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# DICOM Conformance Statement

**MEL 90**

**Version 4.3**

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## 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)
<b>Transfer</b>		
Raw Data Storage	Yes	Yes
Video Photographic Image Storage	Yes	No
Encapsulated PDF Storage	Yes	No
<b>Workflow Management</b>		
Verification	Yes	Yes
Storage Commitment Push Model SOP Class	Yes	No
<b>Query / Retrieve</b>		
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](http://www.ihe.net/Technical_Framework/index.cfm)).

## 4 Networking

### 4.1 Implementation Model

#### 4.1.1 Application Data Flow

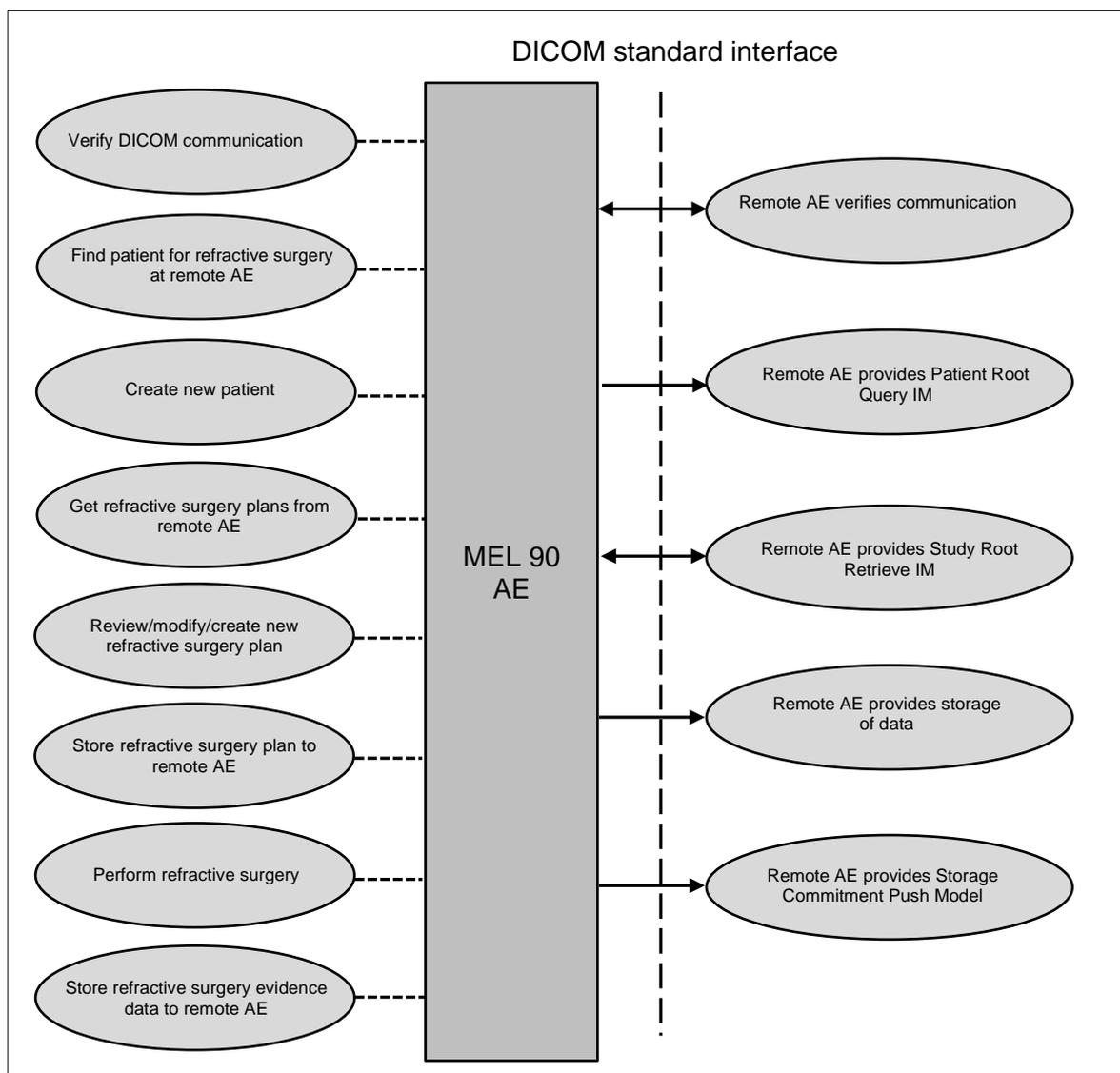


Figure 4-1 Application Data Flow

#### 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:

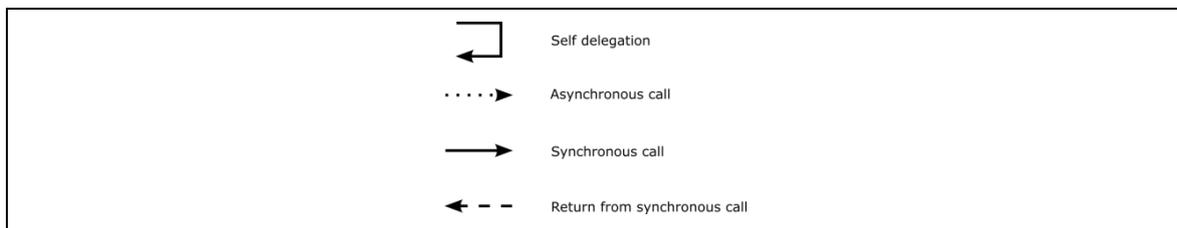
- Verification
- Raw Data Storage

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)

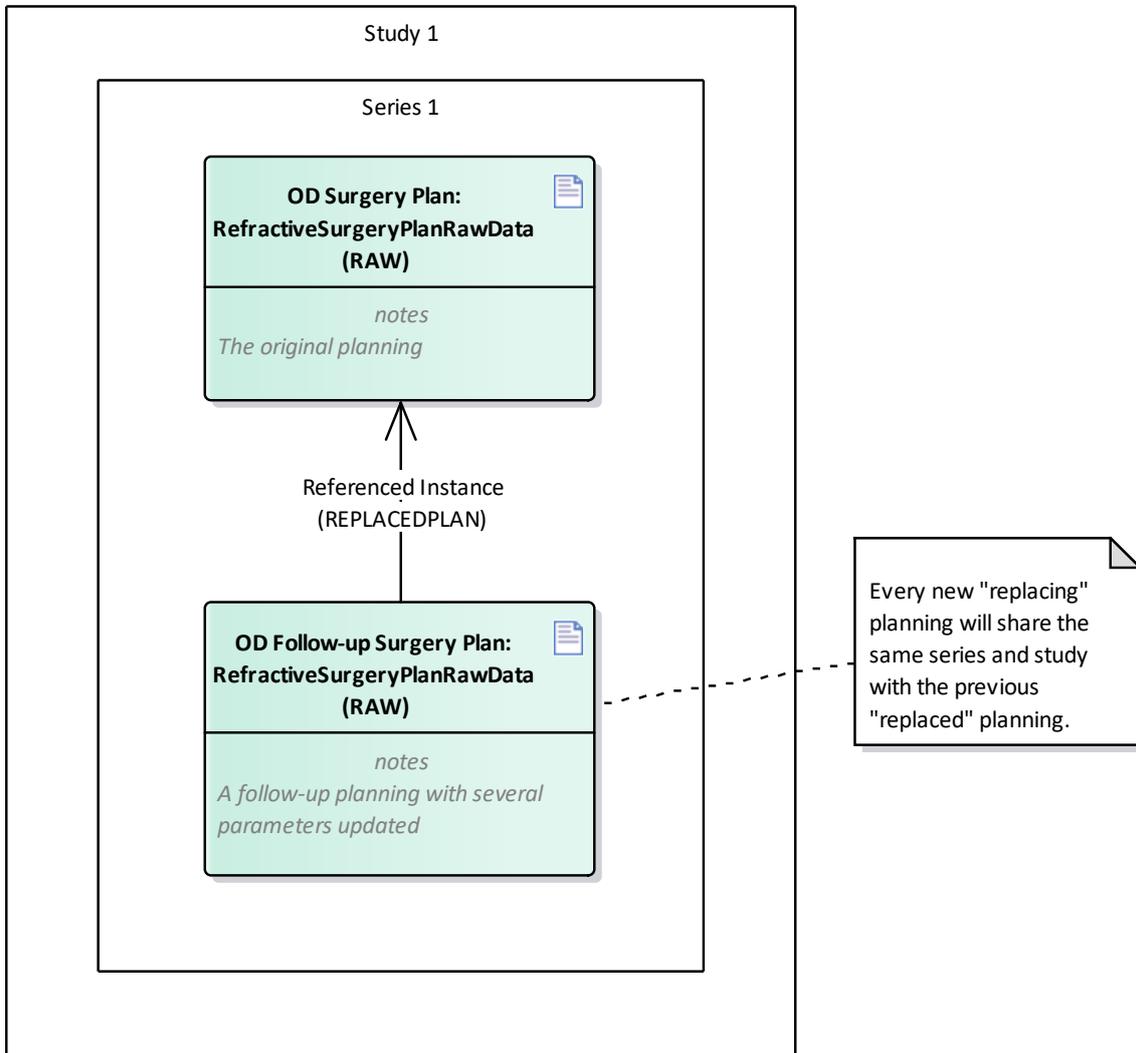


Figure 4-2 Single eye planning with predecessor

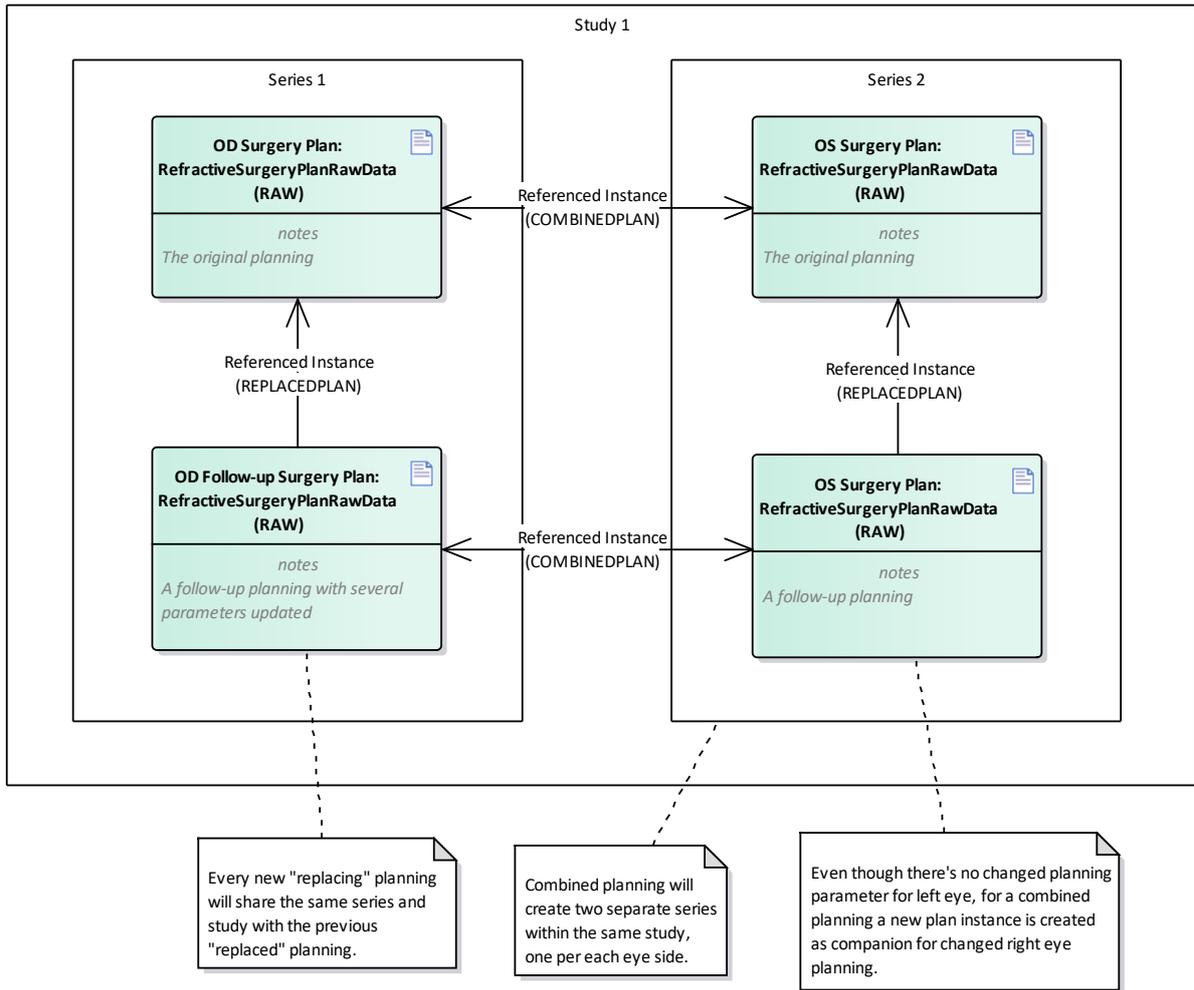


Figure 4-3 Combined eye planning

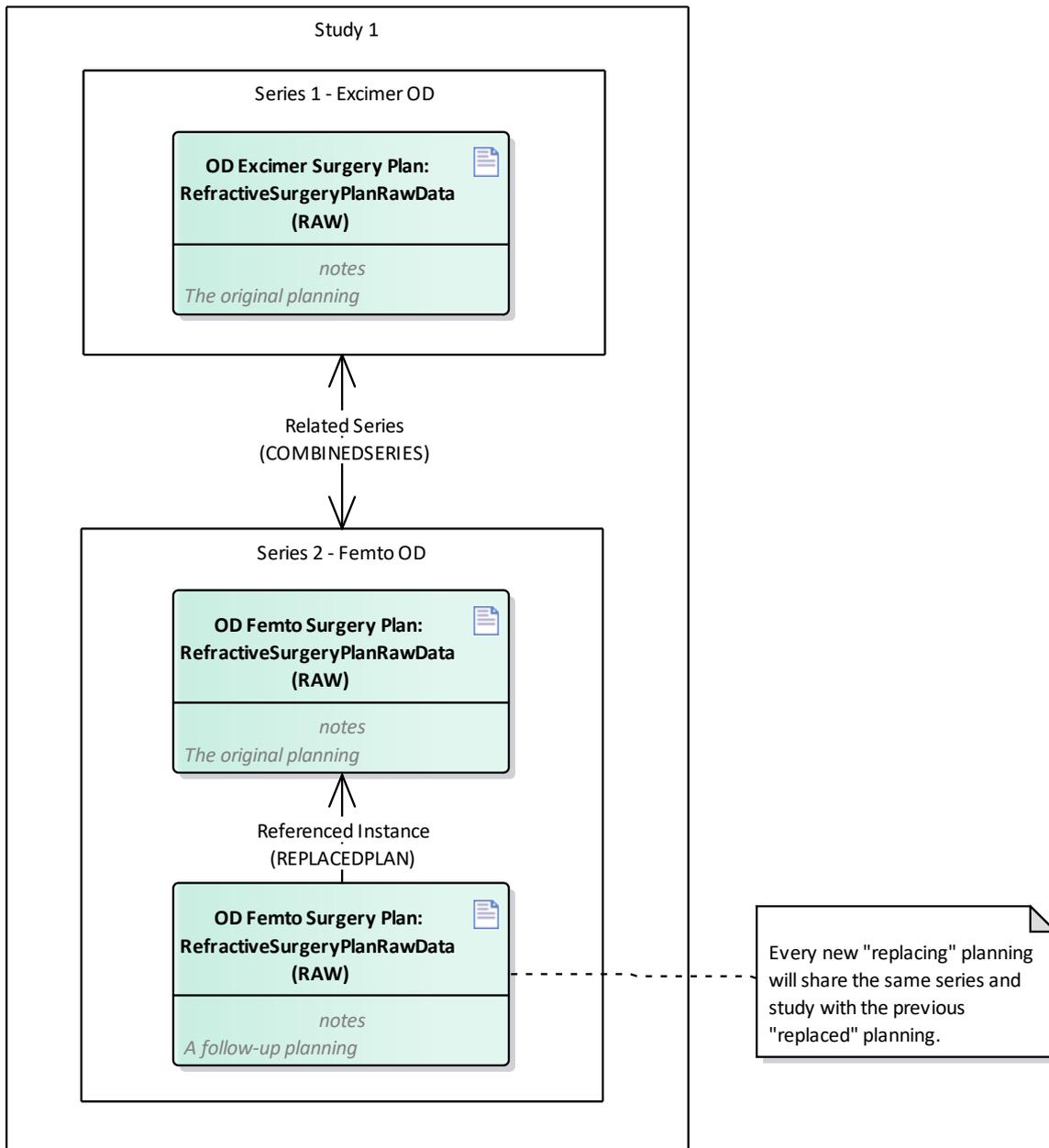


Figure 4-4 Multi-type surgery planning

### 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)

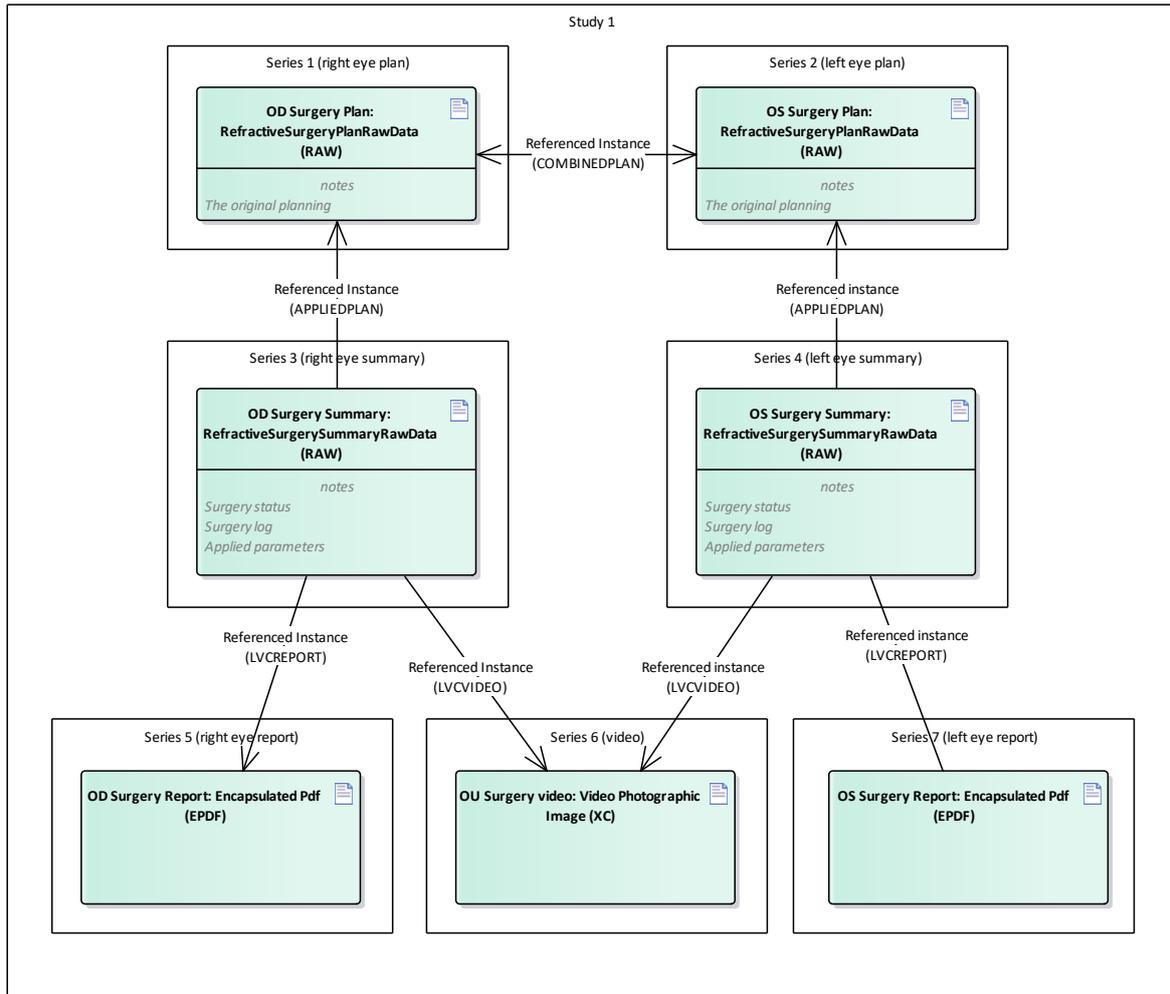


Figure 4-5 Combined eye surgery summary

#### 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.

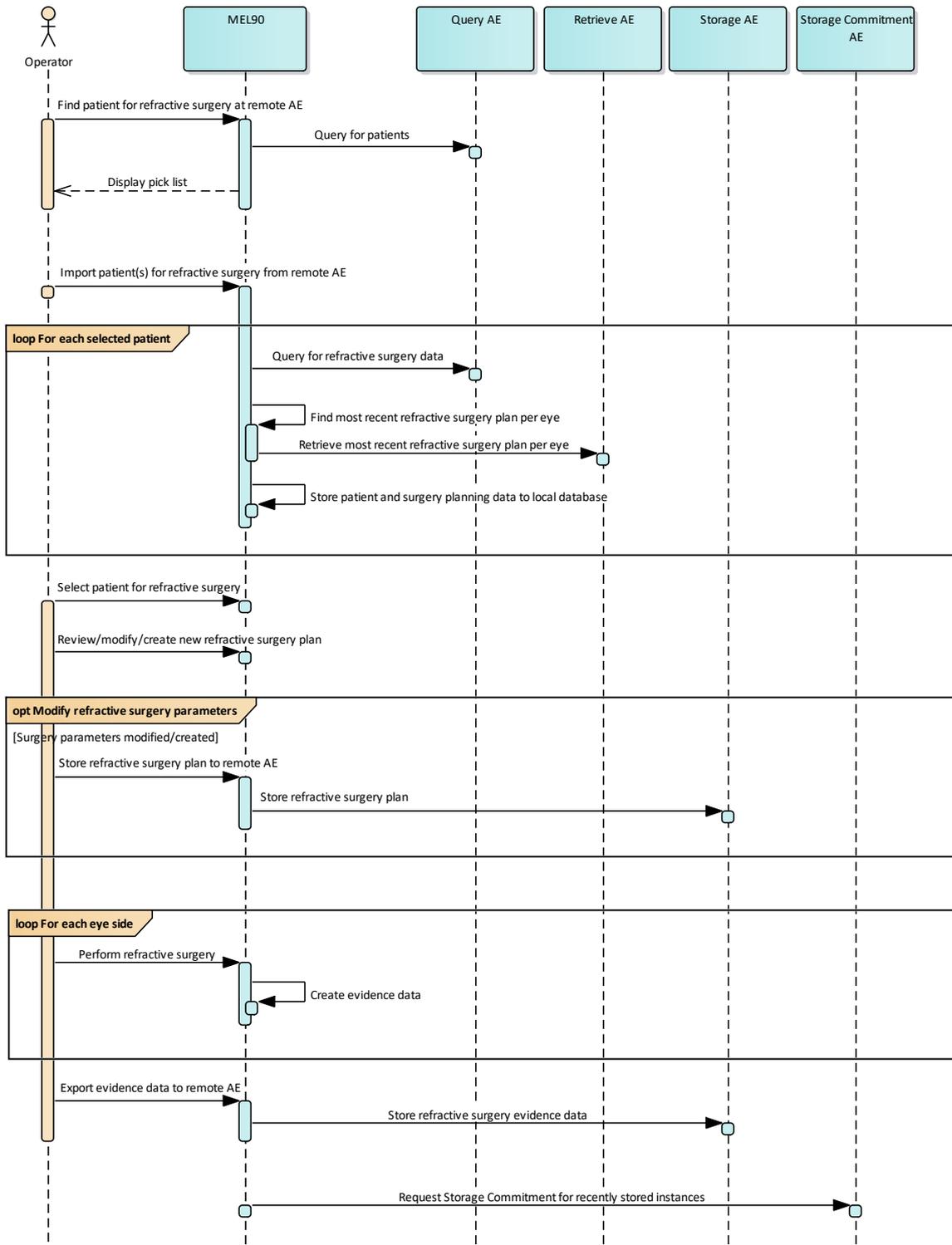


Figure 4-6 Standard workflow

## 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
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##### 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-sequent 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 <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	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 <sup>1</sup>
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

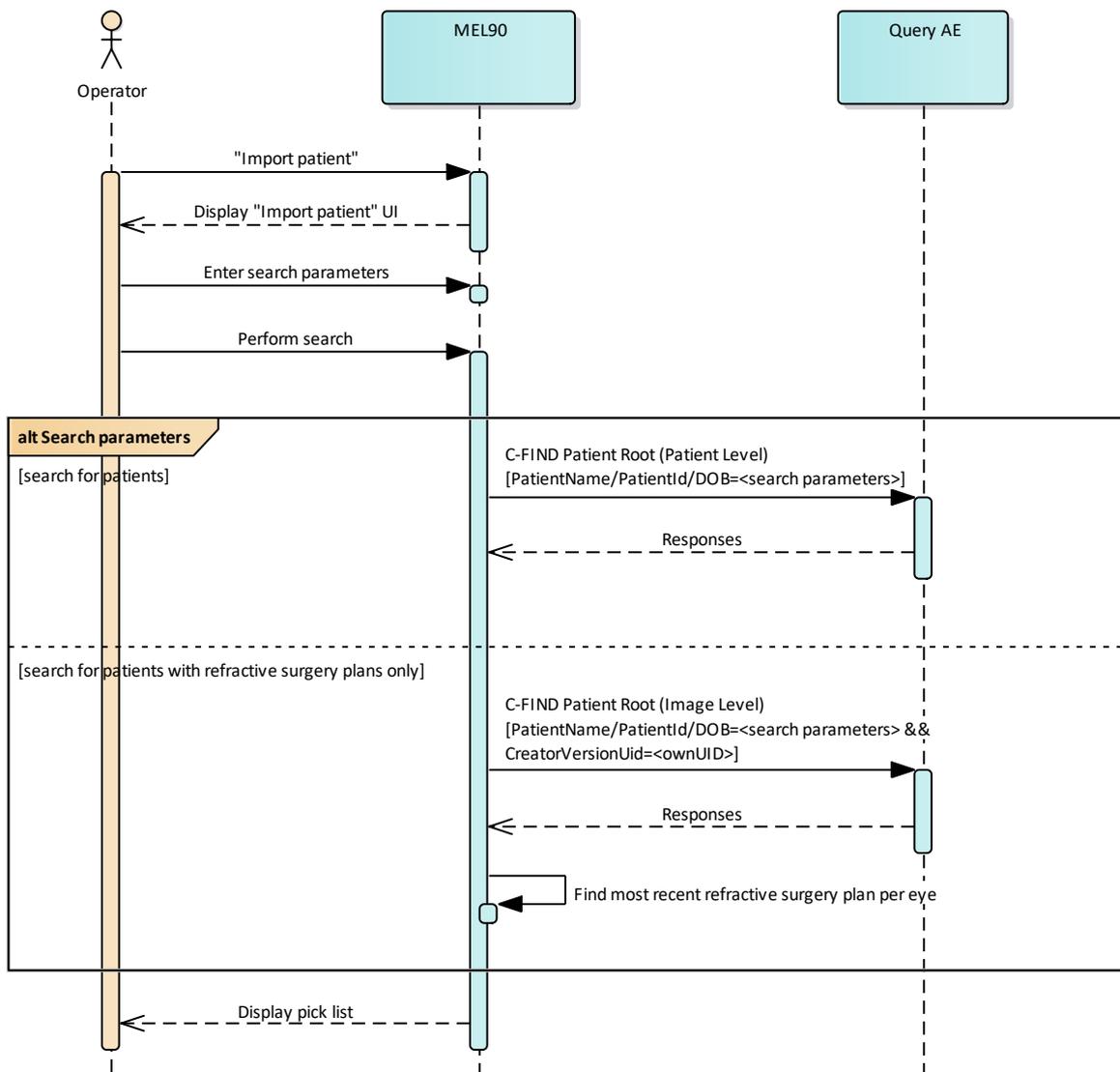


Figure 4-7 Find patient for refractive surgery at remote AE

## 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 <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	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 <sup>1</sup>
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 <sup>1</sup>	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

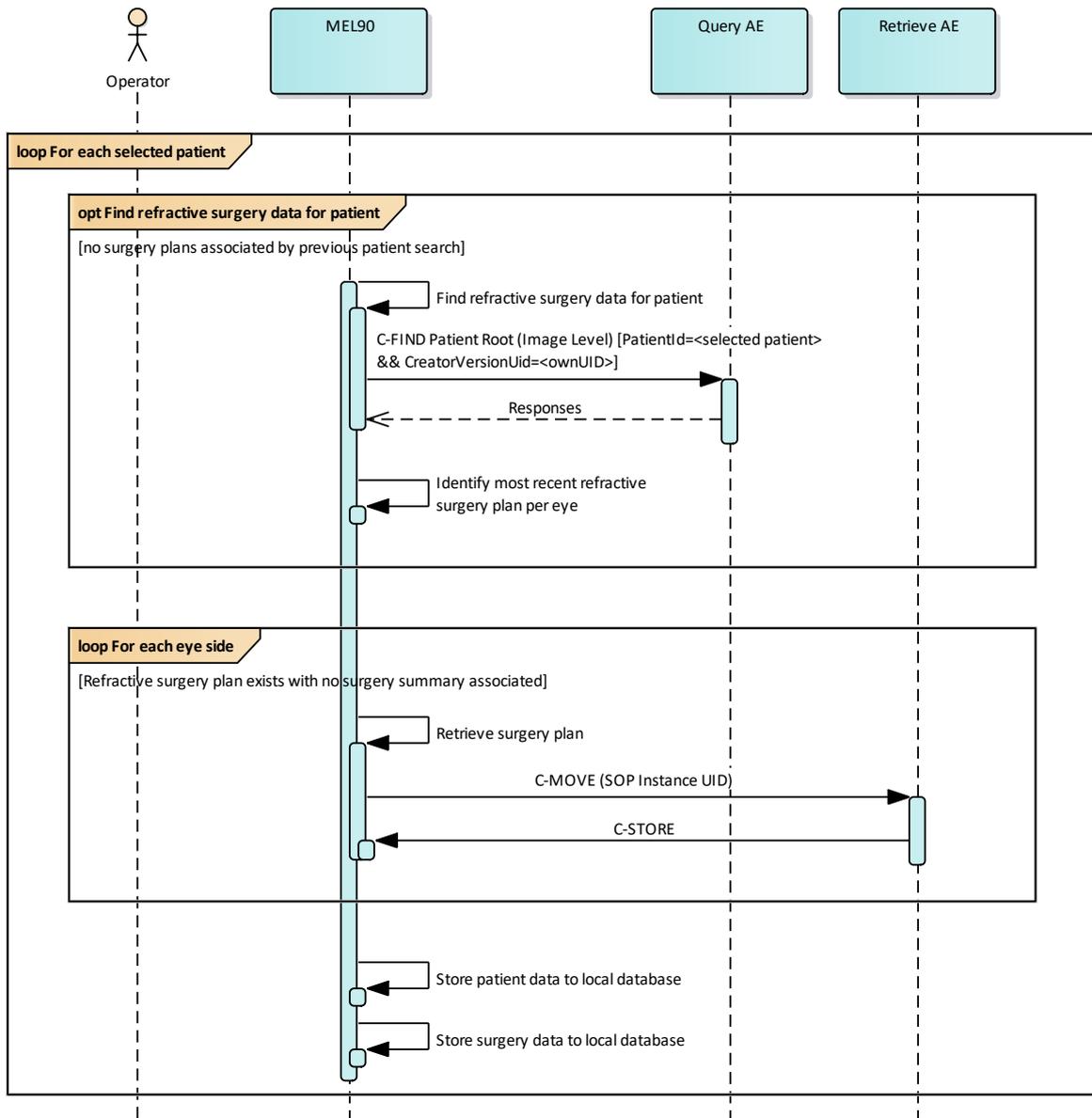


Figure 4-8 Import patients for refractive surgery from remote AE

#### 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 <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	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 <sup>1</sup>
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 <sup>1</sup>	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 <sup>1</sup>	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

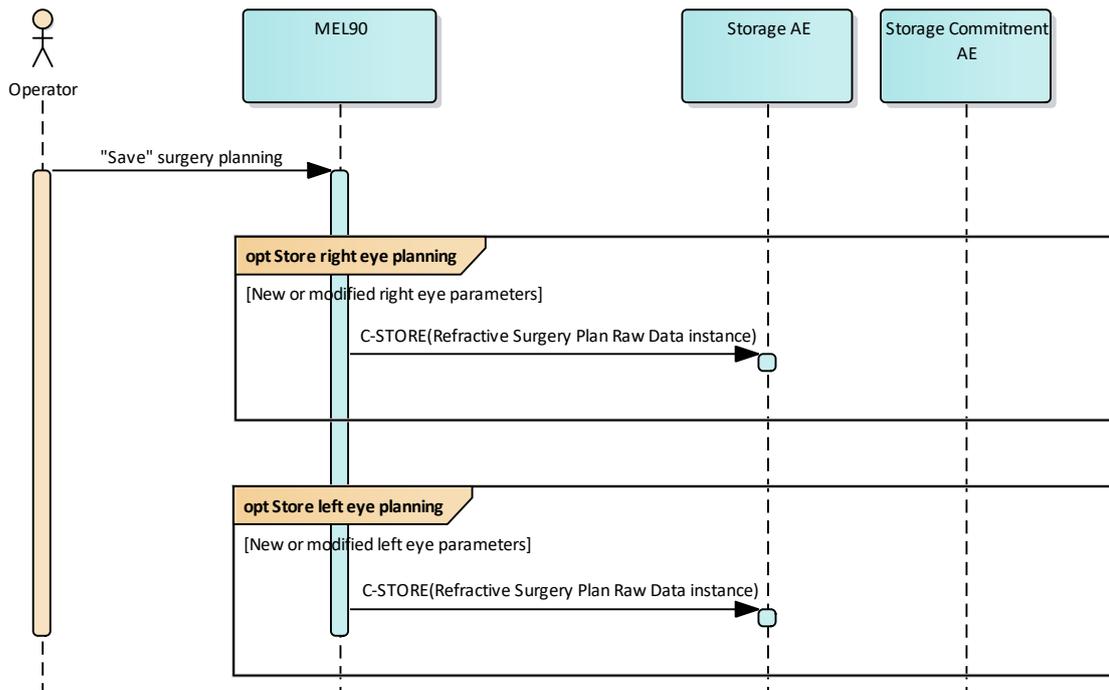


Figure 4-9 Store refractive surgery plan to remote AE

#### 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 <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	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 <sup>1</sup>
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

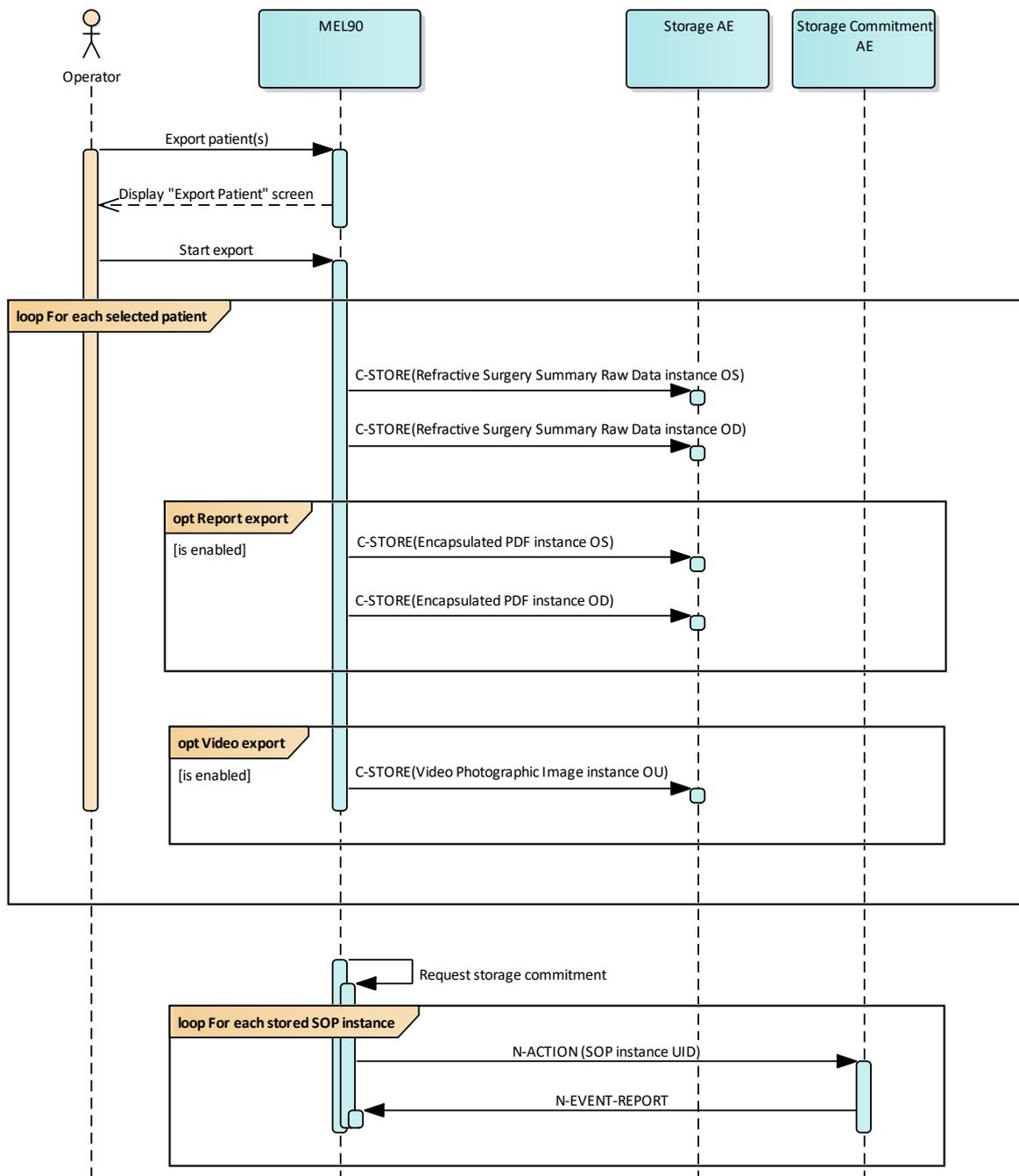


Figure 4-10 Store refractive surgery evidence data to remote AE

#### 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 <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	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 <sup>1</sup>
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	Ext. Neg.
Name	UID	Name List	UID List		
	1.2.840.10008. ...		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
<b>General Parameters</b>		
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
<b>AE Specific Parameters</b>		
Number of simultaneous Associations by Service and/or SOP Class?	No	50
<b>Verification SCU Parameters</b>		
No specific configuration required.		
<b>Patient Root Q/R and Study Root Q/R SCU Parameters</b>		
Maximum Query Responses (Modality Worklist IM, Patient Root Q/R IM and Study Root Q/R IM)	Yes (10-999)	400
Specific Character Set <sup>1</sup>	Yes (by service personnel only)	None (MEL 90 Application Software uses UTF-8)
<b>Storage Commitment SCU Parameters</b>		
No specific configuration required		
<b>Storage SCU Parameters</b>		
Specific Character Set <sup>1</sup>	Yes (by service personnel only)	None (MEL 90 Application Software uses UTF-8)
<b>Verification SCP Parameters</b>		
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**

<b>Supported Specific Character Set</b>	
<b>Character Set Description</b>	<b>Defined Term</b>
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"		
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**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	CONFIG
>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

>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

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

>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

>>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

>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

>>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

>>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

>>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

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

			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

>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

>>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

>>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

>>>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

			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

>>>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

>>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 "LF"	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		
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**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 <sup>1</sup>	(0010,0010)	Patient's Name <sup>1</sup>	(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 <sup>1</sup>	(0008,114A) >(0008,1155)	No
Instance Number	(0020,0013)	Instance Number <sup>2</sup>	(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
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### 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	Autorefractometry 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
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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.



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