | Data Set does not match SOP Class | B007 | The Application Software logs this event. |
| Warning | Elements Discarded | B006 | The Application Software logs this event. |
| Success | Successful Storage | 0000 | None |
| Unknown | All other responses with unknown code | xxxx | Log message and do not retry. Message to user. |

4.2.1.3.8.4 SOP Specific Conformance for Storage Commitment SOP Class

4.2.1.3.8.4.1 Storage Commitment Operations (N-ACTION)

The Application Software will request storage commitment for stored instances if the Remote AE is configured as Storage Commitment Provider and a presentation context for the Storage Commitment Push Model has been accepted.

The Storage Commitment Request addresses at least one SOP Instance and at maximum 500 SOP instances.

The behavior of the Application Software when encountering status codes in a N-ACTION response is summarized in the table below:

Table 4-32 Storage Commitment N-ACTION Response Status Handling Behavior

| Service Status | Further Meaning | Status Code | Behavior |
|----------------|-------------------------|-------------|--|
| Failure | Class-instance conflict | 0119 | The SOP Instance is considered as not being committed. Application software writes SOP Instance UID and failure reason to the log file. |
| Failure | Duplicate invocation | 0210 | |
| Failure | Invalid argument value | 0115 | |
| Failure | Invalid SOP Instance | 0117 | |
| Failure | Mistyped argument | 0212 | |
| Failure | No such action | 0123 | |
| Failure | No such argument | 0114 | |
| Failure | No such SOP class | 0118 | |
| Failure | No such SOP Instance | 0112 | |
| Failure | Processing failure | 0110 | |

| | | | |
|---------|--|------|--|
| Failure | Resource limitation | 0213 | |
| Failure | Unrecognized operation | 0211 | |
| Success | Success | 0000 | The Application Software will wait for an incoming N-EVENT-REPORT. |
| Unknown | All other responses with unknown code meaning. | xxxx | The SOP Instance is considered as not being committed. Application software writes SOP Instance UID and failure reason to the log file. |

Table 4-33 C-STORE Communication Failure Behavior

| Exception | Behavior |
|--|---|
| DIMSE response timeout | The Association is aborted using A-ABORT. The reason is written to the log file. A user alert message is displayed. |
| Network Timeout | The Application Software is unable to connect to the remote Application Entity. The reason is written to the log file. A user alert message is displayed. |
| Maximum Association Idle Time exceeded | The Artim timer expires and the socket is closed. The reason is written to the log file. |

4.2.1.3.8.4.2 Storage Commitment Communication Failure Behaviour

If the Application Software runs in a timeout or if the association is aborted by the provider or network layer, or if waiting duration for Storage Commitment N-EVENT-REPORT oversteps a configurable time limit then the related SOP Instance is considered as not being committed. Then the SOP Instance is subject of a future Storage Commitment service call. It will be included again within next call of this activity.

In addition to that, the Application Software writes the SOP Instance UID to the log file, together with the failure reason.

4.2.1.4 Association Acceptance Policy

4.2.1.4.1 Activity - Verify Communication

The activity can be performed at any time. The service is available as soon as the Application Software has been started.

4.2.1.4.1.1 Description and Sequencing of Activities

The Software AE responds to verification requests made by remote AEs.

4.2.1.4.1.2 Accepted Presentation Contexts

Table 4-34 Presentation Context accepted for Activity Verify Communication

| Presentation Context Table | | | | | |
|----------------------------|---------------------------|-----------------|--------------------------------|------|-----------|
| Abstract Syntax | | Transfer Syntax | | Role | Ext. Neg. |
| Name | UID 1.2.840.10008. ... | Name List | UID List 1.2.840.10008. ... | | |
| Verification | ... 1.1 | ILE | ... 1.2 | BOTH | None |

4.2.1.4.1.3 SOP Specific Conformance for Verification SOP Class as SCP

The Application Software AE provides standard conformance.

4.2.1.4.2 Activity – Import patients for refractive surgery from remote AE

This chapter describes the aspect of association acceptance of the activity “Import patients for refractive surgery from remote AE”. The activity retrieves refractive surgery planning and summary data for a selected patient.

4.2.1.4.2.1 Description and Sequencing of Activities

The description and sequencing of activities is covered by chapter 4.2.1.3.4 Activity – Import patients for refractive surgery from remote AE.

4.2.1.4.2.2 Accepted Presentation Contexts

Table 4-35 Acceptable Presentation Contexts for Activity Import patients for refractive surgery from remote AE

| Presentation Context Table | | | | | |
|----------------------------|---------------------------|-----------------|--------------------------------|------|-----------|
| Abstract Syntax | | Transfer Syntax | | Role | Ext. Neg. |
| Name | UID 1.2.840.10008. ... | Name List | UID List 1.2.840.10008. ... | | |
| Verification | 1.1 | ILE | 1.2 | SCP | No |
| Raw Data Storage | 5.1.4.1.1.66 | ILE | 1.2 | SCP | No |
| | | ELE | 1.2.1 | SCP | No |

4.2.1.4.2.3 SOP Specific Conformance for Storage SOP Class as SCP

The Application Software AE provides standard conformance.

4.2.1.4.3 Activity - Store refractive surgery plan to remote AE

This chapter describes the aspect of association acceptance of the activity " Store refractive surgery plan to remote AE ". The activity stores refractive surgery planning data for a patient's eyes as described in chapter 4.2.1.3.6 Activity - Store refractive surgery plan to remote AE.

After successful storage the MEL 90 application software asks the configured Storage Commitment Provider to take over responsibility on data persistence for the data previously transferred to the remote Storage AE.

4.2.1.4.3.1 Description and Sequencing of Activities

The description and sequencing of activities is covered by chapter 4.2.1.3.6 Activity - Store refractive surgery plan to remote AE.

4.2.1.4.3.2 Accepted Presentation Contexts

Table 4-36 Presentation Contexts accepted for Activity Store refractive surgery plan to remote AE

| Presentation Context Table | | | | | |
|-------------------------------|---------------------------|-----------------|--------------------------------|------|-----------|
| Abstract Syntax | | Transfer Syntax | | Role | Ext. Neg. |
| Name | UID 1.2.840.10008. ... | Name List | UID List 1.2.840.10008. ... | | |
| Verification | 1.1 | ILE | 1.2 | BOTH | None |
| Storage Commitment Push Model | 1.20.1 | ILE | 1.2 | SCU | None |

4.2.1.4.3.3 SOP Specific Conformance for Storage SOP Class as SCP

The Application Software AE provides standard conformance.

4.2.1.4.3.4 SOP Specific Conformance for Storage Commitment SOP Class

4.2.1.4.3.4.1 Storage Commitment Operations (N-EVENT-REPORT)

The Application Software is capable of receiving an N-EVENT-REPORT notification if it has successfully negotiated a Presentation Context for the Storage Commitment Push

The behavior of Application Software when receiving Event Types within the N-EVENT-REPORT is summarized in the table below.

Table 4-37 Storage Commitment N-EVENT-REPORT Request Failure Reasons

| Service Status | Further Meaning | Status Code | Behavior |
|----------------|---|-------------|---|
| Failure | Processing Failure | 0110 | The SOP Instance is considered as not being committed. Application software writes SOP Instance UID and failure reason to the log file. |
| Failure | No such object instance | 0112 | The SOP Instance is considered as neither being archived nor being committed. Application software writes SOP Instance UID and failure reason to the log file. |
| Failure | Resource limitation | 0213 | The SOP Instance is considered as not being committed. |
| Failure | Referenced SOP Class not supported | 0122 | Application software writes SOP Instance UID and failure reason to the log file. |
| Failure | Class / Instance conflict | 0119 | |
| Failure | Duplicate transaction UID | 0131 | |
| Unknown | All other responses with unknown code meaning | xxxx | |

If the N-EVENT-REPORT contains failed instances the behavior of the application software depends on the failure reason associated with the failed instances. In general retry means a retry for 2 times, no retry will set the error counter to maximum. A reset of the error counter is possible in the application settings screen.

4.2.1.4.4 Activity - Export refractive surgery evidence data to remote AE

This chapter describes the aspect of association acceptance of the activity "Store refractive surgery evidence data to remote AE". The activity stores refractive surgery evidence data for one or more a patients as described in chapter 4.2.1.3.8 Activity – Export refractive surgery evidence data to remote AE.

After successful storage the MEL 90 application software asks the configured Storage Commitment Provider to take over responsibility on data persistence for the data previously transferred to the remote Storage AE.

4.2.1.4.4.1 Description and Sequencing of Activities

The description and sequencing of activities is covered by chapter 4.2.1.3.8 Activity – Export refractive surgery evidence data to remote AE.

4.2.1.4.4.2 Accepted Presentation Contexts

Table 4-38 Presentation Contexts accepted for Activity Export refractive surgery evidence data to remote AE

| Presentation Context Table | | | | |
|----------------------------|---------------------------|-----------------|--------------------------------|------|
| Abstract Syntax | | Transfer Syntax | | Role |
| Name | UID 1.2.840.10008. ... | Name List | UID List 1.2.840.10008. ... | |

| | | | | | |
|-------------------------------|--------|-----|-----|------|------|
| Verification | 1.1 | ILE | 1.2 | BOTH | None |
| Storage Commitment Push Model | 1.20.1 | ILE | 1.2 | SCU | None |

4.2.1.4.4.3 SOP Specific Conformance for Storage SOP Class as SCP

The Application Software AE provides standard conformance.

4.2.1.4.4.4 SOP Specific Conformance for Storage Commitment SOP Class

4.2.1.4.4.4.1 Storage Commitment Operations (N-EVENT-REPORT)

The Application Software is capable of receiving an N-EVENT-REPORT notification if it has successfully negotiated a Presentation Context for the Storage Commitment Push

The behavior of Application Software when receiving Event Types within the N-EVENT-REPORT is summarized in the table below.

Table 4-39 Storage Commitment N-EVENT-REPORT Request Failure Reasons

| Service Status | Further Meaning | Status Code | Behavior |
|----------------|---|-------------|---|
| Failure | Processing Failure | 0110 | The SOP Instance is considered as not being committed. Application software writes SOP Instance UID and failure reason to the log file. |
| Failure | No such object instance | 0112 | The SOP Instance is considered as neither being archived nor being committed. Application software writes SOP Instance UID and failure reason to the log file. |
| Failure | Resource limitation | 0213 | The SOP Instance is considered as not being committed. |
| Failure | Referenced SOP Class not supported | 0122 | Application software writes SOP Instance UID and failure reason to the log file. |
| Failure | Class / Instance conflict | 0119 | |
| Failure | Duplicate transaction UID | 0131 | |
| Unknown | All other responses with unknown code meaning | xxxx | |

If the N-EVENT-REPORT contains failed instances the behavior of the application software depends on the failure reason associated with the failed instances. In general retry means a retry for 2 times, no retry will set the error counter to maximum. A reset of the error counter is possible in the application settings screen.

4.3 Network Interfaces

4.3.1 Physical Network Interface

The physical network interface is not visible for the application software which uses the communication stack as offered by the Operating System.

4.3.2 Additional Protocols

Both IP addresses and host names are supported and get resolved.
Else no additional protocols are supported.

4.3.3 IPv4 and IPv6 Support

Application software does only support IPv4 and does not support any IPv6 features.

4.4 Configuration

Local application entity and remote application entity information can be configured in the *FORUM Settings* section of the software application's *Settings* dialog. This dialog does also allow other networking and DICOM related settings like networking timeouts and patient query item limit parameters.

For institution related settings like Institution Name or Issuer of Patient ID an administrator can use the *System Settings* section of the *Settings* dialog.

For AutoConnect™-enabled systems from ZEISS the configuration can be performed automatically using the AutoConnect button.

4.4.1 AE Title/Presentation Address Mapping

The mapping from AE Title to TCP/IP addresses and ports is configurable and set at the time of installation by Installation Personnel.

4.4.1.1 Local AE Titles

The IP can be configured to be set up manually or to be administered by the Operating System. The Application Entity Title as well as the port number is configurable. The default port number is 11112. In case AutoConnect is enabled in both MEL 90 and FORUM, the Local AE configuration is registered automatically in the FORUM AE Title Administration.

4.4.1.2 Remote AE Titles

The mapping of external AE Titles to TCP/IP addresses and ports is configurable. The MEL 90 Application Software allows setting up a remote Application Entity for each service. For all Application Entities, the host name or IP, the Port and the Application Entity Title must be known.

Mapping of DICOM services to remote AE can be done either manually or by using the AutoConnect feature. In case AutoConnect is enabled in both MEL 90 and FORUM, the configuration of the Remote Application Entities can be performed automatically using the AutoConnect button.

4.4.2 Parameters

4.4.2.1 General Parameters

The general parameters are shared for associations to any of the configured AE.

Table 4-40 Configuration Parameters Table

| Parameter | Configurable (Yes/No) | Default Value |
|----------------------------|--------------------------|---------------|
| General Parameters | | |
| DIMSE RSP Timeout | Yes (10 – 60 sec.) | 60 sec |
| Network Timeout | Yes (5-20 sec.) | 20 sec. |
| Max. Association Idle Time | Yes (10 – 60 sec.) | 30 sec |
| Network log level | Yes | Warning |
| (0008,1010) Station Name | Yes | EMPTY |

| | | |
|---|------------------------------------|---|
| (0010,0021) Issuer of Patient ID | Yes | MEL90_ + EthernetAddress |
| AE Specific Parameters | | |
| Number of simultaneous Associations by Service and/or SOP Class? | No | 50 |
| Verification SCU Parameters | | |
| No specific configuration required. | | |
| Patient Root Q/R and Study Root Q/R SCU Parameters | | |
| Maximum Query Responses (Modality Worklist IM, Patient Root Q/R IM and Study Root Q/R IM) | Yes (10-999) | 400 |
| Specific Character Set ¹ | Yes (by service personnel only) | None (MEL 90 Application Software uses UTF-8) |
| Storage Commitment SCU Parameters | | |
| No specific configuration required | | |
| Storage SCU Parameters | | |
| Specific Character Set ¹ | Yes (by service personnel only) | None (MEL 90 Application Software uses UTF-8) |
| Verification SCP Parameters | | |
| No specific configuration required The configuration of port number and Application Entity Title are part of the Local Application Entity setup (see 4.4.1.1 Local AE Titles). | | |

Note 1: DICOM Specific Character Set (Configuration settings available for Service user only). See chapter 6 Support of Character Sets for more details.

5 *Media Interchange*

Media Interchange is not scope of this document since Media Interchange is not supported by MEL 90 Application Software.

6 Support of Character Sets

All application entities described in the previous chapters support UTF-8 character set per default.

A specific character set can be provided optionally and individually per remote Service Provider with the exception of the Storage Commitment service, where specific character set is not needed.

Possible defined terms for the character set element are listed in. MEL 90 Application Software does not support Code Extension techniques via configuration, so ISO 2022 standard cannot be used.

Table 6-1 Supported Character Set

| Supported Specific Character Set | |
|----------------------------------|----------------------|
| Character Set Description | Defined Term |
| UTF-8 encoded Unicode | ISO_IR 192 (Default) |
| Latin alphabet No. 1 | ISO_IR 100 |
| Latin alphabet No. 2 | ISO_IR 101 |
| Latin alphabet No. 3 | ISO_IR 109 |
| Latin alphabet No. 4 | ISO_IR 110 |
| Latin alphabet No. 5 | ISO_IR 148 |
| Cyrillic | ISO_IR 144 |
| Arabic | ISO_IR 127 |
| Greek | ISO_IR 126 |
| Hebrew | ISO_IR 138 |
| Japanese | ISO_IR 13 |
| Thai | ISO_IR 166 |
| Chinese | GB18030 |

Please note, configured Character Set will only come into effect if the remote Service Provider does not send it in the DICOM response. The latter would be a violation of the DICOM standard which now can be corrected by service personnel via Character Set configuration.

Configuration of Specific Character Sets can only be performed by a Service User (Table 4-40 Configuration Parameters Table).

If Specific Character Set is missing in the request or response data set and no Character Set is configured (settings is "None"), the MEL 90 Application Software uses ISO_IR 192 (UTF-8) as default.

Examples of when to use the optional configuration of specific character sets:

- A 3rd party MWL Provider sends responses with string values encoded in Latin alphabet No. 1 but does not provide corresponding Specific Character Set attribute. The MWL Character Set should be set to ISO_IR 100 to ensure a proper decoding of the data set.
- A 3rd party Storage/Query/Retrieve Provider does only support DICOM instances with Specific Character Set ISO_IR 100. The Storage/Query/Retrieve Character Set should be set to ISO_IR 100 to ensure a proper encoding of the DICOM data set.
- Configuration of a Character Set is not needed if connected to FORUM Archive.

7 Security

The MEL 90 Application Software provides only support for some specific security measures, but not for any security profiles as defined in NEMA PS3.15.

It is assumed that MEL 90 Application Software is used within a secured environment. It is assumed that a secured environment includes at a minimum:

- Firewall or router protections to ensure that only approved external hosts have network access to MEL 90 Application Software
- Firewall or router protections to ensure that MEL 90 Application Software only has network access to approved external hosts and services.
- Any communication with external hosts and services outside the locally secured environment use appropriate secure network channels (e.g. such as a Virtual Private Network (VPN))

Other network security procedures such as automated intrusion detection may be appropriate in some environments. Additional security features may be established by the local security policy and are beyond the scope of this conformance statement.

7.1 Security Profiles

The MEL 90 Application Software does not support any specific security profiles as defined in NEMA PS3.15.

However, the application requires a secured, TSL encrypted DICOM connection to the configured remote application entities, based on the stunnel program and self-signed certificates. A specific setup document is available for more details.

7.2 Association Level Security

The MEL 90 Application Software does not support any association level security.

7.3 Application Level Security

The MEL 90 Application Software requires a user to authenticate using a password controlled user account.

After a pre-set amount of time with no user activity, the MEL 90 Application Software is automatically locked and the user has to re-authenticate.

8 Annexes

8.1 IOD Contents

8.1.1 Created SOP Instance(s)

Abbreviations used for presence of values:

VNAP

Value Not Always Present (attribute sent zero length if no value is present) – Applicable for Type 2, 2C.

ANAP

Attribute is not always present – Applicable for Type 3

ALWAYS

Attribute is always present with a value – Applicable for Type 1

EMPTY

Attribute is sent without a value – Applicable for Type 2

Abbreviations used for sources of data:

USER

The attribute value source is from User input

AUTO

The attribute value is generated automatically

CONFIG

The attribute value source is a configurable parameter

PRQ

The attribute value is same as the value received using the DICOM service Patient Root Query (FIND).

SRR

The attribute value is same as the value received using the DICOM service Study Root Retrieve (MOVE).

8.1.1.1 Refractive Surgery Plan Raw Data Information Object Definition

| IE | Module | Reference | Presence of Module |
|--------------------|------------------------|-----------|--------------------|
| Patient | Patient | Table 8-1 | ALWAYS |
| | Clinical Trial Subject | | NEVER |
| Study | General Study | Table 8-2 | ALWAYS |
| | Patient Study | | NEVER |
| | Clinical Trial Study | | NEVER |
| Series | General Series | Table 8-3 | ALWAYS |
| | Clinical Trial Series | | NEVER |
| Frame of Reference | Frame of Reference | | NEVER |
| | Synchronization | | NEVER |
| Equipment | General Equipment | Table 8-4 | ALWAYS |
| Raw Data | Acquisition Context | Table 8-5 | ALWAYS |

| | | | |
|--|-----------------------------|-----------|--------|
| | Specimen | | NEVER |
| | Raw Data | Table 8-6 | ALWAYS |
| | Sop Common | Table 8-7 | ALWAYS |
| | CZM Pre-surgical Eye Status | Table 8-8 | ALWAYS |
| | CZM Refractive Surgery Plan | Table 8-9 | ALWAYS |

8.1.1.2 Refractive Surgery Summary Raw Data Information Object Definition

| IE | Module | Reference | Presence of Module |
|--------------------|--------------------------------|------------|--------------------|
| Patient | Patient | Table 8-1 | ALWAYS |
| | Clinical Trial Subject | | NEVER |
| Study | General Study | Table 8-2 | ALWAYS |
| | Patient Study | | NEVER |
| | Clinical Trial Study | | NEVER |
| Series | General Series | Table 8-3 | ALWAYS |
| | Clinical Trial Series | | NEVER |
| Frame of Reference | Frame of Reference | | NEVER |
| | Synchronization | | NEVER |
| Equipment | General Equipment | Table 8-4 | ALWAYS |
| Raw Data | Acquisition Context | Table 8-5 | ALWAYS |
| | Specimen | | NEVER |
| | Raw Data | Table 8-6 | ALWAYS |
| | Sop Common | Table 8-7 | ALWAYS |
| | CZM Refractive Surgery Summary | Table 8-10 | ALWAYS |

8.1.1.3 Encapsulated PDF Information Object Definition

| IE | Module | Reference | Presence of Module |
|-----------|------------------------------|------------|--------------------|
| Patient | Patient | Table 8-1 | ALWAYS |
| | Clinical Trial Subject | | NEVER |
| Study | General Study | Table 8-2 | ALWAYS |
| | Patient Study | | NEVER |
| | Clinical Trial Study | | NEVER |
| Series | Encapsulated Document Series | Table 8-11 | ALWAYS |
| | Clinical Trial Series | | NEVER |
| Equipment | General Equipment | Table 8-4 | ALWAYS |

| | | | |
|-----------------------|-----------------------|------------|--------|
| | SC Equipment | Table 8-12 | ALWAYS |
| Encapsulated Document | Encapsulated Document | Table 8-13 | ALWAYS |
| | SOP Common | Table 8-14 | ALWAYS |

8.1.1.4 Video Photographic Image Information Object Definition

| IE | Module | Reference | Presence of Module |
|-----------|------------------------|------------|--------------------|
| Patient | Patient | Table 8-1 | ALWAYS |
| | Clinical Trial Subject | | NEVER |
| Study | General Study | Table 8-2 | ALWAYS |
| | Patient Study | | NEVER |
| | Clinical Trial Study | | NEVER |
| Series | General Series | Table 8-3 | ALWAYS |
| | Clinical Trial Series | | NEVER |
| Equipment | General Equipment | Table 8-4 | ALWAYS |
| Image | General Image | Table 8-15 | ALWAYS |
| | Cine | Table 8-16 | ALWAYS |
| | Multi-frame | Table 8-17 | ALWAYS |
| | Image Pixel | Table 8-18 | ALWAYS |
| | Acquisition Context | Table 8-19 | ALWAYS |
| | Device | | NEVER |
| | Specimen | | NEVER |
| | VL Image | Table 8-20 | ALWAYS |
| | ICC Profile | | NEVER |
| | SOP Common | Table 8-21 | ALWAYS |
| | Frame Extraction | | NEVER |

8.1.1.5 Common Modules

Table 8-1 Common Modules - Module "Patient"

| Name | Tag | VR | Description | PoV | Source |
|----------------------|-------------|----|--|--------|-----------------|
| Patient's Name | (0010,0010) | PN | Patient's full name. <i>Note: In case of manually entered patient data first and last name are mandatory and limited to 40 characters each.</i> | VNAP | PRQ, USER |
| Patient ID | (0010,0020) | LO | Primary hospital identification number or code for the patient. <i>Note: In case of manually entered patient data Patient ID is mandatory and limited to 40 characters.</i> | ALWAYS | PRQ, AUTO, USER |
| Issuer of Patient ID | (0010,0021) | LO | Identifier of the Assigning Authority (system, organization, agency, or department) that issued the Patient ID. <i>Note: Equivalent to HL7 v2 CX component 4 subcomponent 1.</i> | ANAP | PRQ, CONFIG |
| Patient's Birth Date | (0010,0030) | DA | Birth date of the patient. | VNAP | PRQ |
| Patient's Sex | (0010,0040) | CS | Sex of the named patient. Enumerated Values: M = male F = female O = other | VNAP | PRQ |
| Other Patient IDs | (0010,1000) | LO | Other identification numbers or codes used to identify the patient. | ANAP | PRQ |
| Patient Comments | (0010,4000) | LT | User-defined additional information about the patient. | ANAP | PRQ |

Table 8-2 Common Modules - Module "General Study"

| Name | Tag | VR | Description | PoV | Source |
|----------------------------|-------------|----|---|--------|-----------|
| Study Instance UID | (0020,000D) | UI | Unique identifier for the Study. In case of a follow-up surgery planning the value is copied from the retrieved planning instance. Otherwise MEL 90 uses a constant prefix of "1.2.276.0.75.2.1.100.1.1." followed by a date/time stamp and machine specific identifier. | ALWAYS | SRR, AUTO |
| Study Date | (0008,0020) | DA | Date the Study started. | ALWAYS | SRR, AUTO |
| Study Time | (0008,0030) | TM | Time the Study started. | ALWAYS | SRR, AUTO |
| Referring Physician's Name | (0008,0090) | PN | Name of the patient's referring physician. | EMPTY | AUTO |
| Study ID | (0020,0010) | SH | User or equipment generated Study identifier. In the follow-up case the value is copied from the retrieved SOP instance. Otherwise the value is an Equipment generated Study identifier. | ALWAYS | SRR, AUTO |

Table 8-3 Common Modules - Module "General Series"

| Name | Tag | VR | Description | PoV | Source |
|----------|-------------|----|--|--------|--------|
| Modality | (0008,0060) | CS | Type of equipment that originally acquired the data used to create the images in this Series. "LVCPLAN" for Refractive Surgery Plans "LVCSUMMARY" for Refractive Surgery Summaries "XC" for Refractive Surgery Observation Videos "DOC" for Refractive Surgery Reports | ALWAYS | AUTO |

| | | | | | |
|-------------------------------------|-------------|----|---|--------|------------|
| Series Instance UID | (0020,000E) | UI | Unique identifier of the Series. In case of a follow-up surgery planning the value is copied from the retrieved planning instance. Otherwise MEL 90 uses a constant prefix of "1.2.276.0.75.2.1.100.1.2." followed by a date/time stamp and machine specific identifier. | ALWAYS | SRR, AUTO |
| Series Number | (0020,0011) | IS | A number that identifies this Series. In case of a follow-up surgery planning the value is copied from the retrieved planning instance. Otherwise MEL 90 uses an Equipment generated identifier. | ALWAYS | SRR, AUTO |
| Series Date | (0008,0021) | DA | Date the Series started. | ALWAYS | SRR, AUTO |
| Series Time | (0008,0031) | TM | Time the Series started. | ALWAYS | SRR, AUTO |
| Performing Physician's Name | (0008,1050) | PN | Name of the physician(s) administering the Series. | ALWAYS | AUTO, USER |
| Related Series Sequence | (0008,1250) | SQ | Identification of Series significantly related to this Series. One or more Items are permitted in this Sequence. Notes: 1. For example, for a combined CT and PET acquisition, the CT images and PET images would be in separate series that could cross-reference each other with multiple purpose of reference codes meaning same anatomy, simultaneously acquired and same indication. 2. The related series may have different Frames of Reference and hence require some sort of registration before spatial coordinates can be directly compared. 3. This attribute is not intended for conveying localizer reference information, for which Referenced Image Sequence (0008,1140) should be used. Used for referring a related series in case of a multi-type refractive surgery. | ANAP | AUTO |
| >Study Instance UID | (0020,000D) | UI | Instance UID of Study to which the related Series belongs | ALWAYS | AUTO |
| >Series Instance UID | (0020,000E) | UI | Instance UID of Related Series | ALWAYS | AUTO |
| >Purpose of Reference Code Sequence | (0040,A170) | SQ | Describes the purpose for which the reference is made. Zero or more Items shall be included in this sequence. When absent, implies that the reason for the reference is unknown. | ALWAYS | AUTO |
| >>Code Value | (0008,0100) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-29 Coded Values - Related Series Purposes of Reference | ALWAYS | AUTO |
| >>Coding Scheme Designator | (0008,0102) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-29 Coded Values - Related Series Purposes of Reference | ALWAYS | AUTO |
| >>Coding Scheme Version | (0008,0103) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-29 Coded Values - Related Series Purposes of Reference | ALWAYS | AUTO |
| >>Code Meaning | (0008,0104) | LO | For possible values see section 8.3 Coded Terminology and Templates - Table 8-29 Coded Values - Related Series Purposes of Reference | ALWAYS | AUTO |
| Body Part Examined | (0018,0015) | CS | Text description of the part of the body examined. See PS 3.16 Annexes on Correspondence of Anatomic Region Codes and Body Part Examined for Humans and for Animals for Defined Terms Note: Some IODs support the Anatomic | ALWAYS | AUTO |

| | | | | |
|--|--|--|--|--|
| | | Region Sequence (0008,2218), which can provide a more comprehensive mechanism for specifying the body part being examined. Always "EYE" | | |
|--|--|--|--|--|

Table 8-4 Common Modules - Module "General Equipment"

| Name | Tag | VR | Description | PoV | Source |
|---------------------------|-------------|----|--|--------|--------|
| Manufacturer | (0008,0070) | LO | Manufacturer of the equipment that produced the composite instances Always "Carl Zeiss Meditec" | ALWAYS | AUTO |
| Station Name | (0008,1010) | SH | User defined name identifying the machine that produced the composite instances. Attribute does not exist if no Station Name is configured. | ANAP | CONFIG |
| Manufacturer's Model Name | (0008,1090) | LO | Manufacturer's model name of the equipment that produced the composite instances. "MEL 90" | ALWAYS | AUTO |
| Device Serial Number | (0018,1000) | LO | Manufacturer's serial number of the equipment that produced the composite instances. Note: This identifier corresponds to the device that actually created the images, such as a CR plate reader or a CT console, and may not be sufficient to identify all of the equipment in the imaging chain, such as the generator or gantry or plate. | ALWAYS | AUTO |
| Software Version(s) | (0018,1020) | LO | Manufacturer's designation of software version of the equipment that produced the composite instances. "4.3" | ALWAYS | AUTO |

8.1.1.6 Refractive Surgery Plan/Summary Raw Data Modules

Table 8-5 Refractive Surgery Plan/Summary Raw Data IOD - Module "Acquisition Context"

| Name | Tag | VR | Description | PoV | Source |
|------------------------------|-------------|----|---|-------|--------|
| Acquisition Context Sequence | (0040,0555) | SQ | A sequence of Items that describes the conditions present during the acquisition of the data of the SOP Instance. Zero or more items shall be included in this sequence. Always empty sequence | EMPTY | AUTO |

Table 8-6 Refractive Surgery Plan/Summary Raw Data IOD - Module "Raw Data"

| Name | Tag | VR | Description | PoV | Source |
|----------------------|-------------|----|---|--------|--------|
| Instance Number | (0020,0013) | IS | A number that identifies this raw data. The value shall be unique within a Series. | ALWAYS | AUTO |
| Content Date | (0008,0023) | DA | The date the raw data creation started. | ALWAYS | AUTO |
| Content Time | (0008,0033) | TM | The time the raw data creation started. | ALWAYS | AUTO |
| Acquisition Datetime | (0008,002A) | DT | The date and time that the acquisition of data started. Note: The synchronization of this time with an external clock is specified in the synchronization Module in Acquisition Time synchronized (0018,1800). | ALWAYS | AUTO |
| Image Laterality | (0020,0062) | CS | Laterality of (possibly paired) body part examined. Enumerated Values: R = right L = left U = unpaired B = both left and right | ALWAYS | AUTO |

| | | | | | |
|-------------------------------------|-------------|----|---|--------|------|
| Creator-Version UID | (0008,9123) | UI | Unique identification of the equipment and version of the software that has created the Raw Data information. The UID allows one to avoid attempting to interpret raw data with an unknown format. Always "1.2.276.0.75.2.1.100.1.6.4.3" | ALWAYS | AUTO |
| Referenced Instance Sequence | (0008,114A) | SQ | Other Instances significantly related to this Instance. One or more Items are permitted in this Sequence. Contains references to other refractive surgery planning instances related to this plan. | ANAP | AUTO |
| >Referenced SOP Class UID | (0008,1150) | UI | Uniquely identifies the referenced SOP Class. | ALWAYS | AUTO |
| >Referenced SOP Instance UID | (0008,1155) | UI | Uniquely identifies the referenced SOP Instance. | ALWAYS | AUTO |
| >Purpose of Reference Code Sequence | (0040,A170) | SQ | Describes the purpose for which the reference is made. Only a single Item shall be included in this sequence. See C.7.6.16.2.5.1. | ALWAYS | AUTO |
| >>Code Value | (0008,0100) | SH | For possible values see section 8.3 Coded Terminology And Templates - Table 8-30 Coded Values - Referenced Instance Purposes of Reference | ALWAYS | AUTO |
| >>Coding Scheme Designator | (0008,0102) | SH | For possible values see section 8.3 Coded Terminology And Templates - Table 8-30 Coded Values - Referenced Instance Purposes of Reference | ALWAYS | AUTO |
| >>Coding Scheme Version | (0008,0103) | SH | For possible values see section 8.3 Coded Terminology And Templates - Table 8-30 Coded Values - Referenced Instance Purposes of Reference | ANAP | AUTO |
| >>Code Meaning | (0008,0104) | LO | For possible values see section 8.3 Coded Terminology And Templates - Table 8-30 Coded Values - Referenced Instance Purposes of Reference | ALWAYS | AUTO |

Table 8-7 Refractive Surgery Plan/Summary Raw Data IOD - Module "Sop Common"

| Name | Tag | VR | Description | PoV | Source |
|------------------------|-------------|----|--|--------|--------|
| SOP Class UID | (0008,0016) | UI | Uniquely identifies the SOP Class. See NEMA PS3.3 C.12.1.1.1 for further explanation. See also PS 3.4. Always "1.2.840.10008.5.1.4.1.1.66" | ALWAYS | AUTO |
| SOP Instance UID | (0008,0018) | UI | Uniquely identifies the SOP Instance. See NEMA PS3.3 C.12.1.1.1 for further explanation. See also PS 3.4. MEL 90 uses a constant prefix of "1.2.276.0.75.2.1.100.1.3." followed by a date/time stamp and machine specific identifier. | ALWAYS | AUTO |
| Specific Character Set | (0008,0005) | CS | Character Set that expands or replaces the Basic Graphic Set. Required if an expanded or replacement character set is used. See PS3.3 C.12.1.1.2 for Defined Terms. See 6 Support of Character Sets. | ALWAYS | AUTO |
| Instance Creation Date | (0008,0012) | DA | Date the SOP Instance was created. | ALWAYS | AUTO |
| Instance Creation Time | (0008,0013) | TM | Time the SOP Instance was created. | ALWAYS | AUTO |

Table 8-8 Refractive Surgery Plan/Summary Raw Data IOD - Module "CZM Pre-surgical Eye Status"

| Name | Tag | VR | Description | PoV | Source |
|--|-------------|----|---|--------|-----------|
| Corneal Thickness Sequence | (2D01,xx01) | SQ | Corneal thickness value and source. Only a single Item is permitted in this Sequence. | ANAP | AUTO |
| >Corneal Thickness | (2D01,xx02) | FD | The thickness of the cornea, in millimeters. | ALWAYS | USER, SRR |
| >Source of Corneal Thickness Code Sequence | (2D01,xx03) | SQ | Source of the value of Corneal Thickness. Zero or one Item shall be included in this sequence. | ALWAYS | AUTO |
| >>Code Value | (2D01,xx04) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-28 Coded Values - Ophthalmic Measurement or Calculation Data Source | ALWAYS | AUTO |
| >>Coding Scheme Designator | (2D01,xx05) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-28 Coded Values - Ophthalmic Measurement or Calculation Data Source | ALWAYS | AUTO |
| >>Code Meaning | (2D01,xx06) | LO | For possible values see section 8.3 Coded Terminology and Templates - Table 8-28 Coded Values - Ophthalmic Measurement or Calculation Data Source | ALWAYS | AUTO |
| >Referenced SOP Sequence | (2D01,xx07) | SQ | SOP Instance that is relevant to the interpretation of this SOP Instance. Only a single Item shall be included in this Sequence. See Section C.8.25.16.1.1 for further explanation. Required if Source of Corneal Thickness Code Sequence indicates another SOP instance as source of data. | ANAP | AUTO |
| >>Referenced SOP Class UID | (2D01,xx08) | UI | Uniquely identifies the referenced SOP Class. | ALWAYS | AUTO |
| >>Referenced SOP Instance UID | (2D01,xx09) | UI | Uniquely identifies the referenced SOP Instance. | ALWAYS | AUTO |
| Keratometry Sequence | (2D01,xx0A) | SQ | Keratometry values and source. Only a single Item is permitted in this Sequence. | ANAP | AUTO |
| >Steep Keratometric Axis Sequence | (2D01,xx0B) | SQ | A sequence that specifies the steepest meridian as defined by the greatest power of curvature and shortest radius of curvature. Only a single item shall be included in this sequence. | ALWAYS | AUTO |
| >>Radius of Curvature | (2D01,xx0C) | FD | The radius of curvature of the principal meridians of the cornea, measured in millimeters. | ALWAYS | USER, SRR |
| >>Keratometric Power | (2D01,xx0D) | FD | The refractive power of the cornea at the principal meridians, measured in diopters. | ALWAYS | USER, SRR |
| >>Keratometric Axis | (2D01,xx0E) | FD | The meridian where the keratometric radius of curvature or power is measured, in degrees. | ALWAYS | USER, SRR |
| >Flat Keratometric Axis Sequence | (2D01,xx0F) | SQ | A sequence that specifies the flattest meridian as defined by the least power of curvature and longest radius of curvature. Only a single item shall be included in this sequence. | ALWAYS | AUTO |
| >>Radius of Curvature | (2D01,xx0C) | FD | The radius of curvature of the principal meridians of the cornea, measured in millimeters. | ALWAYS | USER, SRR |

| | | | | | |
|--------------------------------------|-------------|----|---|--------|------------|
| >>Keratometric Power | (2D01,xx0D) | FD | The refractive power of the cornea at the principal meridians, measured in diopters. | ALWAYS | USER , SRR |
| >>Keratometric Axis | (2D01,xx0E) | FD | The meridian where the keratometric radius of curvature or power is measured, in degrees. | ALWAYS | USER , SRR |
| >Source of Keratometry Code Sequence | (2D01,xx10) | SQ | Source of the values of Steep and Flat Keraometry. Zero or one Item shall be included in this sequence. | ALWAYS | AUTO |
| >>Code Value | (2D01,xx04) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-28 Coded Values - Ophthalmic Measurement or Calculation Data Source | ALWAYS | AUTO |
| >>Coding Scheme Designator | (2D01,xx05) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-28 Coded Values - Ophthalmic Measurement or Calculation Data Source | ALWAYS | AUTO |
| >>Code Meaning | (2D01,xx06) | LO | For possible values see section 8.3 Coded Terminology and Templates - Table 8-28 Coded Values - Ophthalmic Measurement or Calculation Data Source | ALWAYS | AUTO |
| >Referenced SOP Sequence | (2D01,xx07) | SQ | SOP Instance that is relevant to the interpretation of this SOP Instance. Only a single Item shall be included in this Sequence. See Section C.8.25.16.1.1 for further explanation. Required if Source of Corneal Thickness Code Sequence indicates another SOP instance as source of data. | ANAP | AUTO |
| >>Referenced SOP Class UID | (2D01,xx08) | UI | Uniquely identifies the referenced SOP Class. | ALWAYS | AUTO |
| >>Referenced SOP Instance UID | (2D01,xx09) | UI | Uniquely identifies the referenced SOP Instance. | ALWAYS | AUTO |
| >Keratometer Index | (2D01,xx11) | FL | The translation factor specific to each keratometer that derives a number for power from the measured radius of curvature of the cornea. | ALWAYS | CONF IG |
| >Refractive Index of Cornea | (2D01,xx12) | FL | The refractive translation factor specific for the cornea. | ANAP | AUTO |
| Refractive State Sequence | (2D01,xx13) | SQ | Refractive state of the eye, values and source. One or more Items shall be included in this Sequence. | ANAP | AUTO |
| >Sphere Power | (2D01,xx14) | FD | Sphere value, in diopters. | ALWAYS | USER , SRR |
| >Cylinder Power | (2D01,xx15) | FD | Cylinder value, in diopters. Required if astigmatic correction or astigmatism is present. | ALWAYS | USER , SRR |
| >Cylinder Axis | (2D01,xx16) | FD | Axis value, in degrees. Required if astigmatic correction or astigmatism is present. | ALWAYS | USER , SRR |
| >Vertex Distance | (2D01,xx17) | FD | The vertex distance as distance between the back surface of a corrective lens, i.e. glasses (spectacles) or contact lenses, and the front of the cornea, in millimeters. | ALWAYS | USER , SRR |
| >Spherical Aberration | (2D01,xx42) | FD | Fourth-order spherical aberration coefficient of the eye, given as Z(4,0) in the Zernike polynomial expansion in Malacara notation, in microns. | ANAP | USER |
| >Source of Refractive | (2D01,xx18) | SQ | Source of values of Refractive State. Only a single Item shall be included in this sequence. | ALWAYS | AUTO |

| | | | | | |
|---|-------------|----|---|--------|------|
| State Code Sequence | | | | | |
| >>Code Value | (2D01,xx04) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-28 Coded Values - Ophthalmic Measurement or Calculation Data Source | ALWAYS | AUTO |
| >>Coding Scheme Designator | (2D01,xx05) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-28 Coded Values - Ophthalmic Measurement or Calculation Data Source | ALWAYS | AUTO |
| >>Code Meaning | (2D01,xx06) | LO | For possible values see section 8.3 Coded Terminology and Templates - Table 8-28 Coded Values - Ophthalmic Measurement or Calculation Data Source | ALWAYS | AUTO |
| >Referenced SOP Sequence | (2D01,xx07) | SQ | SOP Instance that is relevant to the interpretation of this SOP Instance. Only a single Item shall be included in this Sequence. See Section C.8.25.16.1.1 for further explanation. Required if Source of Corneal Thickness Code Sequence indicates another SOP instance as source of data. | ANAP | AUTO |
| >>Referenced SOP Class UID | (2D01,xx08) | UI | Uniquely identifies the referenced SOP Class. | ALWAYS | AUTO |
| >>Referenced SOP Instance UID | (2D01,xx09) | UI | Uniquely identifies the referenced SOP Instance. | ALWAYS | AUTO |
| Corneal Epithelium Thickness Sequence | (2D01,xx80) | SQ | Corneal epithelium thickness values and source. One or more Items shall be included in this Sequence. | ANAP | AUTO |
| >Corneal Region Code Sequence | (2D01,xx81) | SQ | Region of the cornea where value is measured. Only a single Item shall be included in this sequence. | ALWAYS | AUTO |
| >>Code Value | (2D01,xx04) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-32 Coded Values – Corneal Region | ALWAYS | AUTO |
| >>Coding Scheme Designator | (2D01,xx05) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-32 Coded Values – Corneal Region | ALWAYS | AUTO |
| >>Code Meaning | (2D01,xx06) | LO | For possible values see section 8.3 Coded Terminology and Templates - Table 8-32 Coded Values – Corneal Region | ALWAYS | AUTO |
| >Corneal Epithelium Thickness | (2D01,xx82) | FD | Thickness of the corneal epithelium, measured in millimeters | ALWAYS | AUTO |
| >Source of Corneal Epithelium Thickness Code Sequence | (2D01,xx83) | SQ | Source of the value of Corneal Epithelium Thickness. Zero or one Item shall be included in this sequence. | ALWAYS | AUTO |
| >>Code Value | (2D01,xx04) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-28 Coded Values - Ophthalmic Measurement or Calculation Data Source | ALWAYS | AUTO |
| >>Coding Scheme Designator | (2D01,xx05) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-28 Coded Values - Ophthalmic Measurement or Calculation Data Source | ALWAYS | AUTO |
| >>Code Meaning | (2D01,xx06) | LO | For possible values see section 8.3 Coded Terminology and Templates - Table 8-28 Coded Values - Ophthalmic Measurement or Calculation Data Source | ALWAYS | AUTO |

| | | | | | |
|-------------------------------|-------------|----|---|--------|------|
| >Referenced SOP Sequence | (2D01,xx07) | SQ | SOP Instance that is relevant to the interpretation of this SOP Instance. Only a single Item shall be included in this Sequence. See Section C.8.25.16.1.1 for further explanation. Required if Source of Corneal Thickness Code Sequence indicates another SOP instance as source of data. | ANAP | AUTO |
| >>Referenced SOP Class UID | (2D01,xx08) | UI | Uniquely identifies the referenced SOP Class. | ALWAYS | AUTO |
| >>Referenced SOP Instance UID | (2D01,xx09) | UI | Uniquely identifies the referenced SOP Instance. | ALWAYS | AUTO |

Table 8-9 Refractive Surgery Plan Raw Data IOD - Module "CZM Refractive Surgery Plan"

| Name | Tag | VR | Description | PoV | Source |
|---|-------------|----|---|--------|------------|
| General Parameters Sequence | (2D01,xx19) | SQ | General planning parameters relevant to any type of refractive surgery. Only a single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >Refractive Surgery Type Code Sequence | (2D01,xx1A) | SQ | Type of the refractive surgery. Only one single Item is permitted in this Sequence. | ALWAYS | USER |
| >>Code Value | (2D01,xx04) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-27 Coded Values - Refractive Surgery Types | ALWAYS | AUTO |
| >>Coding Scheme Designator | (2D01,xx05) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-27 Coded Values - Refractive Surgery Types | ALWAYS | AUTO |
| >>Code Meaning | (2D01,xx06) | LO | For possible values see section 8.3 Coded Terminology and Templates - Table 8-27 Coded Values - Refractive Surgery Types | ALWAYS | AUTO |
| >Target Refraction Sequence | (2D01,xx1B) | SQ | The desired postoperative refractive error. Only a single Item is permitted in this Sequence. | ANAP | AUTO |
| >>Sphere Power | (2D01,xx14) | FD | Sphere value, in diopters. | ALWAYS | AUTO, USER |
| >>Cylinder Power | (2D01,xx15) | FD | Cylinder value, in diopters. | ALWAYS | AUTO, USER |
| >Refractive Correction Sequence | (2D01,xx1C) | SQ | The intended refractive correction. Only a single Item is permitted in this Sequence. | ANAP | AUTO |
| >>Sphere Power | (2D01,xx14) | FD | Sphere value, in diopters. | ALWAYS | AUTO |
| >>Cylinder Power | (2D01,xx15) | FD | Cylinder value, in diopters. | ALWAYS | AUTO |
| >Refractive Correction Laser Set Sequence | (2D01,xx1D) | SQ | The actual laser set refractive correction to be used for surgery. This is either equal to the intended correction or values calculated by a user nomogram. Only a single Item is permitted in this Sequence. | ANAP | AUTO |
| >>Sphere Power | (2D01,xx14) | FD | Sphere value, in diopters. | ALWAYS | AUTO |
| >>Cylinder Power | (2D01,xx15) | FD | Cylinder value, in diopters. | ALWAYS | AUTO |

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|---|-------------|----|--|--------|------------|
| >Optical Zone | (2D01,xx1E) | FD | Diameter of the optical zone, in millimeters | ANAP | AUTO, USER |
| >Editors Name | (2D01,xx1F) | PN | Name(s) of the editor(s) involved in creating the refractive surgery plan. | ANAP | AUTO |
| >Scheduled Surgery DateTime | (2D01,xx3D) | DT | The scheduled surgery date and time. | ANAP | USER |
| >Refractive Surgery Plan Comments | (2D01,xx20) | LT | Comments on the refractive surgery plan. | ANAP | USER |
| >Refractive Module Info Sequence | (2D01,xx21) | SQ | Information about the refractive software modules applied on refractive surgery plan. One or more Items shall be included in this Sequence. | ANAP | AUTO |
| >>Module Type Code Sequence | (2D01,xx22) | SQ | The type of the module. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >>>Code Value | (2D01,xx04) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-33 Coded Values – Refractive Module Type | ALWAYS | AUTO |
| >>>Coding Scheme Designator | (2D01,xx05) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-33 Coded Values – Refractive Module Type | ALWAYS | AUTO |
| >>>Code Meaning | (2D01,xx06) | LO | For possible values see section 8.3 Coded Terminology and Templates - Table 8-33 Coded Values – Refractive Module Type | ALWAYS | AUTO |
| >>Module Name | (2D01,xx23) | LO | A human readable name of the software module. | ALWAYS | AUTO |
| >>Module ID | (2D01,xx24) | LO | The identification of the software module. | ALWAYS | AUTO |
| >>Module Version | (2D01,xx25) | LO | The version of the software module. | ALWAYS | AUTO |
| >Residual Stroma Thickness | (2D01,xx26) | FD | The expected residual thickness of the stroma after surgery will be performed on the eye, in millimeters. | ANAP | AUTO |
| General Femtosecond Parameters Sequence | (2D01,xx27) | SQ | General planning parameters relevant to femtosecond laser based refractive surgery. Only a single Item is permitted in this Sequence. Required if Refractive Surgery Type Code Sequence contains an item that refers to a femtosecond laser based surgery type. | ANAP | AUTO |
| >Centration Target Position | (2D01,xx28) | FD | The target position of the centration relatively to pupil center specified by a numeric pair - x-position (delimiter) y-position, in millimeters. | ALWAYS | USER |
| >Selected Treatment Pack Code Sequence | (2D01,xx29) | SQ | The treatment pack selected for the refractive surgery. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >>Treatment Pack Size | (2D01,xx2A) | CS | The treatment pack's size specification. Enumerated values: S M L | ALWAYS | USER |
| >>Treatment Pack Label | (2D01,xx2B) | LO | A descriptive or identifying label of the treatment pack. | ANAP | USER |

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|-------------------------------------|-------------|----|---|--------|------------|
| General Excimer Parameters Sequence | (2D01,xx2C) | SQ | General planning parameters relevant to excimer laser based refractive surgery. Only a single Item is permitted in this Sequence. Required if Refractive Surgery Type Code Sequence contains an item that refers to an excimer laser based surgery type. | ANAP | AUTO |
| >Ablation Details Sequence | (2D01,xx2D) | SQ | Detailed parameters for the corneal tissue ablation performed on the patient's eye. Only one single Item is permitted in this Sequence. | ANAP | AUTO |
| >>Ablation Depth | (2D01,xx2E) | FD | Maximum thickness of corneal tissue ablated, in millimeters. | ALWAYS | AUTO |
| >>Distance | (2D01,xx2F) | FD | Radial coordinate of the location of maximum ablation in a polar coordinate system where the center of the optical zone represents the pole, in millimeters. Required if location of maximum ablation is neither at the center of the optical zone (myopic correction) nor at the edge of the optical zone (hyperopic correction). | ANAP | AUTO |
| >>Angle | (2D01,xx30) | FD | Angular coordinate of the location of maximum ablation in a polar coordinate system where the center of the optical zone represents the pole, in degrees. Required if location of maximum ablation is neither at the center of the optical zone (myopic correction) nor at the edge of the optical zone (hyperopic correction). | ANAP | AUTO |
| >Laser Frequency | (2D01,xx31) | FD | The pulse repetition frequency of the laser system. This frequency corresponds to the number of shots per second emitted by the laser system, in Hertz | ALWAYS | AUTO, USER |
| FLAP Parameters Sequence | (2D01,xx32) | SQ | Specific planning parameters relevant to a refractive surgery of type FLAP. Only a single Item is permitted in this Sequence. Required if Refractive Surgery Type Code Sequence contains an item with the value (LVCFLAP, 99CZM, 'Refractive surgery type FLAP'). | ANAP | AUTO |
| >Flap Cut Parameters Sequence | (2D01,xx33) | SQ | Parameters defining a single flap cut of a refractive surgery. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >>Cut Order Index | (2D01,xx34) | US | The unique zero-based position of this laser cut in the sequence of all laser cuts. All cuts are performed one after each other in a specific chronological order. The value of this attribute shall specify the position within this order. The attribute shall have no value if the cut will not be performed. | VNAP | AUTO |
| >>Flap Diameter | (2D01,xx35) | FD | The flap diameter, in millimeters. | ALWAYS | AUTO, USER |
| >>Flap Thickness | (2D01,xx36) | FD | The flap thickness, in millimeters. | ALWAYS | AUTO, USER |
| >Border Cut Parameters Sequence | (2D01,xx37) | SQ | Parameters defining a single flap border cut of a refractive surgery. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >>Cut Order Index | (2D01,xx34) | US | The unique zero-based position of this laser cut in the sequence of all laser cuts. All cuts are performed one after each other in a specific chronological order. The value of this attribute shall specify the position within this order. The attribute shall have no value if the cut will not be performed. | VNAP | AUTO |
| >>Flap Side Cut Angle | (2D01,xx38) | FD | The width of the flap border side cut as angle, in degrees. | ALWAYS | AUTO, USER |

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|---|-------------|----|--|--------|------------|
| >Hinge Sector Parameters Sequence | (2D01,xx39) | SQ | Parameters defining a single hinge sector of a refractive surgery. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >>Hinge Position | (2D01,xx3A) | FD | The position of the hinge as angle, in degrees. | ALWAYS | AUTO, USER |
| >>Hinge Angle | (2D01,xx3B) | FD | The width of the hinge as angle, in degrees. | ALWAYS | AUTO, USER |
| >>Hinge Width | (2D01,xx3C) | FD | The width of the hinge, in millimeters. | ALWAYS | AUTO, USER |
| LBV Parameters Sequence | (2D01,xx3E) | SQ | Specific planning parameters relevant to a refractive surgery of type Laser Blended Vision (LBV). Only a single Item is permitted in this Sequence. Required if Refractive Surgery Type Code Sequence contains an item with the value (LVCLBV, 99CZM, 'Refractive surgery type Laser Blended Vision'). | ANAP | AUTO |
| >Patient's Functional Age | (2D01,xx3F) | AS | The functional age of the patient according to the eye's accommodation ability. | ANAP | USER |
| >Dominant Eye | (2D01,xx40) | CS | Indicates whether this refractive surgery planning is for the patient's dominant eye or not. Enumerated Values: YES NO | ANAP | USER |
| >Monovision Acceptance | (2D01,xx41) | CS | Indicates whether the mono vision acceptance (+1.5 diopters test tolerance) is confirmed by the patient or not. Enumerated Values: YES NO | ANAP | USER |
| SMILE Parameters Sequence | (2D01,xx43) | SQ | Specific planning parameters relevant to a refractive surgery of type SMILE. Only a single Item is permitted in this Sequence. Required if Refractive Surgery Type Code Sequence contains an item with the value (111681, DCM, 'SMILE'). | ANAP | AUTO |
| >Lenticule Edge Thickness | (2D01,xx44) | FD | The thickness of the lenticule at the edge that ensures that the edge has a finite height, in millimeters. | ALWAYS | AUTO, USER |
| >Lenticule Central Thickness | (2D01,xx45) | FD | Central thickness of the lenticule, in millimeters. Note: In the myopic case it is calculated from the specified correction and the edge thickness. In the hyperopic case this is the given by the user input | ALWAYS | AUTO, USER |
| >Lenticule Central Thickness User Entry | (2D01,xx46) | CS | Indicates whether the value for Lenticule Central Thickness originates from a user input or not. Enumerated Values: YES NO | ANAP | AUTO |
| >Lenticule Max Thickness | (2D01,xx47) | FD | Maximum thickness of the lenticule, in millimeters. Note: For the myopic case this is equal to the central thickness. In the hyperopic case the maximum thickness of the lenticule is decentral. | ALWAYS | USER, AUTO |
| >Lenticule Max Thickness radius | (2D01,xx48) | FD | Indicates the location where the lenticule has its max thickness, in millimeters. | ALWAYS | AUTO |
| >Cap Cut Parameters Sequence | (2D01,xx49) | SQ | Parameters defining a single cap cut of a refractive surgery. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >>Cut Order Index | (2D01,xx34) | US | The unique zero-based position of this laser cut in the sequence of all laser cuts. All cuts are performed one after each other in a specific chronological order. The value of this attribute shall specify the position within this order. The attribute shall have no value if the cut will not be performed. | VNAP | AUTO |

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|---|-------------|----|--|--------|------------|
| >>Cap Diameter | (2D01,xx4A) | FD | The diameter of the upper cut that is concentric to the surface of the cornea, in millimeters. | ALWAYS | AUTO, USER |
| >>Cap Thickness | (2D01,xx4B) | FD | The depth of the cap cut in the cornea, in millimeters. | ALWAYS | AUTO, USER |
| >Cap Side Cut Parameters Sequence | (2D01,xx4C) | SQ | Parameters defining a single cap side cut of a refractive surgery. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >>Cut Order Index | (2D01,xx34) | US | The unique zero-based position of this laser cut in the sequence of all laser cuts. All cuts are performed one after each other in a specific chronological order. The value of this attribute shall specify the position within this order. The attribute shall have no value if the cut will not be performed. | VNAP | AUTO |
| >>Cap Side Cut Angle | (2D01,xx4D) | FD | The angle between cap side cut and cornea surface, in degrees. This is the cut angle of the incisions. | ALWAYS | AUTO, USER |
| >Incision Parameters Sequence | (2D01,xx4E) | SQ | Parameters defining a single incision cut of a refractive surgery. One or more Items shall be included in this Sequence. | ALWAYS | AUTO |
| >>Incision Position | (2D01,xx4F) | FD | The position of the incision as angle, in degrees. Note: A value of zero means positive x direction (on the right) independent from the eye selection. | ALWAYS | AUTO, USER |
| >>Incision Width | (2D01,xx50) | FD | The width of the incision as angle, in degrees. Note: The incision extends from Incision Position - 0.5 * Incision Width to Incision Position + 0.5 * Incision Width | ALWAYS | AUTO, USER |
| >Lenticule Cut Parameters Sequence | (2D01,xx51) | SQ | Parameters defining a single lenticule cut of a refractive surgery. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >>Cut Order Index | (2D01,xx34) | US | The unique zero-based position of this laser cut in the sequence of all laser cuts. All cuts are performed one after each other in a specific chronological order. The value of this attribute shall specify the position within this order. The attribute shall have no value if the cut will not be performed. | VNAP | AUTO |
| >>Lenticule Optical Zone | (2D01,xx52) | FD | The diameter of the optical relevant part of the lower cut, in millimeters. | ALWAYS | AUTO, USER |
| >>Lenticule Transition Zone | (2D01,xx53) | FD | Size of the transition zone that is present in case of myopic astigmatism and hyperopic corrections, in millimeters. | ANAP | USER |
| >Lenticule Side Cut Parameters Sequence | (2D01,xx54) | SQ | Parameters defining a single lenticule side cut of a refractive surgery. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >>Cut Order Index | (2D01,xx34) | US | The unique zero-based position of this laser cut in the sequence of all laser cuts. All cuts are performed one after each other in a specific chronological order. The value of this attribute shall specify the position within this order. The attribute shall have no value if the cut will not be performed. | VNAP | AUTO |
| >>Lenticule Side Cut Angle | (2D01,xx55) | FD | The angle between lenticule side cut and cornea surface, in degrees. | ALWAYS | AUTO, USER |
| ICR Parameters Sequence | (2D01,xx56) | SQ | Specific planning parameters relevant to a refractive surgery of type ICR (intrastromal corneal ring implanting). Only a single Item is permitted in this Sequence. Required if Refractive Surgery Type Code Sequence contains an item with the value (LVCICR, 99CZM, 'Refractive surgery type ICR'). | ANAP | AUTO |

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|-------------------------------------|-------------|----|---|--------|------------|
| >ICR Preset Identification Sequence | (2D01,xx57) | SQ | Attributes identifying the parameters preset selected for the ICR surgery. Only one single Item is permitted in this Sequence. | ANAP | AUTO, USER |
| >>ICR Preset ID | (2D01,xx58) | LO | The unique ID of the selected ICR preset. | ALWAYS | AUTO |
| >>ICR Preset Name | (2D01,xx59) | LO | The name of the selected ICR preset. | ALWAYS | AUTO |
| >ICR Access Cut Parameters Sequence | (2D01,xx5A) | SQ | Parameters defining the a single access cut of a refractive surgery of type ICR. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >>ICR Cut 1 enabled | (2D01,xx5B) | CS | Indicates if the first access cut shall be performed or not. Enumerated Values: YES NO | ALWAYS | AUTO, USER |
| >>ICR Cut 1 position | (2D01,xx5C) | FD | Calculated angular position of the first access cut, in degrees. | ANAP | AUTO, USER |
| >>ICR Cut 2 enabled | (2D01,xx5D) | CS | Indicates if the second access cut shall be performed or not. Enumerated Values: YES NO | ALWAYS | AUTO, USER |
| >>ICR Cut 2 position | (2D01,xx5E) | FD | Calculated angular position of the second access cut, in degrees. | ANAP | AUTO, USER |
| >>ICR Lower Width | (2D01,xx5F) | FD | Width of the bottom of the access cut in radial direction, in millimeters. | ALWAYS | AUTO, USER |
| >>ICR Upper Width | (2D01,xx60) | FD | Width of the top of the access cut in radial direction, in millimeters. | ALWAYS | AUTO, USER |
| >ICR Tunnel Cut Parameters Sequence | (2D01,xx61) | SQ | Parameters defining the a single tunnel cut of a refractive surgery of type ICR. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >>ICR Inner Diameter | (2D01,xx62) | FD | Inner diameter of the ICR tunnel cut, in millimeters. | ALWAYS | AUTO, USER |
| >>ICR Outer Diameter | (2D01,xx63) | FD | Outer diameter of the ICR tunnel cut, in millimeters. | ALWAYS | AUTO, USER |
| >>ICR Inner Depth | (2D01,xx64) | FD | Depth of the ICR tunnel cut at the inner diameter, in millimeters. | ALWAYS | AUTO, USER |
| >>ICR Outer Depth | (2D01,xx65) | FD | Depth of the ICR tunnel cut at the outer diameter, in millimeters. | ALWAYS | AUTO, USER |
| >>ICR Position | (2D01,xx66) | FD | The position of the center axis of the ICR tunnel segment as angle, in degrees. | ALWAYS | AUTO, USER |
| >>ICR Angle | (2D01,xx67) | FD | The width of the center axis of the ICR tunnel segment as angle, in degrees. | ALWAYS | AUTO, USER |
| Keratoplasty Parameters Sequence | (2D01,xx68) | SQ | Specific planning parameters relevant to a refractive surgery of type Keratoplasty. Only a single Item is permitted in this Sequence. Required if Refractive Surgery Type Code Sequence contains an item with the value (KERATOPLASTY, 99CZM, 'Refractive surgery type Keratoplasty'). | ANAP | AUTO |
| >Keratoplasty Type Code Sequence | (2D01,xx69) | SQ | The type of keratoplasty. Only one single Item is permitted in this Sequence. | ALWAYS | USER |
| >>Code Value | (2D01,xx04) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-34 Coded Values – Keratoplasty Type | ALWAYS | AUTO |

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|---|-------------|----|--|--------|------------|
| >>Coding Scheme Designator | (2D01,xx05) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-34 Coded Values – Keratoplasty Type | ALWAYS | AUTO |
| >>Code Meaning | (2D01,xx06) | LO | For possible values see section 8.3 Coded Terminology and Templates - Table 8-34 Coded Values – Keratoplasty Type | ALWAYS | AUTO |
| >Donor ID | (2D01,xx6A) | LO | Identification of the donor of the transplanted cornea. | ANAP | AUTO, USER |
| >Graft Diameter | (2D01,xx6B) | FD | Diameter of the graft at the bottom circle of the side cut, in millimeters. | ALWAYS | AUTO, USER |
| >Keratoplasty Graft Cut Parameters Sequence | (2D01,xx6C) | SQ | Parameters defining a single lamellar graft cut of a refractive surgery of type Keratoplasty. Only one single Item is permitted in this Sequence. Required if Keratoplasty Type Code Value contains an item with the Code Value LAMELLAR. | ANAP | AUTO |
| >>Graft Thickness | (2D01,xx6D) | FD | Thickness of the graft relatively to the cornea surface, in millimeters. | ALWAYS | AUTO, USER |
| >Keratoplasty Side Cut Parameters Sequence | (2D01,xx6E) | SQ | Parameters defining a single graft side cut of a refractive surgery of type Keratoplasty. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >>Graft Side Cut Angle | (2D01,xx6F) | FD | The angle between graft side cut and cornea surface, in degrees. | ALWAYS | AUTO, USER |
| Circle Parameters sequence | (2D01,xx70) | SQ | Specific planning parameters relevant to a refractive surgery of type CIRCLE. Only a single Item is permitted in this Sequence. Required if Refractive Surgery Type Code Sequence contains an item with the value (LVCCIRCLE, 99CZM, 'Refractive surgery type CIRCLE'). | ANAP | AUTO |
| >Circle Mode Code Sequence | (2D01,xx71) | SQ | Type of the circle refractive surgery. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO, USER |
| >>Code Value | (2D01,xx04) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-35 Coded Values – Circle Mode | ALWAYS | AUTO |
| >>Coding Scheme Designator | (2D01,xx05) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-35 Coded Values – Circle Mode | ALWAYS | AUTO |
| >>Code Meaning | (2D01,xx06) | LO | For possible values see section 8.3 Coded Terminology and Templates - Table 8-35 Coded Values – Circle Mode | ALWAYS | AUTO |
| >Lamellar Ring Cut Parameters Sequence | (2D01,xx72) | SQ | Parameters defining a single lamellar ring cut of a refractive surgery of type CIRCLE. Only one single Item is permitted in this Sequence. Required if Circle Mode Code Sequence contains an item with Code Value other than SIDECUTONLY. | ANAP | AUTO |
| >>Lamellar Ring Outer Diameter | (2D01,xx73) | FD | Outer diameter of lamellar ring, in millimeters. | ALWAYS | AUTO, USER |
| >>Lamellar Ring Inner Diameter | (2D01,xx74) | FD | Inner diameter of lamellar ring, in millimeters. | ALWAYS | AUTO, USER |
| >>Lamellar Ring Depth | (2D01,xx75) | FD | Depth of lamellar ring, in millimeters. | ALWAYS | AUTO, USER |

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| >>Circle Junction Upper Depth | (2D01,xx76) | FD | Depth of the upper junction, starting from the inner diameter of the lamellar cut upwards, in millimeters. Required if Circle Mode Code Sequence contains an item with Code Value UPJUNCTION or UPDOWNJUNCTION. | ANAP | AUTO, USER |
| >>Circle Junction Lower Depth | (2D01,xx77) | FD | Depth of the lower junction, starting from the inner diameter of the lamellar cut downwards, in millimeters. Required if Circle Mode Code Sequence contains an item with Code Value DOWNJUNCTION or UPDOWNJUNCTION. | ANAP | AUTO, USER |
| >CIRCLE Side Cut Parameters Sequence | (2D01,xx78) | SQ | Parameters defining a single side cut of a refractive surgery of type CIRCLE. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >>CIRCLE Side Cut Angle | (2D01,xx79) | FD | The angle between circle side cut and cornea surface, in degrees. | ALWAYS | AUTO, USER |
| >Hinge Sector Parameters Sequence | (2D01,xx39) | SQ | Parameters defining a single hinge sector of a refractive surgery. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >>Hinge Position | (2D01,xx3A) | FD | The position of the hinge as angle, in degrees. | ALWAYS | AUTO, USER |
| >>Hinge Angle | (2D01,xx3B) | FD | The width of the hinge as angle, in degrees. | ALWAYS | AUTO, USER |
| >>Hinge Width | (2D01,xx3C) | FD | The width of the hinge, in millimeters. | ALWAYS | AUTO, USER |

Table 8-10 Refractive Surgery Summary Raw Data IOD - Module "CZM Refractive Surgery Summary"

| Name | Tag | VR | Description | PoV | Source |
|--|-------------|----|---|--------|--------|
| General Summary Sequence | (2D03,xx01) | SQ | General surgery outcomes relevant to any type of refractive surgery. Only a single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >Refractive Surgery Type Code Sequence | (2D03,xx02) | SQ | Type of the refractive surgery. Only one single Item is permitted in this Sequence. | ALWAYS | USER |
| >>Code Value | (2D03,xx1D) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-27 Coded Values - Refractive Surgery Types | ALWAYS | AUTO |
| >>Coding Scheme Designator | (2D03,xx1E) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-27 Coded Values - Refractive Surgery Types | ALWAYS | AUTO |
| >>Code Meaning | (2D03,xx1F) | LO | For possible values see section 8.3 Coded Terminology and Templates - Table 8-27 Coded Values - Refractive Surgery Types | ALWAYS | AUTO |
| >Refractive Surgery Status Code Sequence | (2D03,xx03) | SQ | Status of the Surgery at the time the Refractive Surgery Summary was created. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >>Code Value | (2D03,xx1D) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-36 Coded Values – Refractive Surgery Status | ALWAYS | AUTO |

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|---------------------------------------|-------------|----|--|--------|------|
| >>Coding Scheme Designator | (2D03,xx1E) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-36 Coded Values – Refractive Surgery Status | ALWAYS | AUTO |
| >>Code Meaning | (2D03,xx1F) | LO | For possible values see section 8.3 Coded Terminology and Templates - Table 8-36 Coded Values – Refractive Surgery Status | ALWAYS | AUTO |
| >Refractive surgery comments | (2D03,xx04) | LT | Comments on the refractive surgery. | ANAP | USER |
| >Surgical Audit Checklist Sequence | (2D03,xx05) | SQ | Internal audit checklist of this surgery. Zero or more Items may be present in this Sequence. | VNAP | AUTO |
| >>Audit Identifier | (2D03,xx06) | CS | An identification code for this specific audit check. | ALWAYS | AUTO |
| >>Audit Check | (2D03,xx07) | ST | A textual description of this audit check. | ALWAYS | AUTO |
| >>Audit Result | (2D03,xx08) | CS | The audit check result. Defined Terms: PASSED FAILED NOT_APPLICABLE NOT_TESTED | ALWAYS | USER |
| >Surgery Log Sequence | (2D03,xx09) | SQ | Log of time-stamped events occurring during this refractive surgery. Zero or more Items may be present in this Sequence. | VNAP | AUTO |
| >>Log Timestamp | (2D03,xx0A) | DT | The time stamp of this log entry. | ALWAYS | AUTO |
| >>Log Message | (2D03,xx0B) | ST | The message of this log entry | ALWAYS | AUTO |
| >Laser Emission Duration | (2D03,xx0C) | UL | The total time span laser energy has been emitted to the patient's eye, in milliseconds. | ALWAYS | AUTO |
| General Femtosecond Summary Sequence | (2D03,xx0D) | SQ | General surgery outcomes relevant to femtosecond laser based refractive surgery. Only a single Item is permitted in this Sequence. Required if Refractive Surgery Type Code Sequence contains an item that refers to a femtosecond laser based surgery type. | ANAP | AUTO |
| >Centration Achieved Position | (2D03,xx0E) | FD | The position of the actually achieved centration relatively to pupil center specified by a numeric pair - x-position (delimiter) y-position, in millimeters. | ALWAYS | AUTO |
| >Decentration Distance | (2D03,xx0F) | FD | The actual decentration as Euclidean distance measured between planned target centration and achieved centration, in millimeters. | ALWAYS | AUTO |
| >Applied Treatment Pack Code Sequence | (2D03,xx10) | SQ | The treatment pack actually applied at the refractive surgery. Only one single Item is permitted in this Sequence. | ALWAYS | USER |
| >>Treatment Pack Size | (2D03,xx11) | CS | The treatment pack's size specification. Enumerated values: S M L | ALWAYS | AUTO |
| >>Treatment Pack Label | (2D03,xx12) | LO | A descriptive or identifying label of the treatment pack. | ANAP | AUTO |
| >Eye Suction Duration | (2D03,xx13) | UL | The total time span the patient's eye has been attached to the refractive surgery device, in milliseconds | ALWAYS | AUTO |
| >Laser Cut Parameters Preset Name | (2D03,xx14) | LO | Textual identifier of the preset used for the actually applied laser cut parameters. | ALWAYS | AUTO |

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| Flap Summary Sequence | (2D03,xx15) | SQ | Specific surgery outcomes relevant to a refractive surgery of type FLAP. Only a single Item is permitted in this Sequence. Required if Refractive Surgery Type Code Sequence contains an item with the value (LVCFLAP, 99CZM, 'Refractive surgery type FLAP'). | ANAP | AUTO |
| >Flap Cut Summary Sequence | (2D03,xx16) | SQ | Summary of a single flap cut of a refractive surgery. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >>Cut Order Index | (2D03,xx17) | US | The unique zero-based position of this laser cut in the sequence of all laser cuts. All cuts are performed one after each other in a specific chronological order. The value of this attribute shall specify the position within this order. The attribute shall have no value if the cut has not been performed. | VNAP | AUTO |
| >>Achieved Progress | (2D03,xx18) | FD | The progress actually achieved for this laser cut, in percent. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Energy Index | (2D03,xx19) | US | The applied energy for this laser cut as index of the energy table. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Spot Distance | (2D03,xx1A) | FD | The distance between two laser spots, in micrometers. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Track Distance | (2D03,xx1B) | FD | The distance between two tracks, in micrometers. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Laser Scan Direction Code Sequence | (2D03,xx1C) | SQ | Laser scan direction used for this laser cut. Only one single Item is permitted in this Sequence. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>>Code Value | (2D03,xx1D) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >>>Coding Scheme Designator | (2D03,xx1E) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >>>Code Meaning | (2D03,xx1F) | LO | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >Border Cut Summary Sequence | (2D03,xx20) | SQ | Summary of a single flap border cut of a refractive surgery. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >>Cut Order Index | (2D03,xx17) | US | The unique zero-based position of this laser cut in the sequence of all laser cuts. All cuts are performed one after each other in a specific chronological order. The value of this attribute shall specify the position within this order. The attribute shall have no value if the cut has not been performed. | VNAP | AUTO |
| >>Achieved Progress | (2D03,xx18) | FD | The progress actually achieved for this laser cut, in percent. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Energy Index | (2D03,xx19) | US | The applied energy for this laser cut as index of the energy table. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Spot Distance | (2D03,xx1A) | FD | The distance between two laser spots, in micrometers. | ANAP | AUTO |

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| | | | Required if Cut Order Index has a value. | | |
| >>Track Distance | (2D03,xx1B) | FD | The distance between two tracks, in micrometers. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Laser Scan Direction Code Sequence | (2D03,xx1C) | SQ | Laser scan direction used for this laser cut. Only one single Item is permitted in this Sequence. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>>Code Value | (2D03,xx1D) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >>>Coding Scheme Designator | (2D03,xx1E) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >>>Code Meaning | (2D03,xx1F) | LO | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| Smile Summary Sequence | (2D03,xx21) | SQ | Specific surgery outcomes relevant to a refractive surgery of type SMILE. Only a single Item is permitted in this Sequence. Required if Refractive Surgery Type Code Sequence contains an item with the value (111681, DCM, 'SMILE'). | ANAP | AUTO |
| >Cap Cut Summary Sequence | (2D03,xx22) | SQ | Summary of a single cap cut of a refractive surgery. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >>Cut Order Index | (2D03,xx17) | US | The unique zero-based position of this laser cut in the sequence of all laser cuts. All cuts are performed one after each other in a specific chronological order. The value of this attribute shall specify the position within this order. The attribute shall have no value if the cut has not been performed. | VNAP | AUTO |
| >>Achieved Progress | (2D03,xx18) | FD | The progress actually achieved for this laser cut, in percent. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Energy Index | (2D03,xx19) | US | The applied energy for this laser cut as index of the energy table. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Spot Distance | (2D03,xx1A) | FD | The distance between two laser spots, in micrometers. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Track Distance | (2D03,xx1B) | FD | The distance between two tracks, in micrometers. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Laser Scan Direction Code Sequence | (2D03,xx1C) | SQ | Laser scan direction used for this laser cut. Only one single Item is permitted in this Sequence. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>>Code Value | (2D03,xx1D) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >>>Coding Scheme Designator | (2D03,xx1E) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >>>Code Meaning | (2D03,xx1F) | LO | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |

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| >Cap Side Cut Summary Sequence | (2D03,xx23) | SQ | Summary of a single cap side cut of a refractive surgery. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >>Cut Order Index | (2D03,xx17) | US | The unique zero-based position of this laser cut in the sequence of all laser cuts. All cuts are performed one after each other in a specific chronological order. The value of this attribute shall specify the position within this order. The attribute shall have no value if the cut has not been performed. | VNAP | AUTO |
| >>Achieved Progress | (2D03,xx18) | FD | The progress actually achieved for this laser cut, in percent. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Energy Index | (2D03,xx19) | US | The applied energy for this laser cut as index of the energy table. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Spot Distance | (2D03,xx1A) | FD | The distance between two laser spots, in micrometers. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Track Distance | (2D03,xx1B) | FD | The distance between two tracks, in micrometers. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Laser Scan Direction Code Sequence | (2D03,xx1C) | SQ | Laser scan direction used for this laser cut. Only one single Item is permitted in this Sequence. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>>Code Value | (2D03,xx1D) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >>>Coding Scheme Designator | (2D03,xx1E) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >>>Code Meaning | (2D03,xx1F) | LO | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >Lenticule Cut Summary Sequence | (2D03,xx24) | SQ | Summary of a single lenticule cut of a refractive surgery. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >>Cut Order Index | (2D03,xx17) | US | The unique zero-based position of this laser cut in the sequence of all laser cuts. All cuts are performed one after each other in a specific chronological order. The value of this attribute shall specify the position within this order. The attribute shall have no value if the cut has not been performed. | VNAP | AUTO |
| >>Achieved Progress | (2D03,xx18) | FD | The progress actually achieved for this laser cut, in percent. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Energy Index | (2D03,xx19) | US | The applied energy for this laser cut as index of the energy table. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Spot Distance | (2D03,xx1A) | FD | The distance between two laser spots, in micrometers. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Track Distance | (2D03,xx1B) | FD | The distance between two tracks, in micrometers. Required if Cut Order Index has a value. | ANAP | AUTO |

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| >>Laser Scan Direction Code Sequence | (2D03,xx1C) | SQ | Laser scan direction used for this laser cut. Only one single Item is permitted in this Sequence. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>>Code Value | (2D03,xx1D) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >>>Coding Scheme Designator | (2D03,xx1E) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >>>Code Meaning | (2D03,xx1F) | LO | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >Lenticule Side Cut Summary Sequence | (2D03,xx25) | SQ | Summary of a single lenticule side cut of a refractive surgery. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >>Cut Order Index | (2D03,xx17) | US | The unique zero-based position of this laser cut in the sequence of all laser cuts. All cuts are performed one after each other in a specific chronological order. The value of this attribute shall specify the position within this order. The attribute shall have no value if the cut has not been performed. | VNAP | AUTO |
| >>Achieved Progress | (2D03,xx18) | FD | The progress actually achieved for this laser cut, in percent. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Energy Index | (2D03,xx19) | US | The applied energy for this laser cut as index of the energy table. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Spot Distance | (2D03,xx1A) | FD | The distance between two laser spots, in micrometers. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Track Distance | (2D03,xx1B) | FD | The distance between two tracks, in micrometers. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Laser Scan Direction Code Sequence | (2D03,xx1C) | SQ | Laser scan direction used for this laser cut. Only one single Item is permitted in this Sequence. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>>Code Value | (2D03,xx1D) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >>>Coding Scheme Designator | (2D03,xx1E) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >>>Code Meaning | (2D03,xx1F) | LO | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| ICR Summary Sequence | (2D03,xx26) | SQ | Specific surgery outcomes relevant to a refractive surgery of type ICR. Only a single Item is permitted in this Sequence. Required if Refractive Surgery Type Code Sequence contains an item with the value (LVCICR, 99CZM, 'Refractive surgery type ICR'). | ANAP | AUTO |
| >ICR Access Cut 1 Summary Sequence | (2D03,xx27) | SQ | Summary of first access cut of a refractive surgery of type ICR. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO |

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| >>Cut Order Index | (2D03,xx17) | US | The unique zero-based position of this laser cut in the sequence of all laser cuts. All cuts are performed one after each other in a specific chronological order. The value of this attribute shall specify the position within this order. The attribute shall have no value if the cut has not been performed. | VNAP | AUTO |
| >>Achieved Progress | (2D03,xx18) | FD | The progress actually achieved for this laser cut, in percent. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Energy Index | (2D03,xx19) | US | The applied energy for this laser cut as index of the energy table. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Spot Distance | (2D03,xx1A) | FD | The distance between two laser spots, in micrometers. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Track Distance | (2D03,xx1B) | FD | The distance between two tracks, in micrometers. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Laser Scan Direction Code Sequence | (2D03,xx1C) | SQ | Laser scan direction used for this laser cut. Only one single Item is permitted in this Sequence. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>>Code Value | (2D03,xx1D) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >>>Coding Scheme Designator | (2D03,xx1E) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >>>Code Meaning | (2D03,xx1F) | LO | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >ICR Access Cut 2 Summary Sequence | (2D03,xx2F) | SQ | Summary of second access cut of a refractive surgery of type ICR. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >>Cut Order Index | (2D03,xx17) | US | The unique zero-based position of this laser cut in the sequence of all laser cuts. All cuts are performed one after each other in a specific chronological order. The value of this attribute shall specify the position within this order. The attribute shall have no value if the cut has not been performed. | VNAP | AUTO |
| >>Achieved Progress | (2D03,xx18) | FD | The progress actually achieved for this laser cut, in percent. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Energy Index | (2D03,xx19) | US | The applied energy for this laser cut as index of the energy table. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Spot Distance | (2D03,xx1A) | FD | The distance between two laser spots, in micrometers. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Track Distance | (2D03,xx1B) | FD | The distance between two tracks, in micrometers. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Laser Scan Direction Code Sequence | (2D03,xx1C) | SQ | Laser scan direction used for this laser cut. Only one single Item is permitted in this Sequence. Required if Cut Order Index has a value. | ANAP | AUTO |

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| >>>Code Value | (2D03,xx1D) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >>>Coding Scheme Designator | (2D03,xx1E) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >>>Code Meaning | (2D03,xx1F) | LO | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >ICR Tunnel Cut Summary Sequence | (2D03,xx28) | SQ | Summary of a single tunnel cut of a refractive surgery of type ICR. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >>Cut Order Index | (2D03,xx17) | US | The unique zero-based position of this laser cut in the sequence of all laser cuts. All cuts are performed one after each other in a specific chronological order. The value of this attribute shall specify the position within this order. The attribute shall have no value if the cut has not been performed. | VNAP | AUTO |
| >>Achieved Progress | (2D03,xx18) | FD | The progress actually achieved for this laser cut, in percent. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Energy Index | (2D03,xx19) | US | The applied energy for this laser cut as index of the energy table. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Spot Distance | (2D03,xx1A) | FD | The distance between two laser spots, in micrometers. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Track Distance | (2D03,xx1B) | FD | The distance between two tracks, in micrometers. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Laser Scan Direction Code Sequence | (2D03,xx1C) | SQ | Laser scan direction used for this laser cut. Only one single Item is permitted in this Sequence. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>>Code Value | (2D03,xx1D) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >>>Coding Scheme Designator | (2D03,xx1E) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >>>Code Meaning | (2D03,xx1F) | LO | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| Keratoplasty Summary Sequence | (2D03,xx29) | SQ | Specific surgery outcomes relevant to a refractive surgery of type Keratoplasty. Only a single Item is permitted in this Sequence. Required if Refractive Surgery Type Code Sequence contains an item with the value (KERATOPLASTY, 99CZM, 'Refractive surgery type Keratoplasty'). | ANAP | AUTO |
| >Keratoplasty Graft Cut Summary Sequence | (2D03,xx2A) | SQ | Summary of a single lamellar graft cut of a refractive surgery of type Keratoplasty. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >>Cut Order Index | (2D03,xx17) | US | The unique zero-based position of this laser cut in the sequence of all laser cuts. All cuts are performed one after each other in a specific chronological order. The value of this attribute shall specify the position within this | VNAP | AUTO |

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| | | | order. The attribute shall have no value if the cut has not been performed. | | |
| >>Achieved Progress | (2D03,xx18) | FD | The progress actually achieved for this laser cut, in percent. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Energy Index | (2D03,xx19) | US | The applied energy for this laser cut as index of the energy table. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Spot Distance | (2D03,xx1A) | FD | The distance between two laser spots, in micrometers. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Track Distance | (2D03,xx1B) | FD | The distance between two tracks, in micrometers. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Laser Scan Direction Code Sequence | (2D03,xx1C) | SQ | Laser scan direction used for this laser cut. Only one single Item is permitted in this Sequence. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>>Code Value | (2D03,xx1D) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >>>Coding Scheme Designator | (2D03,xx1E) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >>>Code Meaning | (2D03,xx1F) | LO | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >Keratoplasty Side Cut Summary Sequence | (2D03,xx2B) | SQ | Summary of a single graft side cut of a refractive surgery of type Keratoplasty. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >>Cut Order Index | (2D03,xx17) | US | The unique zero-based position of this laser cut in the sequence of all laser cuts. All cuts are performed one after each other in a specific chronological order. The value of this attribute shall specify the position within this order. The attribute shall have no value if the cut has not been performed. | VNAP | AUTO |
| >>Achieved Progress | (2D03,xx18) | FD | The progress actually achieved for this laser cut, in percent. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Energy Index | (2D03,xx19) | US | The applied energy for this laser cut as index of the energy table. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Spot Distance | (2D03,xx1A) | FD | The distance between two laser spots, in micrometers. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Track Distance | (2D03,xx1B) | FD | The distance between two tracks, in micrometers. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Laser Scan Direction Code Sequence | (2D03,xx1C) | SQ | Laser scan direction used for this laser cut. Only one single Item is permitted in this Sequence. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>>Code Value | (2D03,xx1D) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |

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| >>>Coding Scheme Designator | (2D03,xx1E) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >>>Code Meaning | (2D03,xx1F) | LO | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| Circle Summary Sequence | (2D03,xx2C) | SQ | Specific surgery outcomes relevant to a refractive surgery of type CIRCLE. Only a single Item is permitted in this Sequence. Required if Refractive Surgery Type Code Sequence contains an item with the value (LVCCIRCLE, 99CZM, 'Refractive surgery type CIRCLE'). | ANAP | AUTO |
| >Lamellar Ring Cut Summary Sequence | (2D03,xx2D) | SQ | Summary of a single lamellar ring cut of a refractive surgery of type CIRCLE. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >>Cut Order Index | (2D03,xx17) | US | The unique zero-based position of this laser cut in the sequence of all laser cuts. All cuts are performed one after each other in a specific chronological order. The value of this attribute shall specify the position within this order. The attribute shall have no value if the cut has not been performed. | VNAP | AUTO |
| >>Achieved Progress | (2D03,xx18) | FD | The progress actually achieved for this laser cut, in percent. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Energy Index | (2D03,xx19) | US | The applied energy for this laser cut as index of the energy table. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Spot Distance | (2D03,xx1A) | FD | The distance between two laser spots, in micrometers. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Track Distance | (2D03,xx1B) | FD | The distance between two tracks, in micrometers. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Laser Scan Direction Code Sequence | (2D03,xx1C) | SQ | Laser scan direction used for this laser cut. Only one single Item is permitted in this Sequence. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>>Code Value | (2D03,xx1D) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >>>Coding Scheme Designator | (2D03,xx1E) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >>>Code Meaning | (2D03,xx1F) | LO | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >Circle Side Cut Summary Sequence | (2D03,xx2E) | SQ | Summary of a single side cut of a refractive surgery of type CIRCLE. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >>Cut Order Index | (2D03,xx17) | US | The unique zero-based position of this laser cut in the sequence of all laser cuts. All cuts are performed one after each other in a specific chronological order. The value of this attribute shall specify the position within this order. The attribute shall have no value if the cut has not been performed. | VNAP | AUTO |

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| >>Achieved Progress | (2D03,xx18) | FD | The progress actually achieved for this laser cut, in percent. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Energy Index | (2D03,xx19) | US | The applied energy for this laser cut as index of the energy table. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Spot Distance | (2D03,xx1A) | FD | The distance between two laser spots, in micrometers. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Track Distance | (2D03,xx1B) | FD | The distance between two tracks, in micrometers. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Laser Scan Direction Code Sequence | (2D03,xx1C) | SQ | Laser scan direction used for this laser cut. Only one single Item is permitted in this Sequence. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>>Code Value | (2D03,xx1D) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >>>Coding Scheme Designator | (2D03,xx1E) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >>>Code Meaning | (2D03,xx1F) | LO | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >Circle Up Junction Cut Summary Sequence | (2D03,xx30) | SQ | Summary of a single upward junction cut of a refractive surgery of type CIRCLE. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >>Cut Order Index | (2D03,xx17) | US | The unique zero-based position of this laser cut in the sequence of all laser cuts. All cuts are performed one after each other in a specific chronological order. The value of this attribute shall specify the position within this order. The attribute shall have no value if the cut has not been performed. | VNAP | AUTO |
| >>Achieved Progress | (2D03,xx18) | FD | The progress actually achieved for this laser cut, in percent. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Energy Index | (2D03,xx19) | US | The applied energy for this laser cut as index of the energy table. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Spot Distance | (2D03,xx1A) | FD | The distance between two laser spots, in micrometers. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Track Distance | (2D03,xx1B) | FD | The distance between two tracks, in micrometers. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Laser Scan Direction Code Sequence | (2D03,xx1C) | SQ | Laser scan direction used for this laser cut. Only one single Item is permitted in this Sequence. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>>Code Value | (2D03,xx1D) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >>>Coding Scheme Designator | (2D03,xx1E) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |

| | | | | | |
|--|-------------|----|---|--------|------|
| >>>Code Meaning | (2D03,xx1F) | LO | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >Circle Down Junction Cut Summary Sequence | (2D03,xx31) | SQ | Summary of a single downward junction cut of a refractive surgery of type CIRCLE. Only one single Item is permitted in this Sequence. | ALWAYS | AUTO |
| >>Cut Order Index | (2D03,xx17) | US | The unique zero-based position of this laser cut in the sequence of all laser cuts. All cuts are performed one after each other in a specific chronological order. The value of this attribute shall specify the position within this order. The attribute shall have no value if the cut has not been performed. | VNAP | AUTO |
| >>Achieved Progress | (2D03,xx18) | FD | The progress actually achieved for this laser cut, in percent. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Energy Index | (2D03,xx19) | US | The applied energy for this laser cut as index of the energy table. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Spot Distance | (2D03,xx1A) | FD | The distance between two laser spots, in micrometers. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Track Distance | (2D03,xx1B) | FD | The distance between two tracks, in micrometers. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>Laser Scan Direction Code Sequence | (2D03,xx1C) | SQ | Laser scan direction used for this laser cut. Only one single Item is permitted in this Sequence. Required if Cut Order Index has a value. | ANAP | AUTO |
| >>>Code Value | (2D03,xx1D) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >>>Coding Scheme Designator | (2D03,xx1E) | SH | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |
| >>>Code Meaning | (2D03,xx1F) | LO | For possible values see section 8.3 Coded Terminology and Templates - Table 8-37 Coded Values – Laser Scan Direction | ALWAYS | AUTO |

8.1.1.7 Encapsulated PDF Modules

Table 8-11 Encapsulated PDF IOD - Module "Encapsulated Document Series"

| Name | Tag | VR | Description | PoV | Source |
|---------------------|-------------|----|---|--------|--------|
| Modality | (0008,0060) | CS | The modality appropriate for the encapsulated document. This Type definition shall override the definition in the SC Equipment Module. Always "DOC" | ALWAYS | AUTO |
| Series Instance UID | (0020,000E) | UI | Unique identifier of the Series. MEL 90 uses a constant prefix of "1.2.276.0.75.2.1.100.1.2." followed by a date/time stamp and machine specific identifier. | ALWAYS | AUTO |
| Series Number | (0020,0011) | IS | A number that identifies the Series. | ALWAYS | AUTO |

Table 8-12 Encapsulated PDF IOD - Module "SC Equipment"

| Name | Tag | VR | Description | PoV | Source |
|-----------------|-------------|----|--|--------|--------|
| Conversion Type | (0008,0064) | CS | Describes the kind of image conversion. Defined Terms : DV = Digitized Video DI = Digital Interface DF = Digitized Film WSD = Workstation SD = Scanned Document SI = Scanned Image DRW = Drawing SYN = Synthetic Image Always "SYN" for Synthetic Image | ALWAYS | AUTO |

Table 8-13 Encapsulated PDF IOD - Module "Encapsulated Document"

| Name | Tag | VR | Description | PoV | Source |
|------------------------------------|-------------|----|---|--------|--------|
| Instance Number | (0020,0013) | IS | A number that identifies this SOP Instance. The value shall be unique within a series. | ALWAYS | AUTO |
| Content Date | (0008,0023) | DA | The date the document content creation was started. | ALWAYS | AUTO |
| Content Time | (0008,0033) | TM | The time the document content creation was started. | ALWAYS | AUTO |
| Acquisition Datetime | (0008,002A) | DT | The date and time that the original generation of the data in the document started. | ALWAYS | AUTO |
| Image Laterality | (0020,0062) | CS | Laterality of the (possibly paired) body part that is the subject of the encapsulated document. Enumerated Values: R = right L = left B = both left and right | ALWAYS | AUTO |
| Burned In Annotation | (0028,0301) | CS | Indicates whether or not the encapsulated document contains sufficient burned in annotation to identify the patient and date the data was acquired. Enumerated Values: YES NO Identification of patient and date as text in an encapsulated document (e.g., in an XML attribute or element) is equivalent to "burned in annotation". A de-identified document may use the value NO. Always "YES" | ALWAYS | AUTO |
| Document Title | (0042,0010) | ST | The title of the document. Note: In the case of a PDF encapsulated document, this may be the value of the "Title" entry in the "Document Information Directory" as encoded in the PDF data. Always "MEL 90 Surgery Report" | ALWAYS | AUTO |
| Concept Name Code Sequence | (0040,A043) | SQ | A coded representation of the document title. Zero or one item may be present. Always empty sequence | EMPTY | AUTO |
| MIME Type of Encapsulated Document | (0042,0012) | LO | The type of the encapsulated document stream described using the MIME Media Type (see RFC 2046). Always "application/pdf" | ALWAYS | AUTO |
| Encapsulated Document | (0042,0011) | OB | Encapsulated Document stream, containing a document encoded according to the MIME Type. | ALWAYS | AUTO |

Table 8-14 Encapsulated PDF IOD - Module "Sop Common"

| Name | Tag | VR | Description | PoV | Source |
|------------------------|-------------|----|--|--------|--------|
| SOP Class UID | (0008,0016) | UI | Uniquely identifies the SOP Class. See NEMA PS3.3 C.12.1.1.1 for further explanation. See also PS 3.4. Always "1.2.840.10008.5.1.4.1.1.104.1" | ALWAYS | AUTO |
| SOP Instance UID | (0008,0018) | UI | Uniquely identifies the SOP Instance. See NEMA PS3.3 C.12.1.1.1 for further explanation. See also PS 3.4. MEL 90 uses a constant prefix of "1.2.276.0.75.2.1.100.1.3." followed by a date/time stamp and machine specific identifier. | ALWAYS | AUTO |
| Specific Character Set | (0008,0005) | CS | Character Set that expands or replaces the Basic Graphic Set. Required if an expanded or replacement character set is used. See PS3.3 C.12.1.1.2 for Defined Terms. See 6 Support of Character Sets. | ALWAYS | AUTO |
| Instance Creation Date | (0008,0012) | DA | Date the SOP Instance was created. | ALWAYS | AUTO |
| Instance Creation Time | (0008,0013) | TM | Time the SOP Instance was created. | ALWAYS | AUTO |

8.1.1.8 Video Photographic Image Modules

Table 8-15 Video Photographic Image IOD - Module "General Image"

| Name | Tag | VR | Description | PoV | Source |
|--------------------------------|-------------|----|--|--------|--------|
| Instance Number | (0020,0013) | IS | A number that identifies this image. Note: This Attribute was named Image Number in earlier versions of this Standard. | ALWAYS | AUTO |
| Patient Orientation | (0020,0020) | CS | Patient direction of the rows and columns of the image. Required if image does not require Image Orientation (Patient) (0020,0037) and Image Position (Patient) (0020,0032). May be present otherwise. See C.7.6.1.1.1 for further explanation. Note: IOD's may have attributes other than Patient Orientation, Image Orientation, or Image Position (Patient) to describe orientation in which case this attribute will be zero length. Always "L\F" | ALWAYS | AUTO |
| Content Date | (0008,0023) | DA | The date the image pixel data creation started. Required if image is part of a series in which the images are temporally related. May be present otherwise. Note: This Attribute was formerly known as Image Date. | ALWAYS | AUTO |
| Acquisition Datetime | (0008,002A) | DT | The date and time that the acquisition of data that resulted in this image started. Note: The synchronization of this time with an external clock is specified in the Synchronization Module in Acquisition Time Synchronized (0018,1800). | ALWAYS | AUTO |
| Lossy Image Compression Method | (0028,2114) | CS | A label for the lossy compression method(s) that have been applied to this image. See C.7.6.1.1.5 for further explanation. May be multivalued if successive lossy compression steps have been applied; the value order shall correspond to the values of Lossy Image Compression Ratio (0028,2112). Note: For historical reasons, the lossy compression method may also be described in Derivation Description (0008,2111). | ALWAYS | AUTO |

| | | | | | |
|--|--|--|---|--|--|
| | | | Always "ISO_13818_2" for MPEG2 Compression Compression | | |
|--|--|--|---|--|--|

Table 8-16 Video Photographic Image IOD - Module "Cine"

| Name | Tag | VR | Description | PoV | Source |
|------------|-------------|----|---|--------|--------|
| Frame Time | (0018,1063) | DS | Nominal time (in msec) per individual frame. See C.7.6.5.1.1 for further explanation. Required if Frame Increment Pointer (0028,0009) points to Frame Time. Always "40.00" | ALWAYS | AUTO |
| Cine Rate | (0018,0040) | IS | Number of frames per second. Always "25" | ALWAYS | AUTO |

Table 8-17 Video Photographic Image IOD - Module "Multi-frame"

| Name | Tag | VR | Description | PoV | Source |
|-------------------------|-------------|----|---|--------|--------|
| Number of Frames | (0028,0008) | IS | Number of frames in a Multi-frame Image. See C.7.6.6.1.1 for further explanation. | ALWAYS | AUTO |
| Frame Increment Pointer | (0028,0009) | AT | Contains the Data Element Tag of the attribute that is used as the frame increment in Multi-frame pixel data. See C.7.6.6.1.2 for further explanation. Always "(0018,1063)" for Frame Time | ALWAYS | AUTO |

Table 8-18 Video Photographic Image IOD - Module "Image Pixel"

| Name | Tag | VR | Description | PoV | Source |
|------------|-------------|-------|--|--------|-------------|
| Rows | (0028,0010) | US | Number of rows in the image. Always "576" | ALWAYS | AUTO |
| Columns | (0028,0011) | US | Number of columns in the image. Always "720" | ALWAYS | AUTO |
| Pixel Data | (7FE0,0010) | OB OW | A data stream of the pixel samples that comprise the Image. See C.7.6.3.1.4 for further explanation. Required if Pixel Data Provider URL (0028,7FE0) is not present. | ALWAYS | ACQUISITION |

Table 8-19 Video Photographic Image IOD - Module "Acquisition Context"

| Name | Tag | VR | Description | PoV | Source |
|------------------------------|-------------|----|---|-------|--------|
| Acquisition Context Sequence | (0040,0555) | SQ | A sequence of Items that describes the conditions present during the acquisition of the data of the SOP Instance. Zero or more items shall be included in this sequence. Always empty sequence | EMPTY | AUTO |

Table 8-20 Video Photographic Image IOD - Module "VL Image"

| Name | Tag | VR | Description | PoV | Source |
|----------------------------|-------------|----|---|--------|--------|
| Image Type | (0008,0008) | CS | Image identification characteristics. See C.8.12.1.1.6 for specialization. Always "ORIGINAL\PRIMARY\LVC VIDEO" | ALWAYS | AUTO |
| Photometric Interpretation | (0028,0004) | CS | Specifies the intended interpretation of the pixel data. See C.8.12.1.1.1 for specialization of this Attribute. Always "YBR_PARTIAL_420" | ALWAYS | AUTO |
| Bits Allocated | (0028,0100) | US | Number of bits allocated for each pixel sample. Each sample shall have the same number of bits allocated. See | ALWAYS | AUTO |

| | | | | | |
|---------------------------|-------------|----|---|--------|------|
| | | | C.8.12.1.1.2 for specialization of this Attribute. See PS 3.5 for further explanation. Always "8" | | |
| Bits Stored | (0028,0101) | US | Number of bits stored for each pixel sample. Each sample shall have the same number of bits stored. See C.8.12.1.1.2 for specialization of this Attribute. See PS 3.5 for further explanation. Always "8" | ALWAYS | AUTO |
| High Bit | (0028,0102) | US | Most significant bit for pixel sample data. Each sample shall have the same high bit. See C.8.12.1.1.2 for specialization of this Attribute. See PS 3.5 for further explanation. Always "7" | ALWAYS | AUTO |
| Pixel Representation | (0028,0103) | US | Data representation of the pixel samples. Each sample shall have the same pixel representation. See Section C.8.12.1.1.3 for specialization of this Attribute. Always "0" | ALWAYS | AUTO |
| Samples per Pixel | (0028,0002) | US | Number of samples (planes) per image. See C.8.12.1.1.4 for specialization of this Attribute. Always "3" | ALWAYS | AUTO |
| Planar Configuration | (0028,0006) | US | Indicates whether the pixel data are sent color-by-plane or color-by-pixel. Required if Samples per Pixel (0028,0002) has a value greater than 1. See C.8.12.1.1.5 for specialization of this Attribute. Enumerated value shall be 0 (color-by-pixel). Always "0" | ALWAYS | AUTO |
| Content Time | (0008,0033) | TM | The time the image pixel data creation started. Required if the Image is part of a series in which the images are temporally related. Note: This Attribute was formerly known as Image Time. | ALWAYS | AUTO |
| Lossy Image Compression | (0028,2110) | CS | Specifies whether an Image has undergone lossy compression. Enumerated Values: 00 = Image has NOT been subjected to lossy compression. 01 = Image has been subjected to lossy compression. See NEMA PS3.3 C.7.6.1.1.5 Always "01" | ALWAYS | AUTO |
| Anatomic Region Sequence | (0008,2218) | SQ | Sequence that identifies the anatomic region of interest in this image (i.e. external anatomy, surface anatomy, or general region of the body). Only a single Item shall be included in this sequence. Required if Number of Frames (0028,0008) is present and Specimen Description Sequence (0040,0560) is absent. May be present otherwise. | ALWAYS | AUTO |
| >Code Value | (0008,0100) | SH | Always "T-AA000" | ALWAYS | AUTO |
| >Coding Scheme Designator | (0008,0102) | SH | Always "SRT" | ALWAYS | AUTO |
| >Code Meaning | (0008,0104) | LO | Always "Eye" | ALWAYS | AUTO |

Table 8-21 Video Photographic Image IOD - Module "Sop Common"

| Name | Tag | VR | Description | PoV | Source |
|---------------|-------------|----|---|--------|--------|
| SOP Class UID | (0008,0016) | UI | Uniquely identifies the SOP Class. See NEMA PS3.3 C.12.1.1.1 for further explanation. See also PS 3.4. Always "1.2.840.10008.5.1.4.1.1.77.1.4.1" | ALWAYS | AUTO |

| | | | | | |
|------------------------|-------------|----|--|--------|------|
| SOP Instance UID | (0008,0018) | UI | Uniquely identifies the SOP Instance. See NEMA PS3.3 C.12.1.1.1 for further explanation. See also PS 3.4. MEL 90 uses a constant prefix of "1.2.276.0.75.2.1.100.1.3." followed by a date/time stamp and machine specific identifier. | ALWAYS | AUTO |
| Specific Character Set | (0008,0005) | CS | Character Set that expands or replaces the Basic Graphic Set. Required if an expanded or replacement character set is used. See PS3.3 C.12.1.1.2 for Defined Terms. See 6 Support of Character Sets. | ALWAYS | AUTO |
| Instance Creation Date | (0008,0012) | DA | Date the SOP Instance was created. | ALWAYS | AUTO |
| Instance Creation Time | (0008,0013) | TM | Time the SOP Instance was created. | ALWAYS | AUTO |

8.1.2 Usage of Attributes from Received IOD's

The usage of attributes of a received Refractive Surgery Plan Raw Data SOP instance is described in chapter 8.1.3 Attribute Mapping.

8.1.3 Attribute Mapping

The following attributes received from a Patient Root Query response are mapped into an exported SOP instance.

Table 8-22 Patient Root Query Response Attribute Mapping

| Patient Root Query Response | | Exported SOP Instance | | Editable |
|-----------------------------|-------------|-----------------------------|-------------|----------|
| Patient's Name ¹ | (0010,0010) | Patient's Name ¹ | (0010,0010) | No |
| Patient ID | (0010,0020) | Patient ID | (0010,0020) | No |
| Issuer of Patient ID | (0010,0021) | Issuer of Patient ID | (0010,0021) | No |
| Patient's Birth Date | (0010,0030) | Patient's Birth Date | (0010,0030) | No |
| Patient's Sex | (0010,0040) | Patient's Sex | (0010,0040) | No |
| Other Patient IDs | (0010,1000) | Other Patient IDs | (0010,1000) | No |
| Patient Comments | (0010,4000) | Patient Comments | (0010,4000) | No |

Note 1: The MEL 90 application does not support multicomponent group name representation and only use the Alphabetic representation group.

In case of a modified refractive surgery planning (so called follow-up planning) a new refractive surgery plan for a patient's eye is created based on the data received from the previous surgery planning for that eye.

In this case the following attributes are mapped from the received Refractive Surgery Plan Raw Data SOP Instance to the exported instance.

Table 8-23 Received SOP Instance Attribute Mapping

| Received SOP Instance | | Exported SOP Instance | | Editable |
|-------------------------------------|-------------|-------------------------------------|-------------|----------|
| Study Instance UID | (0020,000D) | Study Instance UID | (0020,000D) | No |
| Study Date | (0008,0020) | Study Date | (0008,0020) | No |
| Study Time | (0008,0030) | Study Time | (0008,0030) | No |
| Series Instance UID | (0020,000E) | Series Instance UID | (0020,000E) | No |
| Series Date | (0008,0021) | Series Date | (0008,0021) | No |
| Series Time | (0008,0031) | Series Time | (0008,0031) | No |
| Related Series Sequence | (0008,1250) | Related Series Sequence | (0008,1250) | No |
| >Study Instance UID | (0020,000D) | >Study Instance UID | (0020,000D) | No |
| >Series Instance UID | (0020,000E) | >Series Instance UID | (0020,000E) | No |
| >Purpose of Reference Code Sequence | (0040,A170) | >Purpose of Reference Code Sequence | (0040,A170) | No |
| >>Code Value | (0008,0100) | >>Code Value | (0008,0100) | No |
| >>Coding Scheme Designator | (0008,0102) | >>Coding Scheme Designator | (0008,0102) | No |
| >>Coding Scheme Version | (0008,0103) | >>Coding Scheme Version | (0008,0103) | No |

| | | | | |
|-------------------------------------|-------------|---|-----------------------------|----|
| >>Code Meaning | (0008,0104) | >>Code Meaning | (0008,0104) | No |
| SOP Instance UID | (0008,0018) | Referenced Instance Sequence>Referenced SOP Instance UID ¹ | (0008,114A) >(0008,1155) | No |
| Instance Number | (0020,0013) | Instance Number ² | (0020,0013) | No |
| Referenced Instance Sequence | (0008,114A) | Referenced Instance Sequence | (0008,114A) | No |
| >Referenced SOP Class UID | (0008,1150) | >Referenced SOP Class UID | (0008,1150) | No |
| >Referenced SOP Instance UID | (0008,1155) | >Referenced SOP Instance UID | (0008,1155) | No |
| >Purpose of Reference Code Sequence | (0040,A170) | >Purpose of Reference Code Sequence | (0040,A170) | No |
| >>Code Value | (0008,0100) | >>Code Value | (0008,0100) | No |
| >>Coding Scheme Designator | (0008,0102) | >>Coding Scheme Designator | (0008,0102) | No |
| >>Coding Scheme Version | (0008,0103) | >>Coding Scheme Version | (0008,0103) | No |
| >>Code Meaning | (0008,0104) | >>Code Meaning | (0008,0104) | No |

Note 1: Reference to the Surgery Plan SOP Instance the new created instance is based on. The MEL 90 application uses the Purpose of Reference Code Value “REPLACEDPLAN” for this reference.

Note 2: The Instance Number of the originating Surgery Plan SOP Instance is incremented by 1 and copied to the new created instance.

8.1.4 Coerced/Modified Files

Those tags are listed in chapter 8.1.3 Attribute Mapping. Any other attributes get lost and are not available in the MEL 90 Application Software.

8.2 Data Dictionary of Private Attributes

The Private Attributes added to created SOP Instances are listed in the tables below. MEL 90 reserves blocks of private attributes in groups 2D01 and 2201.

Table 8-24 Private Dictionary Group (2D01,00xx) = “99CZM_REF_SURGERYPARAMETERS”

Occurs in: Refractive Surgery Plan Raw Data SOP Instance

| Tag | Attribute Name | VR | VM |
|-------------|---|----|----|
| (2D01,00xx) | Private Creator | LO | 1 |
| (2d01,xx01) | corneal thickness sequence | SQ | 1 |
| (2d01,xx02) | corneal thickness | FD | 1 |
| (2d01,xx03) | source of corneal thickness code sequence | SQ | 1 |
| (2d01,xx04) | code value | SH | 1 |
| (2d01,xx05) | coding scheme designator | SH | 1 |
| (2d01,xx06) | code meaning | LO | 1 |
| (2d01,xx07) | referenced sop sequence | SQ | 1 |
| (2d01,xx08) | referenced sop class uid | UI | 1 |
| (2d01,xx09) | referenced sop instance uid | UI | 1 |
| (2d01,xx0a) | keratometry sequence | SQ | 1 |

| | | | |
|-------------|--|----|-----|
| (2d01,xx0b) | steep keratometric axis sequence | SQ | 1 |
| (2d01,xx0c) | radius of curvature | FD | 1 |
| (2d01,xx0d) | keratometric power | FD | 1 |
| (2d01,xx0e) | keratometric axis | FD | 1 |
| (2d01,xx0f) | flat keratometric axis sequence | SQ | 1 |
| (2d01,xx10) | source of keratometry code sequence | SQ | 1 |
| (2d01,xx11) | keratometer index | FL | 1 |
| (2d01,xx12) | refractive index of cornea | FL | 1 |
| (2d01,xx13) | refractive state sequence | SQ | 1 |
| (2d01,xx14) | sphere power | FD | 1 |
| (2d01,xx15) | cylinder power | FD | 1 |
| (2d01,xx16) | cylinder axis | FD | 1 |
| (2d01,xx17) | vertex distance | FD | 1 |
| (2d01,xx18) | source of refractive state code sequence | SQ | 1 |
| (2d01,xx19) | general parameters sequence | SQ | 1 |
| (2d01,xx1a) | refractive surgery type code sequence | SQ | 1 |
| (2d01,xx1b) | target refraction sequence | SQ | 1 |
| (2d01,xx1c) | refractive correction sequence | SQ | 1 |
| (2d01,xx1d) | refractive correction laser set sequence | SQ | 1 |
| (2d01,xx1e) | optical zone | FD | 1 |
| (2d01,xx1f) | editors name | PN | 1-n |
| (2d01,xx20) | refractive surgery plan comments | LT | 1 |
| (2d01,xx21) | refractive module info sequence | SQ | 1 |
| (2d01,xx22) | module type code sequence | SQ | 1 |
| (2d01,xx23) | module name | LO | 1 |
| (2d01,xx24) | module id | LO | 1 |
| (2d01,xx25) | module version | LO | 1 |
| (2d01,xx26) | residual stroma thickness | FD | 1 |
| (2d01,xx27) | general femtosecond parameters sequence | SQ | 1 |
| (2d01,xx28) | centration target position | FD | 2 |
| (2d01,xx29) | selected treatment pack code sequence | SQ | 1 |
| (2d01,xx2a) | treatment pack size | CS | 1 |
| (2d01,xx2b) | treatment pack label | LO | 1 |
| (2d01,xx2c) | general excimer parameters sequence | SQ | 1 |
| (2d01,xx2d) | ablation details sequence | SQ | 1 |
| (2d01,xx2e) | ablation depth | FD | 1 |

| | | | |
|-------------|--|----|---|
| (2d01,xx2f) | distance | FD | 1 |
| (2d01,xx30) | angle | FD | 1 |
| (2d01,xx31) | laser frequency | FD | 1 |
| (2d01,xx32) | flap parameters sequence | SQ | 1 |
| (2d01,xx33) | flap cut parameters sequence | SQ | 1 |
| (2d01,xx34) | cut order index | US | 1 |
| (2d01,xx35) | flap diameter | FD | 1 |
| (2d01,xx36) | flap thickness | FD | 1 |
| (2d01,xx37) | border cut parameters sequence | SQ | 1 |
| (2d01,xx38) | flap side cut angle | FD | 1 |
| (2d01,xx39) | hinge sector parameters sequence | SQ | 1 |
| (2d01,xx3a) | hinge position | FD | 1 |
| (2d01,xx3b) | hinge angle | FD | 1 |
| (2d01,xx3c) | hinge width | FD | 1 |
| (2d01,xx3d) | scheduled surgery datetime | DT | 1 |
| (2d01,xx3e) | lbv parameters sequence | SQ | 1 |
| (2d01,xx3f) | patients functional age | AS | 1 |
| (2d01,xx40) | dominant eye | CS | 1 |
| (2d01,xx41) | monovision acceptance | CS | 1 |
| (2d01,xx42) | spherical aberration | FD | 1 |
| (2d01,xx43) | smile parameters sequence | SQ | 1 |
| (2d01,xx44) | lenticule edge thickness | FD | 1 |
| (2d01,xx45) | lenticule central thickness | FD | 1 |
| (2d01,xx46) | lenticule central thickness user entry | FD | 1 |
| (2d01,xx47) | lenticule max thickness | FD | 1 |
| (2d01,xx48) | lenticule max thickness radius | FD | 1 |
| (2d01,xx49) | cap cut parameters sequence | SQ | 1 |
| (2d01,xx4a) | cap diameter | FD | 1 |
| (2d01,xx4b) | cap thickness | FD | 1 |
| (2d01,xx4c) | cap side cut parameters sequence | SQ | 1 |
| (2d01,xx4d) | cap side cut angle | FD | 1 |
| (2d01,xx4e) | incision parameters sequence | SQ | 1 |
| (2d01,xx4f) | incision position | FD | 1 |
| (2d01,xx50) | incision width | FD | 1 |
| (2d01,xx51) | lenticule cut parameters sequence | SQ | 1 |
| (2d01,xx52) | lenticule optical zone | FD | 1 |

| | | | |
|-------------|--|----|---|
| (2d01,xx53) | lenticule transition zone | FD | 1 |
| (2d01,xx54) | lenticule side cut parameters sequence | SQ | 1 |
| (2d01,xx55) | lenticule side cut angle | FD | 1 |
| (2d01,xx56) | icr parameters sequence | SQ | 1 |
| (2d01,xx57) | icr preset identification sequence | SQ | 1 |
| (2d01,xx58) | icr preset id | LO | 1 |
| (2d01,xx59) | icr preset name | LO | 1 |
| (2d01,xx5a) | icr access cut parameters sequence | SQ | 1 |
| (2d01,xx5b) | icr cut1 enabled | CS | 1 |
| (2d01,xx5c) | icr cut1 position | FD | 1 |
| (2d01,xx5d) | icr cut2 enabled | CS | 1 |
| (2d01,xx5e) | icr cut2 position | FD | 1 |
| (2d01,xx5f) | icr lower width | FD | 1 |
| (2d01,xx60) | icr upper width | FD | 1 |
| (2d01,xx61) | icr tunnel cut parameters sequence | SQ | 1 |
| (2d01,xx62) | icr inner diameter | FD | 1 |
| (2d01,xx63) | icr outer diameter | FD | 1 |
| (2d01,xx64) | icr inner depth | FD | 1 |
| (2d01,xx65) | icr outer depth | FD | 1 |
| (2d01,xx66) | icr position | FD | 1 |
| (2d01,xx67) | icr angle | FD | 1 |
| (2d01,xx68) | keratoplasty parameters sequence | SQ | 1 |
| (2d01,xx69) | keratoplasty type code sequence | SQ | 1 |
| (2d01,xx6a) | donor id | LO | 1 |
| (2d01,xx6b) | graft diameter | FD | 1 |
| (2d01,xx6c) | keratoplasty graft cut parameters sequence | SQ | 1 |
| (2d01,xx6d) | graft thickness | FD | 1 |
| (2d01,xx6e) | keratoplasty side cut parameters sequence | SQ | 1 |
| (2d01,xx6f) | graft side cut angle | FD | 1 |
| (2d01,xx70) | circle parameters sequence | SQ | 1 |
| (2d01,xx71) | circle mode code sequence | SQ | 1 |
| (2d01,xx72) | lamellar ring cut parameters sequence | SQ | 1 |
| (2d01,xx73) | lamellar ring outer diameter | FD | 1 |
| (2d01,xx74) | lamellar ring inner diameter | FD | 1 |
| (2d01,xx75) | lamellar ring depth | FD | 1 |
| (2d01,xx76) | circle junction upper depth | FD | 1 |

| | | | |
|-------------|--|----|---|
| (2d01,xx77) | circle junction lower depth | FD | 1 |
| (2d01,xx78) | circle side cut parameters sequence | SQ | 1 |
| (2d01,xx79) | circle side cut angle | FD | 1 |
| (2d01,xx80) | corneal epithelium thickness sequence | SQ | 1 |
| (2d01,xx81) | corneal region code sequence | SQ | 1 |
| (2d01,xx82) | corneal epithelium thickness | FD | 1 |
| (2d01,xx83) | source of corneal epithelium thickness code sequence | SQ | 1 |

Table 8-25 Private Dictionary Group (2D03,00xx) = “99CZM_REF_SURGERYSUMMARY”

Occurs in: Refractive Surgery Summary Raw Data SOP Instance

| Tag | Attribute Name | VR | VM |
|-------------|--------------------------------------|----|----|
| (2D03,00xx) | Private Creator | LO | 1 |
| (2D03,xx0F) | decentration distance | FD | 1 |
| (2D03,xx10) | applied treatment pack code sequence | SQ | 1 |
| (2D03,xx11) | treatment pack size | CS | 1 |
| (2D03,xx12) | treatment pack label | LO | 1 |
| (2D03,xx13) | eye suction duration | UL | 1 |
| (2D03,xx14) | laser cut parameters preset name | LO | 1 |
| (2D03,xx15) | flap summary sequence | SQ | 1 |
| (2D03,xx16) | flap cut summary sequence | SQ | 1 |
| (2D03,xx17) | cut order index | US | 1 |
| (2D03,xx18) | achieved progress | FD | 1 |
| (2D03,xx19) | energy index | US | 1 |
| (2D03,xx1A) | spot distance | FD | 1 |
| (2D03,xx1B) | track distance | FD | 1 |
| (2D03,xx1C) | laser scan direction code sequence | SQ | 1 |
| (2D03,xx1D) | code value | SH | 1 |
| (2D03,xx1E) | coding scheme designator | SH | 1 |
| (2D03,xx1F) | code meaning | LO | 1 |
| (2D03,xx20) | border cut summary sequence | SQ | 1 |
| (2D03,xx21) | smile summary sequence | SQ | 1 |
| (2D03,xx22) | cap cut summary sequence | SQ | 1 |
| (2D03,xx23) | cap side cut summary sequence | SQ | 1 |
| (2D03,xx24) | lenticule cut summary sequence | SQ | 1 |
| (2D03,xx25) | lenticule side cut summary sequence | SQ | 1 |
| (2D03,xx26) | icr summary sequence | SQ | 1 |
| (2D03,xx27) | icr access cut 1 summary sequence | SQ | 1 |

| | | | |
|-------------|---|----|---|
| (2D03,xx28) | icr tunnel cut summary sequence | SQ | 1 |
| (2D03,xx29) | keratoplasty summary sequence | SQ | 1 |
| (2D03,xx2A) | keratoplasty graft cut summary sequence | SQ | 1 |
| (2D03,xx2B) | keratoplasty side cut summary sequence | SQ | 1 |
| (2D03,xx2C) | circle summary sequence | SQ | 1 |
| (2D03,xx2D) | lamellar ring cut summary sequence | SQ | 1 |
| (2D03,xx2E) | circle side cut summary sequence | SQ | 1 |
| (2D03,xx2F) | icr access cut2 summary sequence | SQ | 1 |
| (2D03,xx30) | up junction cut summary sequence | SQ | 1 |
| (2D03,xx31) | down junction cut summary sequence | SQ | 1 |

Table 8-26 Private Dictionary Group (2201,00xx) = “99CZM_NIM_INTERNAL_01”

Occurs in: Refractive Surgery Plan Raw Data SOP Instance

| Tag | Attribute Name | VR | VM |
|-------------|-----------------------------------|----|----|
| (2201,00xx) | Private Creator | LO | 1 |
| (2201,xx00) | IOD Name Meta Info | LT | 1 |
| (2201,xx01) | CZM-XML Version | LT | 1 |
| (2201,xx02) | Private Module Names and Versions | LT | 1 |

8.3 Coded Terminology and Templates

This chapter describes the coded terminology and templates used by the application entity. This includes especially the used codes and DICOM Content Mapping Resource context groups where the codes are taken from.

8.3.1 CID 4234. Refractive Surgery Types

The application software uses (0022,1040)/(1203,xx0B) Refractive Surgery Type Code Sequence to specify detailed information on the type of refractive surgery occurred to a patient's eye.

Occurs in: Refractive Surgery Plan Raw Data SOP Instance

Table 8-27 Coded Values - Refractive Surgery Types

| Code Value | Coding Scheme Designator | Coding Scheme Version | Code Meaning / Comments |
|--------------|--------------------------|-----------------------|--|
| P1-A3102 | SRT | n/a | RK |
| P1-A3835 | SRT | n/a | PRK |
| P0-0526F | SRT | n/a | LASIK |
| P1-A3846 | SRT | n/a | LASEK |
| 111681 | DCM | n/a | SMILE |
| LVCFLAP | 99CZM | 20200130 | Refractive surgery type FLAP |
| LVCLBV | 99CZM | 20200130 | Refractive surgery type Laser Blended Vision |
| LVCICR | 99CZM | 20200130 | Refractive surgery type ICR |
| KERATOPLASTY | 99CZM | 20200130 | Refractive surgery type Keratoplasty |
| LVCCIRCLE | 99CZM | 20200130 | Refractive surgery type CIRCLE |

| | | | |
|------------|-------|----------|---------------------------------|
| LVCSHAPING | 99CZM | 20200130 | Refractive surgery type SHAPING |
|------------|-------|----------|---------------------------------|

8.3.2 CID 4240. Ophthalmic Measurement or Calculation Data Source

The application software uses

- (2D01,xx03) Source of Corneal Thickness Code Sequence
- (2D01,xx10) Source of Keratometry Code Sequence
- (2D01,xx18) Source of Refractive State Code Sequence

to specify detailed information on the source of the measured value.

Occurs in: Refractive Surgery Plan Raw Data SOP Instance

Table 8-28 Coded Values - Ophthalmic Measurement or Calculation Data Source

| Code Value | Coding Scheme Designator | Coding Scheme Version | Code Meaning / Comments |
|------------|--------------------------|-----------------------|---|
| 111780 | DCM | n/a | Measurement From This Device |
| 113857 | DCM | n/a | Manual Entry |
| 111781 | DCM | n/a | External Data Source |
| 111782 | DCM | n/a | Axial Measurements SOP Instance |
| 111783 | DCM | n/a | Refractive Measurements SOP Instance |
| 111784 | DCM | n/a | Autorefracton Measurements SOP Instance |
| 111757 | DCM | n/a | Keratometry Measurements SOP Instance |

8.3.3 CID 7210. Related Series Purposes of Reference

The application software uses (0008,1250) Related Series Sequence to specify Series instances significantly related to this Series and therein (0040,A170) Purpose of Reference Code Sequence to describe the purpose for which the reference is made.

Occurs in: Refractive Surgery Plan Raw Data SOP Instance

Table 8-29 Coded Values - Related Series Purposes of Reference

| Code Value | Coding Scheme Designator | Coding Scheme Version | Code Meaning / Comments |
|----------------|--------------------------|-----------------------|--|
| 122400 | DCM | n/a | Simultaneously Acquired |
| 122401 | DCM | n/a | Same Anatomy |
| 122402 | DCM | n/a | Same Indication |
| 122403 | DCM | n/a | For Attenuation Correction |
| 121323 | DCM | n/a | Source series for image processing operation |
| COMBINEDSERIES | 99CZM | 20200130 | Related series of a combined plan |

8.3.4 No CID. Referenced Instance Purposes of Reference

The application software uses (0008,114A) Referenced Instance Sequence to specify SOP instances significantly related to a Surgery Plan and therein (0040,A170) Purpose of Reference Code Sequence to describe the purpose for which the reference is made.

Occurs in: Refractive Surgery Plan Raw Data SOP Instance

Table 8-30 Coded Values - Referenced Instance Purposes of Reference (Surgery Plan)

| Code Value | Coding Scheme Designator | Coding Scheme Version | Code Meaning / Comments |
|------------|--------------------------|-----------------------|-------------------------|
|------------|--------------------------|-----------------------|-------------------------|

| | | | |
|---------------|-------|----------|---|
| REPLACEDPLAN | 99CZM | 20200130 | Replaced plan |
| COMBINEDPLAN | 99CZM | 20200130 | Related plan instance of a combined plan |
| DONORPLAN | 99CZM | 20200130 | Surgery plan of the graft donor |
| RECIPIENTPLAN | 99CZM | 20200130 | Surgery plan of the graft recipient |
| CYCLOREFIMG | 99CZM | 20200130 | Reference image for cyclotorsion correction |

The application software uses (0008,114A) Referenced Instance Sequence to specify SOP instances significantly related to a Surgery Summary and therein (0040,A170) Purpose of Reference Code Sequence to describe the purpose for which the reference is made.

Occurs in: Refractive Surgery Summary Raw Data SOP Instance

Table 8-31 Coded Values - Referenced Instance Purposes of Reference (Surgery Summary)

| Code Value | Coding Scheme Designator | Coding Scheme Version | Code Meaning / Comments |
|-------------|--------------------------|-----------------------|--|
| APPLIEDPLAN | 99CZM | 20200130 | Applied plan |
| LVCREPORT | 99CZM | 20200130 | Report of refractive surgery |
| LVCIMAGE | 99CZM | 20200130 | Image acquired during refractive surgery |
| LVCVIDEO | 99CZM | 20200130 | Video acquired during refractive surgery |

8.3.5 No CID. Corneal Region

The application software uses (2D01,xx81) Corneal Region Code Sequence to specify a certain region of the cornea, e.g. as a location where a certain value is measured.

Occurs in: Refractive Surgery Plan Raw Data SOP Instance

Table 8-32 Coded Values – Corneal Region

| Code Value | Coding Scheme Designator | Coding Scheme Version | Code Meaning / Comments |
|------------|--------------------------|-----------------------|--------------------------------|
| AVERAGE | 99CZM | 20201022 | Average value over all regions |
| CENTRAL | 99CZM | 20201022 | Central cornea |

8.3.6 No CID. Refractive Module Type

The application software uses (2D01,xx21) Refractive Module Info Sequence to specify information about refractive software modules applied on refractive surgery plan and therein (2D01,xx22) Module Type Code Sequence to specify the type of the refractive software module.

Occurs in: Refractive Surgery Plan Raw Data SOP Instance

Table 8-33 Coded Values – Refractive Module Type

| Code Value | Coding Scheme Designator | Coding Scheme Version | Code Meaning / Comments |
|----------------|--------------------------|-----------------------|-------------------------|
| EXCIMERPROFILE | 99CZM | 20200130 | Excimer profile |
| RANGEGUARD | 99CZM | 20200130 | Range guard |
| USERNOMOGRAM | 99CZM | 20200130 | User nomogram |

8.3.7 No CID. Keratoplasty Type

The application software uses (2D01,xx69) Keratoplasty Type Code Sequence to specify the type of the Keratoplasty to perform.

Occurs in: Refractive Surgery Plan Raw Data SOP Instance

Table 8-34 Coded Values – Keratoplasty Type

| Code Value | Coding Scheme Designator | Coding Scheme Version | Code Meaning / Comments |
|-------------|--------------------------|-----------------------|--------------------------|
| LAMELLAR | 99CZM | 20200130 | Lamellar keratoplasty |
| PENETRATING | 99CZM | 20200130 | Penetrating keratoplasty |

8.3.8 No CID. Circle Mode

The application software uses (2D01,xx71) Circle Mode Code Sequence to specify the type of the Circle surgery to perform.

Occurs in: Refractive Surgery Plan Raw Data SOP Instance

Table 8-35 Coded Values – Circle Mode

| Code Value | Coding Scheme Designator | Coding Scheme Version | Code Meaning / Comments |
|----------------|--------------------------|-----------------------|---|
| SIDECUTONLY | 99CZM | 20200130 | Only side cut is performed |
| NOJUNCTION | 99CZM | 20200130 | Lamellar cut and side cut with no junction |
| UPJUNCTION | 99CZM | 20200130 | Lamellar cut and side cut with junction cut upwards |
| DOWNJUNCTION | 99CZM | 20200130 | Lamellar cut and side cut with junction cut downwards |
| UPDOWNJUNCTION | 99CZM | 20200130 | Lamellar cut and side cut with junction upwards and downwards |

8.3.9 No CID. Refractive Surgery Status

The application software uses (2D03,xx03) Refractive Surgery Status Code Sequence to specify the completion status of the surgery at the time the Refractive Surgery Summary was created.

Occurs in: Refractive Surgery Summary Raw Data SOP Instance

Table 8-36 Coded Values – Refractive Surgery Status

| Code Value | Coding Scheme Designator | Coding Scheme Version | Code Meaning / Comments |
|------------|--------------------------|-----------------------|---|
| COMPLETED | 99CZM | 20200130 | Planned surgery has been completed |
| ABORTED | 99CZM | 20200130 | Surgery has been aborted without completing planned treatment |

8.3.10 No CID. Laser Scan Direction

The application software uses (2D03,xx1C) Laser Scan Direction Code Sequence to specify the laser scan direction used for a particular laser cut.

Occurs in: Refractive Surgery Summary Raw Data SOP Instance

Table 8-37 Coded Values – Laser Scan Direction

| Code Value | Coding Scheme Designator | Coding Scheme Version | Code Meaning / Comments |
|----------------|--------------------------|-----------------------|--|
| SPIRALTOCENTER | 99CZM | 20200130 | Spiral scan towards center |
| SPIRALTOBORDER | 99CZM | 20200130 | Spiral scan towards border |
| RADIALTOCENTER | 99CZM | 20200130 | Radial scan towards center |
| RADIALTOBORDER | 99CZM | 20200130 | Radial scan towards border |
| RADIALBOTH | 99CZM | 20200130 | Radial scan towards both center and border |

8.4 Greyscale Image Consistency

Not applicable.

8.5 Standard Extended / Specialized/ Private SOP Classes

The following standard extensions are used in the IODs described in chapter 8.1.1 Created SOP Instance(s):

- Table 8-8 Refractive Surgery Plan/Summary Raw Data IOD - Module "CZM Pre-surgical Eye Status"
- Table 8-9 Refractive Surgery Plan Raw Data IOD - Module "CZM Refractive Surgery Plan"

8.6 Private Transfer Syntaxes

No Private Transfer Syntax is supported.



Carl Zeiss Meditec AG
Goeschwitzer Strasse 51-52
07745 Jena
Germany
www.zeiss.com/mel90
www.zeiss.com/med
www.zeiss.com/dicom