

# **DICOM Conformance Statement**

**IOLMaster® 700**

**Version 1.88**

**Carl Zeiss Meditec AG**  
**Goeschwitzer Strasse 51-52**  
**07745 Jena**  
**Germany**

[www.zeiss.com/med](http://www.zeiss.com/med)

# 1 Conformance Statement Overview

The IOLMaster 700 device is a combined biometry instrument for the visualization of eye structures and acquisition of data of the human eye required for the calculation of the intraocular lens to be implanted.

The device is capable of consecutive measurement of the following eye parameters in one session: axial length, corneal curvatures, corneal thickness, anterior chamber depth, lens thickness and WTW distance. All measurements are non-contact, providing excellent patient comfort.

The IOLMaster 700 Application Software consists of one application entity which allows to:

- query modality worklist
- query patients
- archive biometry measurement data
- archive biometry acquisition images
- archive intraocular lens calculation results
- archive evidence reports

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>  |                       |                           |
| Multi-frame True Color Secondary Capture Image Storage | Yes                   | No                        |
| Ophthalmic Photography 8 Bit Image Storage             | Yes                   | No                        |
| Keratometry Measurements Storage                       | Yes                   | No                        |
| Ophthalmic Axial Measurements Storage                  | Yes                   | No                        |
| Intraocular Lens Calculations Storage                  | Yes                   | No                        |
| Encapsulated PDF Storage                               | Yes                   | No                        |
| <b>Workflow Management</b>                             |                       |                           |
| Verification   | Yes                   | Yes                       |
| Storage Commitment Push Model SOP Class                | Yes                   | No                        |
| Modality Worklist Information Model - FIND             | Yes                   | No                        |
| <b>Query / Retrieve</b>                                |                       |                           |
| Patient Root Query/Retrieve Information Model – FIND   | Yes                   | No                        |

The IOLMaster 700 does not support Media Interchange.

## 2 Table of Contents

|   |    |
|---|----|
| 1 Conformance Statement Overview .....                  | 2  |
| 2 Table of Contents .....                               | 3  |
| 3 Introduction .....                                    | 5  |
| 3.1 Revision History .....                              | 5  |
| 3.2 Audience .....                                      | 5  |
| 3.3 Remarks .....                                       | 5  |
| 3.4 Definitions and Terms .....                         | 5  |
| 3.5 Abbreviations .....                                 | 7  |
| 3.6 References .....                                    | 8  |
| 4 Networking .....                                      | 9  |
| 4.1 Implementation Model .....                          | 9  |
| 4.1.1 Application Data Flow .....                       | 9  |
| 4.1.2 Functional Definition of AEs .....                | 10 |
| 4.1.2.1 Functional Definition of IOLMaster 700 .....    | 10 |
| 4.1.3 Sequencing of Real-World Activities .....         | 10 |
| 4.1.3.1 IOLMaster 700 Activities .....                  | 11 |
| 4.1.3.2 Scheduled case .....                            | 14 |
| 4.1.3.3 Unscheduled case .....                          | 14 |
| 4.2 AE Specifications .....                             | 15 |
| 4.2.1 IOLMaster 700 AE Specification .....              | 15 |
| 4.2.1.1 SOP Classes .....                               | 15 |
| 4.2.1.2 Associations Policies .....                     | 16 |
| 4.2.1.2.1 General .....                                 | 16 |
| 4.2.1.2.2 Number of Associations .....                  | 16 |
| 4.2.1.2.3 Asynchronous Nature .....                     | 16 |
| 4.2.1.2.4 Implementation Identifying Information .....  | 16 |
| 4.2.1.3 Association Initiation Policy .....             | 16 |
| 4.2.1.3.1 Activity - Verify Communication .....         | 16 |
| 4.2.1.3.2 Activity - Query Modality Worklist .....      | 18 |
| 4.2.1.3.3 Activity - Query remote AE for patients ..... | 28 |
| 4.2.1.3.4 Activity - Acquire/Calculate data .....       | 34 |
| 4.2.1.3.5 Activity - Create report .....                | 35 |
| 4.2.1.3.6 Activity - Store data to remote AE .....      | 35 |
| 4.2.1.3.7 Activity - Delete data .....                  | 40 |
| 4.2.1.4 Association Acceptance Policy .....             | 40 |
| 4.2.1.4.1 Activity - Verify Communication .....         | 40 |
| 4.2.1.4.2 Activity - Store data to remote AE .....      | 40 |
| 4.3 Network Interfaces .....                            | 42 |
| 4.3.1 Physical Network Interface .....                  | 42 |
| 4.3.2 Additional Protocols .....                        | 42 |
| 4.3.3 IPv4 and IPv6 Support .....                       | 42 |
| 4.4 Configuration .....                                 | 42 |
| 4.4.1 AE Title/Presentation Address Mapping .....       | 42 |
| 4.4.1.1 Local AE Titles .....                           | 43 |
| 4.4.1.2 Remote AE Titles .....                          | 43 |
| 4.4.2 Parameters .....                                  | 43 |
| 4.4.2.1 General Parameters .....                        | 43 |
| 5 Media Interchange .....                               | 47 |
| 6 Support of Character Sets .....                       | 48 |
| 7 Security .....  | 49 |
| 8 Annexes .....   | 50 |
| 8.1 IOD Contents .....                                  | 50 |

|  |     |
|--|-----|
| 8.1.1 Created SOP Instance(s) .....  | 50  |
| 8.1.1.1 Encapsulated PDF Information Object Definition .....                       | 50  |
| 8.1.1.2 Ophthalmic Photography 8 Bit Information Object Definition .....           | 51  |
| 8.1.1.3 Multi Frame True Color Sc Image Information Object Definition .....        | 51  |
| 8.1.1.4 Ophthalmic Axial Measurements Information Object Definition .....          | 52  |
| 8.1.1.5 Keratometry Measurements Information Object Definition .....               | 52  |
| 8.1.1.6 Intraocular Lens Calculations Information Object Definition .....          | 53  |
| 8.1.1.7 Common Modules .....   | 54  |
| 8.1.1.8 Encapsulated PDF Modules .....   | 60  |
| 8.1.1.9 Ophthalmic Photography 8 Bit Modules .....                                 | 71  |
| 8.1.1.10 Multi Frame True Color Sc Image Modules .....                             | 81  |
| 8.1.1.11 Ophthalmic Axial Measurements Modules .....                               | 90  |
| 8.1.1.12 Keratometry Measurements Modules .....                                    | 107 |
| 8.1.1.13 Intraocular Lens Calculations Modules .....                               | 120 |
| 8.1.2 Usage of Attributes from Received IOD's .....                                | 133 |
| 8.1.3 Attribute Mapping .....  | 133 |
| 8.1.4 Coerced/Modified Files .....   | 134 |
| 8.2 Data Dictionary of Private Attributes .....                                    | 134 |
| 8.3 Coded Terminology and Templates .....  | 138 |
| 8.3.1 CID 4202. Ophthalmic Photography Acquisition Device .....                    | 138 |
| 8.3.2 CID 4209. Ophthalmic Anatomic Structure Imaged .....                         | 138 |
| 8.3.3 CID 4231. Lens Status .....  | 138 |
| 8.3.4 CID 4232. Vitreous Status .....  | 139 |
| 8.3.5 CID 4233. Ophthalmic Axial Length Measurements Segment Names .....           | 139 |
| 8.3.6 CID 4234. Refractive Surgery Types .....                                     | 139 |
| 8.3.7 CID 4235. Keratometry Descriptors .....                                      | 139 |
| 8.3.8 CID 4236. IOL Calculation Formula .....                                      | 140 |
| 8.3.9 CID 4237. Lens Constant Type .....   | 140 |
| 8.3.10 CID 4238. Refractive Error Types .....                                      | 140 |
| 8.3.11 CID 4239. Anterior Chamber Depth Definition .....                           | 140 |
| 8.3.12 CID 4240. Ophthalmic Measurement or Calculation Data Source .....           | 141 |
| 8.3.13 CID 4241. Ophthalmic Axial Length Selection Method .....                    | 141 |
| 8.3.14 CID 4243. Ophthalmic Quality Metric Type .....                              | 141 |
| 8.3.15 CID 7004. Waveform Purposes of Reference .....                              | 142 |
| 8.3.16 CID 7005. Contributing Equipment Purposes of Reference .....                | 142 |
| 8.3.17 CID 7201. Referenced Image Purposes of Reference .....                      | 142 |
| 8.3.18 No CID. Acquisition Context Sequence Codes (no context group defined) ..... | 142 |
| 8.4 Greyscale Image Consistency .....  | 145 |
| 8.5 Standard Extended / Specialized/ Private SOP Classes .....                     | 145 |
| 8.6 Private Transfer Syntaxes .....  | 145 |

## 3 Introduction

### 3.1 Revision History

| Document Version | Date       | Author          | Changes   |
|------------------|------------|-----------------|---|
| I                | 2019-03-28 | Patrick A. Nast | New document revision for Software version "1.88.1.64861"<br>New storage IOD: Intraocular Lens Calculations (IOL) |

### 3.2 Audience

This document is written for the people that need to understand how IOLMaster 700 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 IOLMaster 700 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   |
| 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   |
| IOL          | Intraocular lens – A lens implanted in the eye  |
| 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<br>(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   |
| 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)<br>– 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

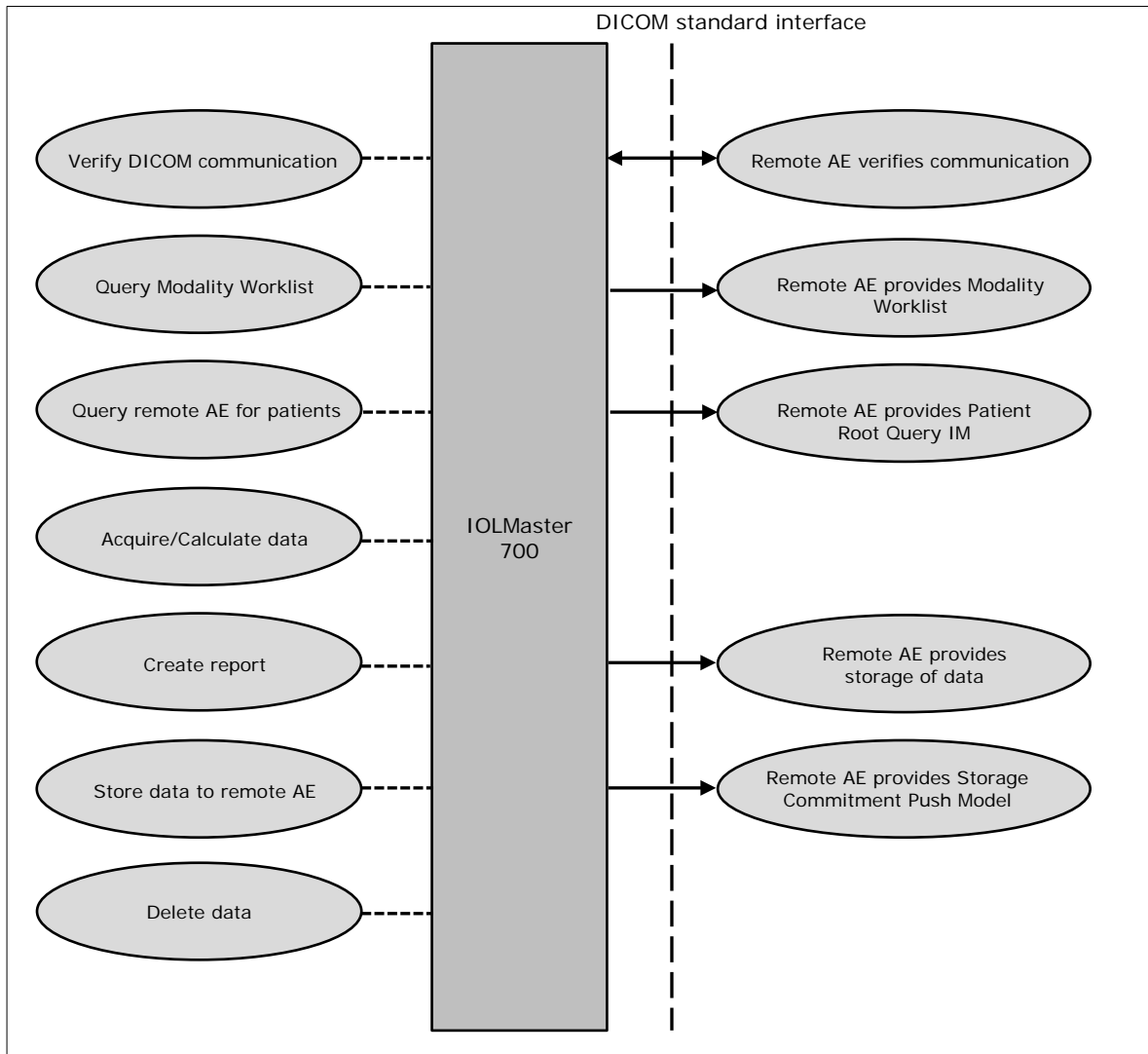


Figure 4-1 IOLMaster 700 Application Software as Acquisition Modality

## 4.1.2 Functional Definition of AEs

### 4.1.2.1 Functional Definition of IOLMaster 700

The IOLMaster 700 device is a combined biometry instrument for the visualization of eye structures and acquisition of data of the human eye required for the calculation of the intraocular lens to be implanted.

The device is capable of consecutive measurement of the following eye parameters in one session: axial length, corneal curvatures, corneal thickness, anterior chamber depth, lens thickness and WTW distance. All measurements are non-contact, providing excellent patient comfort.

The IOLMaster 700 Application Software consists of one application entity which allows to:

- query modality worklist
- query patients
- archive biometry measurement data
- archive biometry acquisition images
- archive intraocular lens calculation results
- archive evidence reports

IOLMaster 700 implements a Service Class User (SCU) for the following DICOM Services:

- Verification
- Modality Worklist Information Model – FIND
- Patient Root Query/Retrieve Information Model – FIND
- Multi-frame True Color Secondary Capture Image Storage
- Ophthalmic Photography 8 Bit Image Storage
- Keratometry Measurements Storage
- Ophthalmic Axial Measurements Storage
- Intraocular Lens Calculations Storage
- Encapsulated PDF Storage
- Storage Commitment Push Model

IOLMaster 700 implements a Service Class Provider (SCP) for the following DICOM Services:

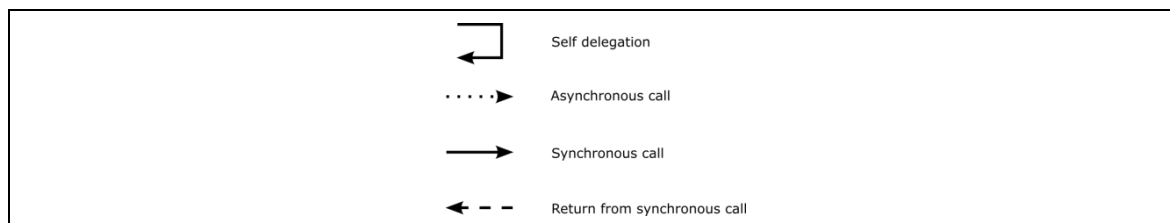
- Verification

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

The IOLMaster 700 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 IOLMaster 700 Activities

##### Query Modality Worklist

When the patient arrives at the IOLMaster 700, the operator queries the worklist. The operator can invoke this by simply select the "Today" tab in the main view which lists:

- all patients scheduled for this instrument (identified by the instrument's AE Title) and with a Scheduled Procedure Step Start Date of the current date
- all patients that were selected in the advanced search during this session
- all patients that were examined today on the system

For more specific worklist queries the "Advanced" and then "Scheduled Patients" button can be used.

In either way the operator can select the wanted item from the result list to proceed with selecting an appropriate Requested Procedure and Scheduled Procedure Step for data acquisition. According to the transferred data IOLMaster 700 creates an entry in the local database.

This activity generates a Scheduled Case.

##### Query remote AE for patients

When the patient arrives at the IOLMaster 700 the operator can search patients stored at a remote AE. This can be done by using the "Quick search" in the main screen or by using "Advanced" and then the "All Patients" for a more detailed search. Any matching results will be listed in patient list.

The operator can then select a patient for data acquisition or calculation.

This activity generates an Unscheduled Case.

##### Acquire/Calculate data

When a patient or scheduled worklist item is selected the operator can start biometry data acquisition and IOL calculation for the patient's eyes. The Application Software allows the user to review the acquired biometry data and calculation results before permanently saving the data.

This activity creates biometry measurement data and IOL calculation results.

Data created by this activity might become subject of the activity "Store data to remote AE".

##### Create report

The operator can invoke the creation of a report based on measured and calculated data. This report can be printed out directly.

Furthermore, reports are created on-the-fly and without any manual intervention whenever measurement data and/or IOL calculation results are about to be archived during activity "Store data to remote AE" since measurement data is always archived together with an electronic report.

##### Store data to remote AE

This activity can be invoked manually by the operator by

- selecting an existing measurement from the measurements list and pressing "Export"
- finishing the "Patient > Measurement > Analysis > IOL Calculation" workflow with pressing "Save & Export"

Once triggered, the application software transfers all data that has been created during the workflow and is subject of storage to the configured Storage AE. The activity automatically invokes the Activity "Create report".

Depending on quality of measured data and user export configuration during the "Store data to remote AE" activity the following instances are transferred to the configured Storage Provider:

- 1 Encapsulated Pdf SOP instances containing acquired data, calculation results and evidence reports
- 0..2 Ophthalmic Photography 8 Bit Image SOP instances containing reference images
- 0..1 Ophthalmic Axial Measurements SOP instances containing acquired axial length data

- 0..2 Multi-frame True Color Secondary Capture Image SOP instances containing axial quality control images
- 0..1 Keratometry Measurements SOP containing acquired keratometric data
- 0..2 Multi-frame True Color Secondary Capture Image SOP instances containing corneal quality control images
- 0..2 Ophthalmic Photography 8 Bit Image SOP instances containing white-to-white images
- 0..1 Intraocular Lens Calculations SOP instance containing IOL calculation results

After a configurable amount of time, the 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.

Due to the versatility of the underlying acquisition technology the application is able to acquire biometry data of different type in a single measurement procedure. During the "Store data to remote AE" activity these data will get "split" and stored to various SOP instances according to its type of data. To signify and maintain the relationship and affiliation of these instances the following relationship information is added to the instances (see also Figure 4-2 SOP instance relationship):

- a) Report instance(s) are identified as "master" instances and will always contain a list of references to all SOP instances created for a particular measurement:
  - this list is stored by (0042,0013) Source Instance Sequence
  - references are uni-directional
- b) One single IOLMaster exam is considered as one Performed Procedure Step. Thus, all SOP instances belonging to that measurement will share the same Performed Procedure Step information:
  - ID - Performed Procedure Step ID (0040,0253)
  - Date - Performed Procedure Step Start Date (0040,0244)
  - Time - Performed Procedure Step Start Time (0040,0245)
  - Description - Performed Procedure Step Description (0040,0254)

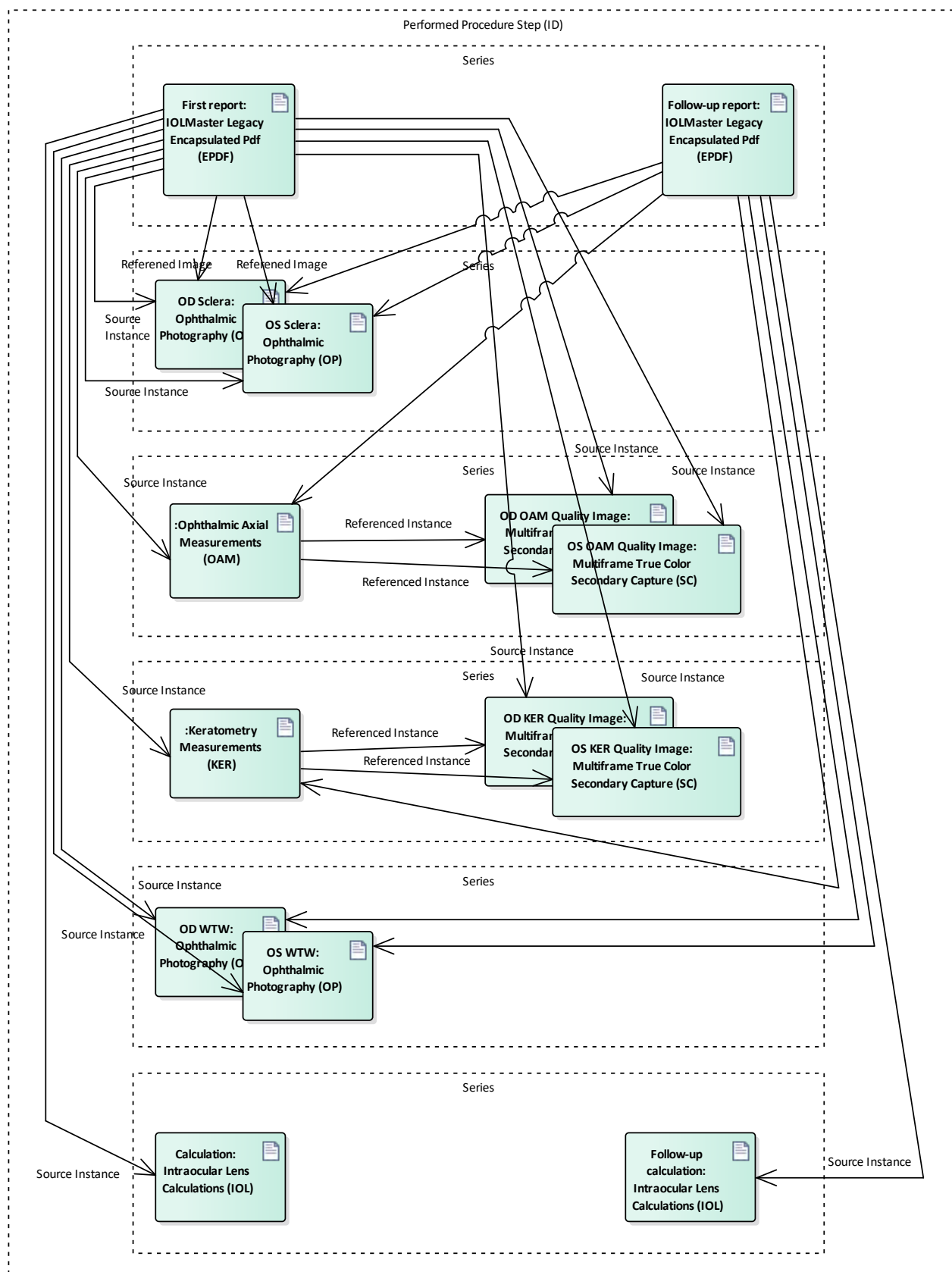


Figure 4-2 SOP instance relationship

## Delete data

This activity allows a user to delete data from the modality. Either specific measurements or complete patient data can be deleted. Deletion of data can only be triggered manually.

### 4.1.3.2 Scheduled case

The normal case is that the patient arrives at the front desk. There could be two possibilities at this point:

- The examination can be scheduled for the instrument.
- The examination was scheduled in advance.

In either case all patient and study related information is available at the day the examination takes place. On the IOLMaster 700 these patients appear in the "Today" list in the main screen. This information is used to take the examination.

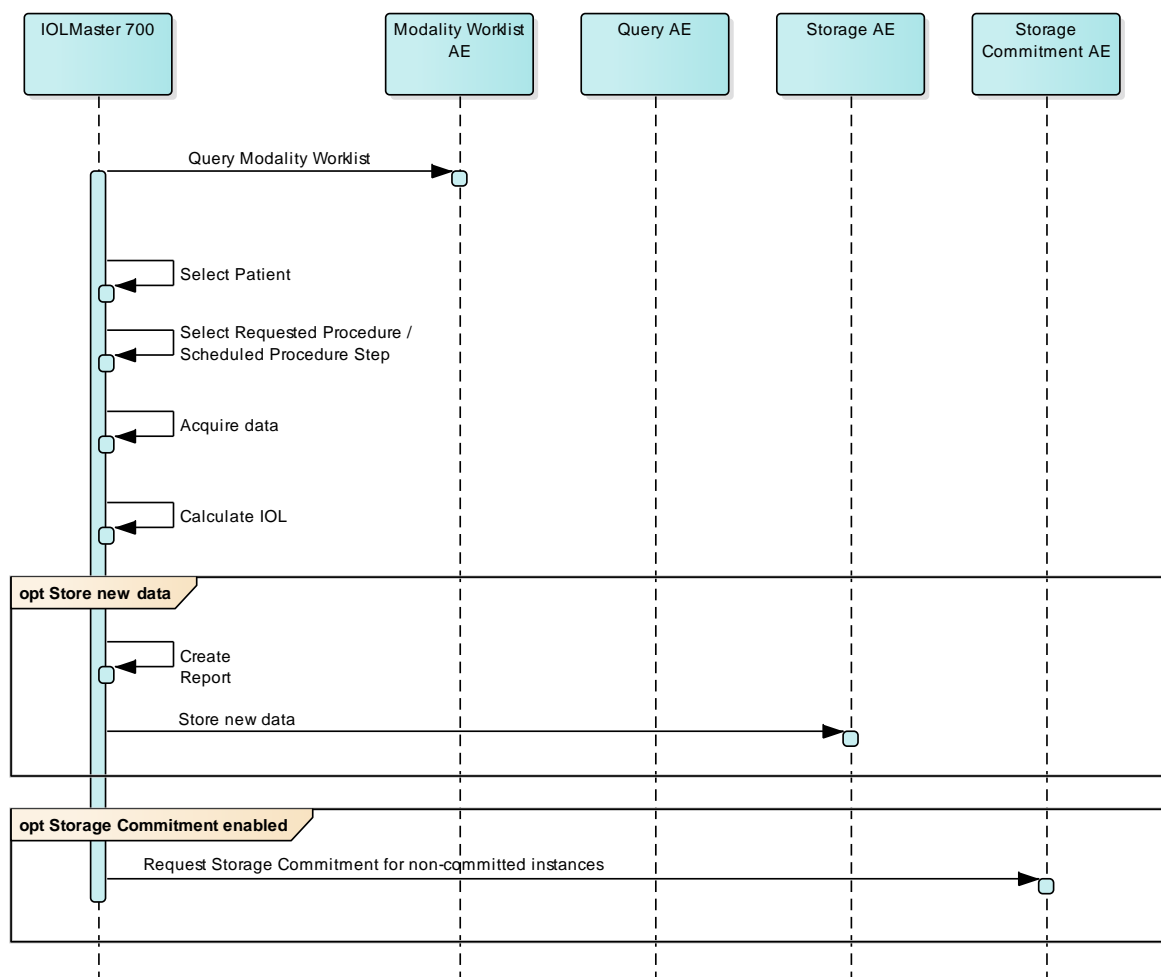


Figure 4-3 Scheduled case

### 4.1.3.3 Unscheduled case

In the unscheduled case the patient arrives immediately at the instrument, so that the patient was not registered at the front desk or the software does not support DICOM modality worklist. Thus the examination is not scheduled in the Modality Worklist. Patient demographics and study specific information has to be generated at the instrument itself. The situation is akin to the case if the Modality Worklist AE could not be reached due to network issues.

Patient demographics can be queried from the Query Service Class Provider. However, this should be considered as an exceptional way to obtain patient demographics.

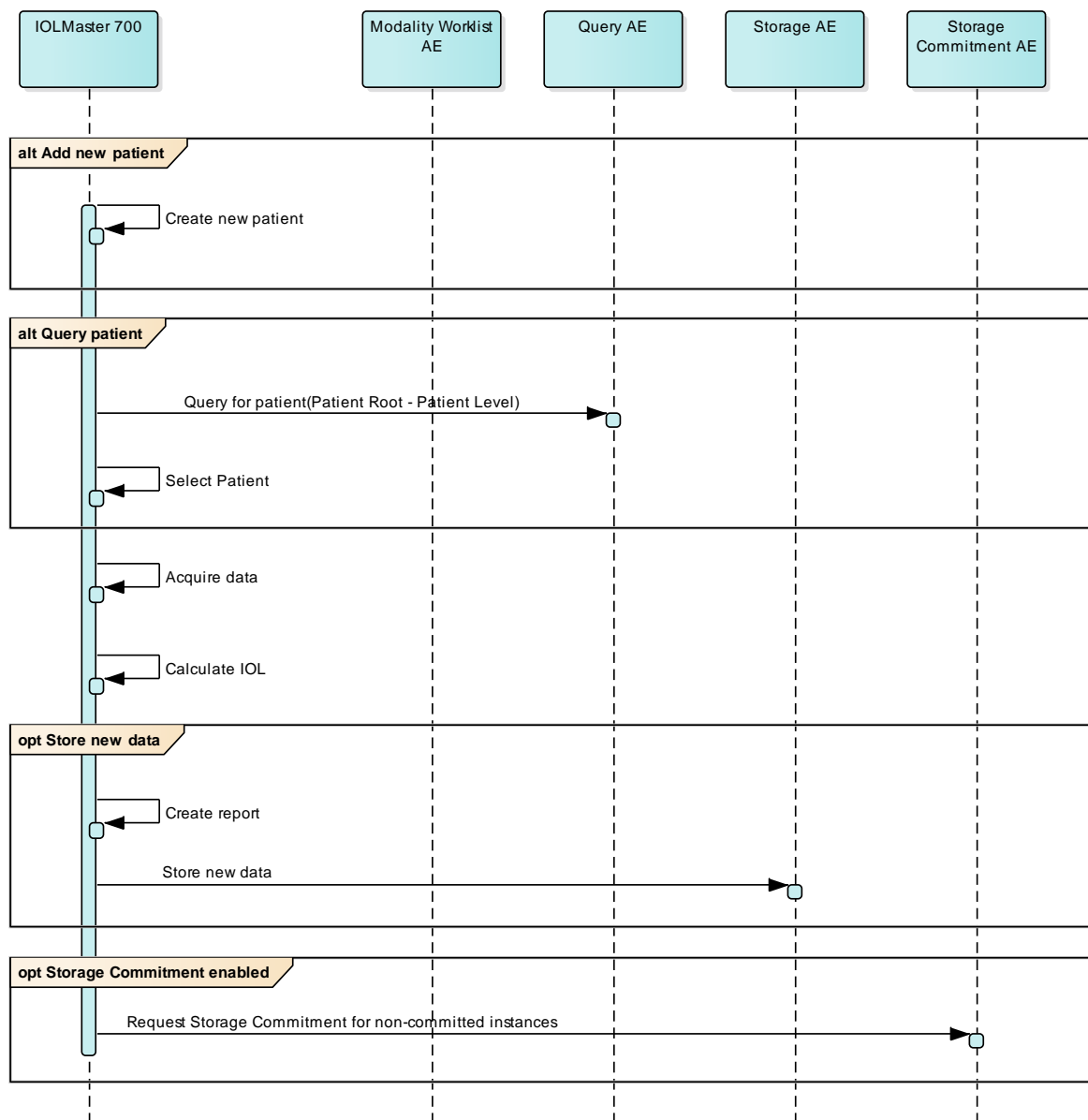


Figure 4-4 Unscheduled case

## 4.2 AE Specifications

### 4.2.1 IOLMaster 700 AE Specification

#### 4.2.1.1 SOP Classes

Table 4-1 SOP Classes for IOLMaster 700 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  |
| Multi-frame True Color Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.4 | Yes | No  |

|  |                                  |     |    |
|--|----------------------------------|-----|----|
| Ophthalmic Photography 8 Bit Image Storage           | 1.2.840.10008.5.1.4.1.1.77.1.5.1 | Yes | No |
| Keratometry Measurements Storage                     | 1.2.840.10008.5.1.4.1.1.78.3     | Yes | No |
| Ophthalmic Axial Measurements Storage                | 1.2.840.10008.5.1.4.1.1.78.7     | Yes | No |
| Intraocular Lens Calculations Storage                | 1.2.840.10008.5.1.4.1.1.78.8     | 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 |
| Modality Worklist Information Model - FIND           | 1.2.840.10008.5.1.4.31           | 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
- n associations for Modality Worklist - FIND, depending on whether search criteria are changed while a previous query is still active (no response yet)
- n associations for Query/Retrieve - FIND, depending on whether search criteria are changed while a previous query is still active (no response yet)

**Table 4-3 Number of associations**

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

##### 4.2.1.2.3 Asynchronous Nature

IOLMaster 700 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-2.9.0           |

#### 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 IOLMaster 700 Application Software proposes not only Verification SOP Class, but also all other SOP Classes as supported by the instrument's DICOM interface.

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

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

#### 4.2.1.3.1.2 Proposed Presentation Contexts

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

- Verification with Transfer Syntax ILE as SCU

**Table 4-5 Proposed Presentation Contexts for Activity Verify Communication**

| Presentation Context Table                             |                           |                 |                                |      |                   |
|--|---------------------------|-----------------|--------------------------------|------|-------------------|
| Abstract Syntax  |                           | Transfer Syntax |                                | Role | Ext. Neg.         |
| Name   | UID<br>1.2.840.10008. ... | Name List       | UID List<br>1.2.840.10008. ... |      |                   |
| Verification   | 1.1                       | ILE             | 1.2                            | BOTH | None              |
| Storage Commitment Push Model                          | 1.20.1                    | ILE             | 1.2                            | SCU  | None              |
| Multi-frame True Color Secondary Capture Image Storage | 5.1.4.1.1.7.4             | JPG-1           | 1.2.4.50                       | SCU  | None              |
| Ophthalmic Photography 8 Bit Image Storage             | 5.1.4.1.1.77.1.5.1        | JPG-1           | 1.2.4.50                       | SCU  | None              |
| Keratometry Measurements Storage                       | 5.1.4.1.1.78.3            | ILE             | 1.2                            | SCU  | None              |
|  |                           | ELE             | 1.2.1                          | SCU  | None              |
| Ophthalmic Axial Measurements Storage                  | 5.1.4.1.1.78.7            | ILE             | 1.2                            | SCU  | None              |
|  |                           | ELE             | 1.2.1                          | SCU  | None              |
| Intraocular Lens Calculations Storage                  | 5.1.4.1.1.78.8            | ILE             | 1.2                            | SCU  | None              |
|  |                           | ELE             | 1.2.1                          | 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 – FIND                    | 5.1.4.1.2.2.1             | ILE             | 1.2                            | SCU  | Yes <sup>1)</sup> |
| Modality Worklist IM – FIND                            | 5.1.4.31                  | ILE             | 1.2                            | SCU  | None              |

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

**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           |
| Study Root Query/Retrieve IM - FIND   | 1.2.840.10008.5.1.4.1.2.2.1 | See Note 1, 2        |

Note 1: Extended negotiation for relational-queries is offered. Relational-query support by the SCP is required for successful Patient Root Query issued by the IOLMaster 700.

Note 2: Study Root Query/Retrieve Information Model – FIND is negotiated but not used by IOLMaster 700.

#### 4.2.1.3.1.3 SOP Specific Conformance for Verification SOP Class

The IOLMaster 700 Application Software provides standard conformance.

#### 4.2.1.3.2 Activity - Query Modality Worklist

The worklist contains scheduling information for patients. Query Modality Worklist is used to search for the right scheduling information for this instrument. An operator has two options to perform this activity.

##### 4.2.1.3.2.1 Description and Sequencing of Activities

###### Option "Today's Patients query"

In this case, the Application Software performs a query with predefined query keys. The applied query keys are:

**Table 4-7 Modality Worklist Query for Today's Patients**

| Tag          | Attribute Name                             | Description   |
|--------------|--|---|
| (0040,0100)  | Scheduled Procedure Step Sequence          |   |
| >(0040,0001) | Scheduled Station Application Entity Title | Default: AE Title as configured for the IOLMaster 700 instrument.<br>See Note 1 |
| >(0040,0002) | Scheduled procedure Step Start Date        | Default: Today's Date<br>See Note 1   |
| >(0008,0060) | Modality                                   | Default: empty<br>See Note 1  |

Note 1: In the Network Settings the default values of these three query keys for Today's Patients Modality Worklist Query can get modified. See Table 4-34 Configuration Parameters Table for details.

All matching worklist items are presented to the operator in the "Today" list and the application keeps all item data needed for further processing. After that, the operator can select one item from that list, choose the appropriate Requested Procedure and Scheduled Procedure Step and start the examination of the patient and acquire measurement data. Once a measurement has been acquired all work item data is persisted along with the instance in the database.

This default query can be manually triggered by simply pressing the button in the header of the "Today" list. This default query is also triggered automatically in a configurable interval to keep the "Today" List up to date if option "Automatic MWL Update" is switched on.

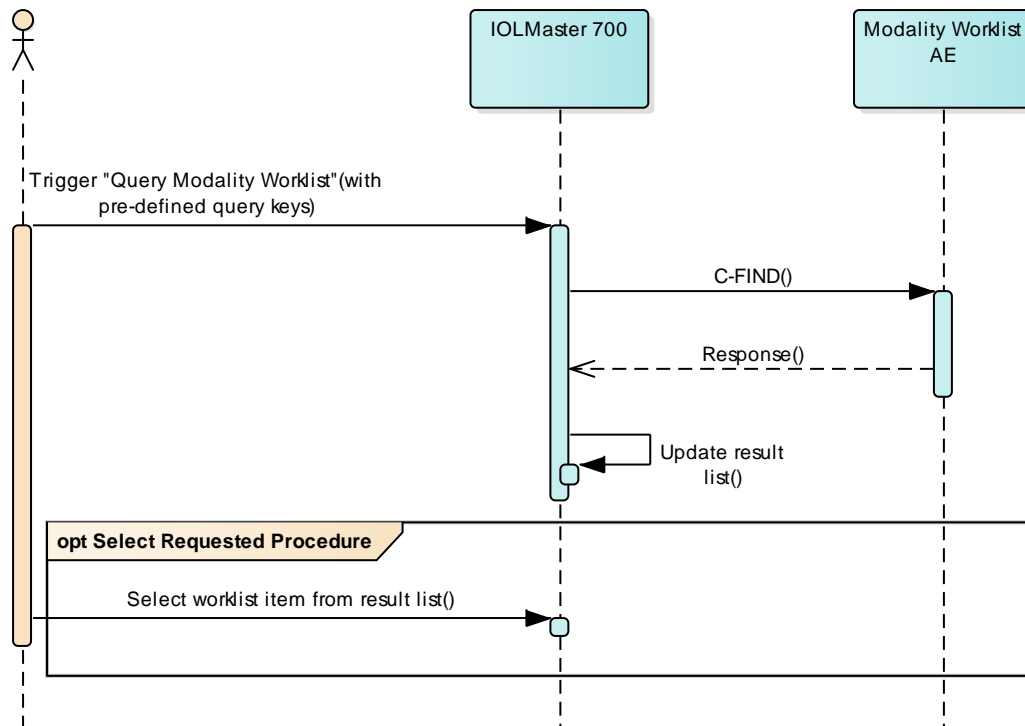


Figure 4-5 Query Modality Worklist - Today's Patients Query

#### Option "Interactive query"

The query keys of the "Interactive query" can be modified by the operator. To modify the query key the operator has to use "Advanced" in the main screen and use the tab "Scheduled Patients". This screen will provide all available search fields for the Modality Worklist search.

The operator can select the patient itself after the Modality Worklist search. In this case the patient will be added to the Today's Patients list and the operator can perform an unscheduled acquisition. No Requested Procedure – Scheduled Procedure Step information is added.

Alternatively the operator can display the Modality Worklist Details for a selected patient. In the Details screen the operator can select a Requested Procedure and add the patient to the Today's Patients list including the selected Requested Procedure information. (Scheduled Case)

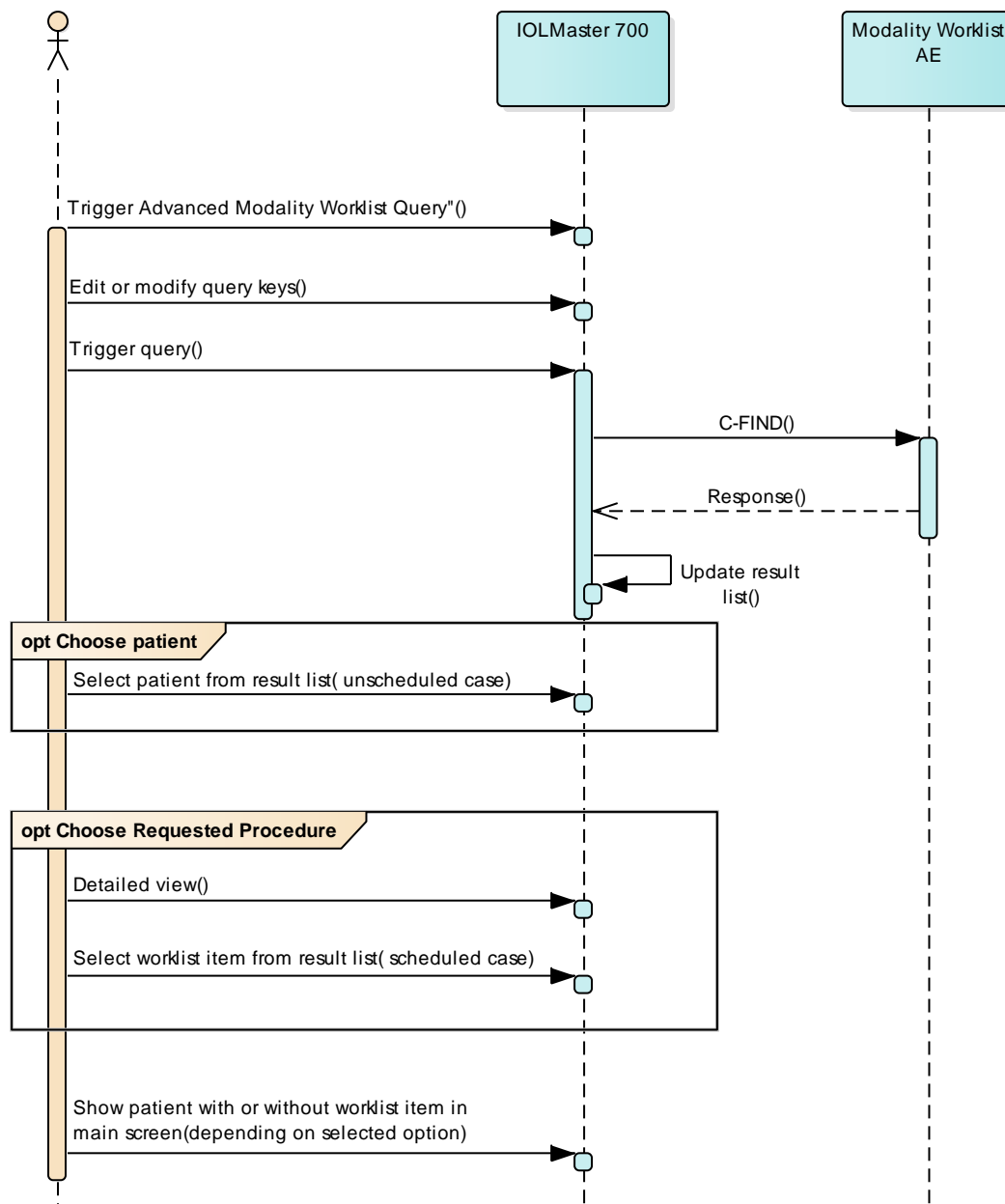


Figure 4-6 Query Modality Worklist - Interactive Query

#### Trigger "Query Modality Worklist"

The activity "Query Modality Worklist" can be triggered by operator at any time if no other activity is in progress. To invoke the query the operator has to use "Advanced" in the main screen and use the tab "Scheduled Patients". It is meaningful to perform the query when the patient arrives at the modality. Then the worklist contains latest information.

#### Edit or modify query keys

The Modality Worklist query offers a GUI for interactive query. The "Scheduled Station AE Title" is prefilled with the instrument AE title and the "Schedule date" is predefined with "All" (all dates). All predefined values can be changed. The operator can change or fill in search criteria in the shown dialog. For instance, the incomplete patient name or the patient ID can be used.

#### Trigger query

The operator triggers the search after he filled in search criteria by pressing the "Search" button. The Application Software sends a DICOM C-FIND request, which contains the search criteria.

The Application Software waits for the response from the partner Application Entity. Application Software will accept up to a configurable number of matches. The Application Software checks whether the number of received worklist items overstepped this configured limit and in such case sends a C-CANCEL-RQ, then an A-RELEASE-RQ to the service provider. A message is displayed to the operator accordingly. Despite this warning, the operator gets results in the result list.

After receiving the response, the pick-list is updated. The result-list provides the most important information for a quick overview (see section 4.2.1.3.2.3 for the supported set of tags).

The operator can start over, redefine query keys and trigger the query again. This can be performed as often as required, until he or she finds the correct worklist item.

#### Select patient from result list

The operator can select one or more patients in the pick-list and return to the acquisition screen. In this case the scheduling information is lost and the workflow results in an unscheduled case.

#### Detailed view

The detailed view can be activated by pressing the "Details" button. A detailed view allows a closer look to all received worklist item for the selected patient. The operator can see more information about patient information and scheduling information.

#### Select Requested Procedure

In the detailed view the operator has the option to select a dedicated Requested Procedure with all associated Scheduled Procedure Steps by clicking on the Select button of the highlighted Requested Procedure.

#### Show worklist item in main screen

The operator can take over the selected item at any time by pressing the "Select" button. The item is stored in the list of "Today" and the application keeps all item data needed for further processing. After that, the operator can start the examination of the patient and acquire measurement data. Once a measurement has been acquired for this item all item data is persisted along with the instance in the database.

#### 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

- "Modality Worklist IM - FIND" with Transfer Syntax ILE as SCU

**Table 4-8 Proposed Presentation Contexts Activity Query Modality Worklist**

| Presentation Context Table                             |                           |                 |                                |      |           |
|--|---------------------------|-----------------|--------------------------------|------|-----------|
| Abstract Syntax  |                           | Transfer Syntax |                                | Role | Ext. Neg. |
| Name   | UID<br>1.2.840.10008. ... | Name List       | UID List<br>1.2.840.10008. ... |      |           |
| Verification   | 1.1                       | ILE             | 1.2                            | BOTH | None      |
| Storage Commitment Push Model                          | 1.20.1                    | ILE             | 1.2                            | SCU  | None      |
| Multi-frame True Color Secondary Capture Image Storage | 5.1.4.1.1.7.4             | JPG-1           | 1.2.4.50                       | SCU  | None      |
| Ophthalmic Photography 8 Bit Image Storage             | 5.1.4.1.1.77.1.5.1        | JPG-1           | 1.2.4.50                       | SCU  | None      |
| Keratometry Measurements Storage                       | 5.1.4.1.1.78.3            | ILE             | 1.2                            | SCU  | None      |
|  |                           | ELE             | 1.2.1                          | SCU  | None      |
| Ophthalmic Axial Measurements Storage                  | 5.1.4.1.1.78.7            | ILE             | 1.2                            | SCU  | None      |
|  |                           | ELE             | 1.2.1                          | SCU  | None      |
| Intraocular Lens Calculations Storage                  | 5.1.4.1.1.78.8            | ILE             | 1.2                            | SCU  | None      |
|  |                           | ELE             | 1.2.1                          | 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 – FIND   | 5.1.4.1.2.2.1 | ILE | 1.2   | SCU | Yes <sup>1)</sup> |
| Modality Worklist IM – FIND           | 5.1.4.31      | ILE | 1.2   | SCU | None              |

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

**Table 4-9 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           |
| Study Root Query/Retrieve IM - FIND   | 1.2.840.10008.5.1.4.1.2.2.1 | See Note 1, 2        |

Note 1: Extended negotiation for relational-queries is offered. Relational-query support by the SCP is required for successful Patient Root Query issued by the IOLMaster 700.

Note 2: Study Root Query/Retrieve Information Model – FIND is negotiated but not used by IOLMaster 700.

#### 4.2.1.3.2.3 SOP Specific Conformance for Modality Worklist SOP Class

**Table 4-10 Modality Worklist 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 message.  |
| Failure        | Identifier Does Not Match SOP Class  | A900       | Log message and display user alert message.  |
| Failure        | Unable to process  | C000-CFFF  | Log message and display user alert message.  |
| Failure        | Refused: SOP class not supported   | 0122       | Log message and display user alert message.  |
| Cancel         | Matching terminated due to Cancel request  | FE00       | Log message  |
| Success        | Matching is complete   | 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 message   |

**Table 4-11 Modality Worklist 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 4-12 Attributes involved in Modality Worklist C-FIND request and response**

| Tag                                   | Tag Name                                   | Query Keys Matching | Mandatory Query Keys Return | Imported | Displayed | Modifiable | SOP Instance |
|---------------------------------------|--|---------------------|-----------------------------|----------|-----------|------------|--------------|
| <b>Scheduled Procedure Step (SPS)</b> |  |                     |                             |          |           |            |              |
| (0040,0100)                           | Scheduled Procedure Step Sequence          |                     | X                           |          |           |            |              |
| >(0040,0001)                          | Scheduled Station Application Entity Title | BRQ, DEF*           | X <sup>1</sup>              | X        | PLD       |            |              |
| >(0040,0003)                          | Scheduled Procedure Step Start Time        |                     | X                           | X        | PLD       |            |              |
| >(0040,0002)                          | Scheduled Procedure Step Start Date        | BRQ, DEF*, SEL, RNG | X                           | X        | PLD       |            |              |
| >(0008,0060)                          | Modality                                   | BRQ, SEL DEF*       | X <sup>2</sup>              | X        | PLD       |            |              |
| >(0040,0006)                          | Scheduled Performing Physicians Name       |                     |                             |          |           |            |              |
| >(0040,0007)                          | Scheduled Procedure Step Description       |                     | X <sup>3</sup>              | X        | PLD       |            | X            |
| >(0040,0010)                          | Scheduled Station Name                     |                     |                             |          |           |            |              |
| >(0040,0011)                          | Scheduled Procedure Step Location          |                     |                             |          |           |            |              |
| >(0040,0008)                          | Scheduled Protocol Code Sequence           |                     | X <sup>3</sup>              | X        |           |            | X            |
| >>(0008,0100)                         | Code Value                                 |                     | X*                          | X        |           |            | X            |
| >>(0008,0102)                         | Coding Scheme Designator                   |                     | X*                          | X        |           |            | X            |
| >>(0008,0103)                         | Coding Scheme Version                      |                     |                             | X        |           |            | X            |
| >>(0008,0104)                         | Code Meaning                               |                     |                             | X        | PLD       |            | X            |
| >(0040,0012)                          | Pre-Medication                             |                     |                             |          |           |            |              |
| >(0040,0009)                          | Scheduled Procedure Step ID                |                     | X                           | X        |           |            | X            |
| >(0032,1070)                          | Requested Contrast Agent                   |                     |                             |          |           |            |              |
| >(0040,0020)                          | Scheduled Procedure Step Status            |                     |                             |          |           |            |              |
| <b>Requested Procedure</b>            |  |                     |                             |          |           |            |              |
| (0040,1001)                           | Requested Procedure ID                     | PBQ                 | X                           | X        | PLD       |            | X            |
| (0032,1060)                           | Requested Procedure Description            |                     | X <sup>4</sup>              | X        | PLD       |            | X            |
| (0032,1064)                           | Requested Procedure Code Sequence          |                     | X <sup>4</sup>              | X        |           |            | X            |
| >(0008,0100)                          | Code Value                                 |                     | X*                          | X        |           |            | X            |
| >(0008,0102)                          | Coding Scheme Designator                   |                     | X*                          | X        |           |            | X            |
| >(0008,0103)                          | Coding Scheme Version                      |                     |                             | X        |           |            | X            |
| >(0008,0104)                          | Code Meaning                               |                     |                             | X        | PLD       |            | X            |
| (0020,000D)                           | Study Instance UID                         |                     | X                           | X        |           |            | X            |
| (0008,0020)                           | Study Date                                 |                     |                             | X        |           |            | X            |
| (0008,0030)                           | Study Time                                 |                     |                             | X        |           |            | X            |
| (0008,1110)                           | Referenced Study Sequence                  |                     |                             | X        |           |            | X            |



|                                |  |     |    |   |              |  |   |
|--------------------------------|--|-----|----|---|--------------|--|---|
| >(0008,1150)                   | Referenced SOP Class UID                               |     | X* | X |              |  | X |
| >(0008,1155)                   | Referenced SOP Instance UID                            |     | X* | X |              |  | X |
| (0040,1003)                    | Requested Procedure Priority                           |     |    |   |              |  |   |
| (0040,1004)                    | Patient Transport Arrangements                         |     |    |   |              |  |   |
| (0040,1400)                    | Requested Procedure Comments                           |     |    | X | PLD          |  |   |
| <b>Imaging Service Request</b> |  |     |    |   |              |  |   |
| (0008,0050)                    | Accession Number                                       | PBQ |    | X | PLD          |  | X |
| (0032,1032)                    | Requesting Physician                                   |     |    |   |              |  |   |
| (0008,0090)                    | Referring Physicians Name                              |     |    | X | PLD          |  | X |
| <b>Visit Identification</b>    |  |     |    |   |              |  |   |
| (0038,0010)                    | Admission ID   |     |    |   |              |  |   |
| <b>Visit Status</b>            |  |     |    |   |              |  |   |
| (0038,0300)                    | Current Patient Location                               |     |    |   |              |  |   |
| <b>Visit Relationship</b>      |  |     |    |   |              |  |   |
| (0008,1120)                    | Referenced Patient Sequence                            |     |    |   |              |  |   |
| >(0008,1150)                   | Referenced SOP Class UID                               |     |    |   |              |  |   |
| >(0008,1155)                   | Referenced SOP Instance UID                            |     |    |   |              |  |   |
| <b>Patient Identification</b>  |  |     |    |   |              |  |   |
| (0010,0010)                    | Patients Name <sup>1</sup>                             | PBQ | X  | X | PL, PLD, APP |  | X |
| (0010,0020)                    | Patients ID  | PBQ | X  | X | PL, PLD, APP |  | X |
| (0010,0021)                    | Issuer of Patient ID                                   |     |    | X | PLD          |  | X |
| (0010,1000)                    | Other Patient IDs                                      |     |    | X |              |  | X |
| <b>Patient Demographic</b>     |  |     |    |   |              |  |   |
| (0010,0030)                    | Patients Birth Date                                    |     |    | X | PL, PLD, APP |  | X |
| (0010,0040)                    | Patients Sex   |     |    | X | PL, PLD, APP |  | X |
| (0010,1030)                    | Patients Weight  |     |    |   |              |  |   |
| (0040,3001)                    | Confidentiality Constraint on Patient Data Description |     |    |   |              |  |   |
| (0010,2160)                    | Ethnic Group   |     |    | X |              |  | X |
| (0010,4000)                    | Patients Comments                                      |     |    | X |              |  | X |
| <b>Patient Medical</b>         |  |     |    |   |              |  |   |
| (0038,0500)                    | Patient State  |     |    |   |              |  |   |
| (0010,21C0)                    | Pregnancy Status                                       |     |    |   |              |  |   |
| (0010,2000)                    | Medical Alerts   |     |    |   |              |  |   |
| (0010,2110)                    | Allergies  |     |    |   |              |  |   |
| (0038,0050)                    | Special Needs  |     |    |   |              |  |   |

Note 1: If the multicomponent name representation is enabled then the name components with Priority 1 and Priority 2 are shown in the PL, the name components with Priority 1 is shown in the PLD and the name component what have been entered as query key will be always sent in the Alphabetic group of the C-Find-RQ (see section 4.4.2.1 for the setting of multicomponent group names).

Note 2: Only patient's first name and last name are displayed in the GUI, but the entire name including all five components of all three component groups are imported and copied into the storage SOP Instance.

Note 3: All attributes with grey background are by default excluded from the list of Modality Worklist C-FIND-RQ matching keys. If needed they can get activated by service personnel.

**Values of column "Query Key Matching":****PBQ**

A tag that is marked with PBQ is used as query key in the Patient Based Query mode of the interactive Modality Worklist Query Dialog.

**BRQ**

A tag that is marked with BRQ is used as query key in the Broad Query mode of the interactive Modality Worklist Query Dialog.

**DEF**

A tag that is marked with DEF has a value assigned when the interactive Modality Worklist Query Dialog is shown the first time or when the Reset button is pushed.

Default values can get modified. The modifications will be stored for next use of Modality Worklist Query Dialog.

**DEF\***

The default value of the associated attribute can be configured in the DICOM settings screen.

**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.

**Values of column "Mandatory Query Key Return":****X**

The tag shall be present in the Modality Worklist C-FIND response. If any required tag is missing the relevant Modality Worklist C-FIND response item (Scheduled Procedure Step) will be ignored and not imported by the application software.

**X\***

The tag shall be present in the Modality Worklist C-FIND response if its enclosing sequence is present. If any required tag is missing the relevant Modality Worklist C-FIND response item (Scheduled Procedure Step) will be ignored and not imported by the application software.

**X<sup>1</sup>**

Scheduled Station Application Entity Title (0040,0001) shall be present in the Modality Worklist C-FIND response. However, if not present in response, application software will use the configured local AE title instead.

**X<sup>2</sup>**

Modality (0008,0060) shall be present in the Modality Worklist C-FIND response. However, if not present in response, application software will use "OAM" instead.

**X<sup>3</sup>**

Either the Scheduled Procedure Step Description (0040,0007) or the Scheduled Protocol Code Sequence (0040,0008) or both shall be present in the Modality Worklist C-FIND response.

**X<sup>4</sup>**

Either the Requested Procedure Description (0032,1060) or the Requested Procedure Code Sequence (0032,1064) or both shall be present in the Modality Worklist C-FIND response.

**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":****PL**

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

**PLD**

Values of this tag are visible in the details dialog of the current selected pick list item.

**APP**

Values of this tag are visible in the application.

**Values of column "Modifiable":****X**

A value which has been imported to the application might be modified inside the application.

**Values of column SOP Instance:****X**

Values of marked tags will be stored in created SOP Instances. See section 8.1 "mapping of attributes" in 8.1.3 Attribute Mapping.

Following set of tags can be used as query key in the so called "**Patient Based Query**". The Patient Based Query is a working mode of the Modality Worklist Query Dialog.

**Table 4-13 Modality Worklist query key details - Patient Based Query**

| Tag         | Tag Name                   | Description  |
|-------------|----------------------------|--|
| (0010,0010) | Patients Name <sup>1</sup> | The IOLMaster 700 Application Software supports family name and given name only.<br>See Table 4-14 Modality Worklist query key – Patient's Name - Wildcard details |
| (0010,0020) | Patient ID                 | The operator can enter a string which conforms to the Value Representation LO.   |
| (0008,0050) | Accession Number           | The operator can enter a string which conforms to the Value Representation SH.   |
| (0040,1001) | Requested Procedure ID     | The operator can enter a string which conforms to the Value Representation SH.   |

Note 1: If the multicomponent group name representation is enabled the name component group which is defined as Priority 1 will contain the specified search string in the C-FIND-RQ data set.

**Table 4-14 Modality Worklist query key – Patient's Name - Wildcard details**

| Multicomponent Group Name Representation  |                          | Search on Patient's Name: Search string entered in GUI: "Quincy" | Query key - Value in attribute (0010,0010) Patient's Name |
|---|--------------------------|--|---|
| Disabled  |                          | Last Name  | Quincy*   |
|   |                          | First Name   | *^Quincy*   |
| Enabled<br>(see section 4.4.2.1 for the setting of multicomponent group names). | Priority 1 - Ideographic | Last Name  | *=Quincy*   |
|   |                          | First Name   | *=*^Quincy*   |
|   | Priority 1 - Phonetic    | Last Name  | *=*^Quincy*   |
|   |                          | First Name   | *=*^Quincy*   |
|   | Priority 1 - Alphabetic  | Last Name  | Quincy*   |
|   |                          | First Name   | *^Quincy*   |

Following set of tags can be used as query key in the so called "**Broad Query**". The Broad Query is a working mode of the Modality Worklist Query Dialog.

**Table 4-15 Modality Worklist query key details - Broad Query**

| Tag          | Tag Name                            | Description  |
|--------------|-------------------------------------|--|
| (0040,0100)  | Scheduled Procedure Step Sequence   | This attribute is the container for the tags as listed below. The sequence contains one item.  |
| >(0040,0002) | Scheduled Procedure Step Start Date | The default value is today's date.<br>The operator can change the value to tomorrow, week and can even enter date ranges.  |
| >(0008,0060) | Modality                            | The operator can change the value and select one value of a predefined set of values including an empty string. Possible values are "OAM", "OP", "OPM", "OPT", "OPV", "IOL". |

|              |                               |  |
|--------------|-------------------------------|--|
| >(0040,0001) | Scheduled Station<br>AE Title | The default value is set by configuration.<br>The operator can enter the AE Title of another device<br>or leave the field empty. |
|--------------|-------------------------------|--|

#### 4.2.1.3.3 Activity - Query remote AE for patients

Query is used to get patient information stored on a DICOM server.

##### 4.2.1.3.3.1 Description and Sequencing of Activities

There are two ways for the user to trigger a query request.

The "Quick search" in the main screen will search in "Patient Given Name", "Patient Last Name", "Patient ID", and "Patient Birth Date" in parallel.

The second way is the "Advanced" search. The user can select this search by clicking the "Advanced" button in the main screen.

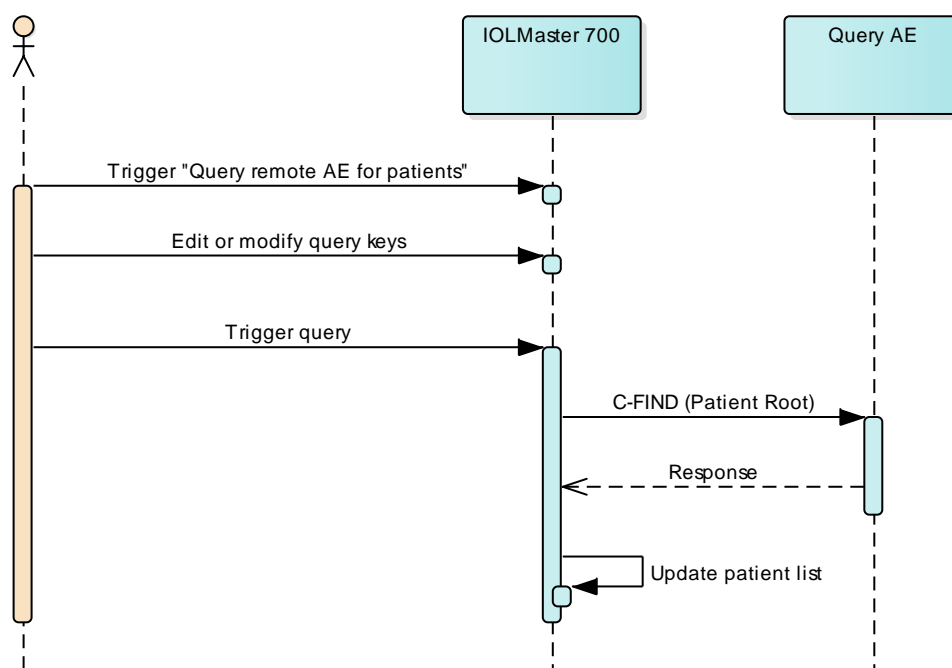


Figure 4-7 Query remote AE for patients

#### Trigger "Query remote AE for patients"

The activity "Query remote AE for patients" can be triggered by the operator by using the "Quick search" or change to the "Advanced" screen.

#### Edit or modify query keys

The "Advanced" screen offers a GUI for interactive query. The operator can change or fill in search criteria in the shown search fields.

The top-most search field in the main screen is the "Quick search" field. Any value entered herein is applied to

- (0010,0010) Patient's Name – Family Name
- (0010,0010) Patient's Name – Given Name
- (0010,0020) Patient ID
- (0010,0030) Patient's Birth Date

and issued as four separate requests. The entered value has automatically a trailing wildcard to fulfill the 'contains' condition.

For more details on supported query keys see Table 4-24 Query key details.

### Trigger query

The operator triggers the search after he or she filled in search criteria by either pressing the "Enter" key or click on the "Search" button. The Application Software sends a Patient Root based DICOM C-FIND request which contains the entered search criteria. The Application Software waits for the response from the Query AE and checks whether the number of received items overstepped a configurable limit. In such case the application sends a C-CANCEL-RQ, then an A-RELEASE-RQ to the Query AE. A message about truncated search results is displayed to the operator and a request to apply more specific query keys. Despite this warning, the operator gets results in the pick-list.

After receiving the response, the patient pick-list is updated. The patient pick-list provides the most important information for a quick overview.

The operator can start over, redefine query keys and trigger the query again. This can be performed as often as required, until he or she finds the correct patient entry.

**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.

In case of patient identification conflicts between locally existing patients and entries from the query response list the application will always create a new patient beside the already existing one. The previously acquired data remains assigned to the old patient. New measurements can be performed for both patients the old and the new one.

#### 4.2.1.3.3.2 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 4-16 Proposed Presentation Contexts Query remote AE for patients and data**

| Presentation Context Table                             |                           |                 |                                |      |           |
|--|---------------------------|-----------------|--------------------------------|------|-----------|
| Abstract Syntax  |                           | Transfer Syntax |                                | Role | Ext. Neg. |
| Name   | UID<br>1.2.840.10008. ... | Name List       | UID List<br>1.2.840.10008. ... |      |           |
| Verification   | 1.1                       | ILE             | 1.2                            | BOTH | None      |
| Storage Commitment Push Model                          | 1.20.1                    | ILE             | 1.2                            | SCU  | None      |
| Multi-frame True Color Secondary Capture Image Storage | 5.1.4.1.1.7.4             | JPG-1           | 1.2.4.50                       | SCU  | None      |
| Ophthalmic Photography 8 Bit Image Storage             | 5.1.4.1.1.77.1.5.1        | JPG-1           | 1.2.4.50                       | SCU  | None      |
| Keratometry Measurements Storage                       | 5.1.4.1.1.78.3            | ILE             | 1.2                            | SCU  | None      |
|  |                           | ELE             | 1.2.1                          | SCU  | None      |
| Ophthalmic Axial Measurements Storage                  | 5.1.4.1.1.78.7            | ILE             | 1.2                            | SCU  | None      |
|  |                           | ELE             | 1.2.1                          | SCU  | None      |
| Intraocular Lens Calculations Storage                  | 5.1.4.1.1.78.8            | ILE             | 1.2                            | SCU  | None      |
|  |                           | ELE             | 1.2.1                          | 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 – FIND   | 5.1.4.1.2.2.1 | ILE | 1.2 | SCU | Yes <sup>1)</sup> |
| Modality Worklist IM – FIND           | 5.1.4.31      | ILE | 1.2 | SCU | None              |

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

**Table 4-17 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           |
| Study Root Query/Retrieve IM - FIND   | 1.2.840.10008.5.1.4.1.2.2.1 | See Note 1, 2        |

Note 1: Extended negotiation for relational-queries is offered. Relational-query support by the SCP is required for successful Patient Root Query issued by the IOLMaster 700.

Note 2: Study Root Query/Retrieve Information Model – FIND is negotiated but not used by IOLMaster 700.

#### 4.2.1.3.3.3 SOP Specific Conformance for Patient Root and Study Root Query/Retrieve SOP Class as SCU

**Table 4-18 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       | None   |
| 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 /                      | 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  |

|         |   |      |  |
|---------|---|------|--|
|         | or matching for this Identifier.              |      | the service provider and a message is displayed. |
| Unknown | All other responses with unknown code meaning | xxxx | Log message and display user alert               |

**Table 4-19 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 4-20 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> | 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        | RNG                |                  | X        | X         | X                        |
| (0010,0032) | Patient's Birth Time        |                    |                  | X        |           |                          |
| (0010,0040) | Patient's Sex               |                    |                  | X        | X         | X                        |
| (0010,1000) | Other Patient IDs           |                    |                  | X        |           | X                        |
| (0010,2160) | Ethnic Group                |                    |                  | X        |           | X                        |
| (0010,4000) | Patient Comments            |                    |                  | X        |           | X                        |

Note 1: If the multicomponent group name representation is enabled the name component group configured with Priority 1 is shown in the pick list and in the patient's details. The search string entered in patient's last name or first name is sent in the component group of the attribute (0010,0010) Patient's Name which corresponds to the representation configured as Priority 1 (see section 4.4.2.1 for the setting of multicomponent group names).

**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                | X |  |  |  |  |
| (0008,0061) | Modalities in Study             |   |  |  |  |  |
| (0008,0090) | Referring Physician's Name      | X |  |  |  |  |
| (0008,0090) | Study Description               |   |  |  |  |  |
| (0008,1080) | Admitting Diagnoses 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                            | SEL                 |                   |          |           |                          |
| (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                       |                     |                   |          |           |                          |
| (0020,0060) | Laterality                          |                     |                   |          |           |                          |
| (0040,0244) | Performed Procedure Step Start Date |                     |                   |          |           |                          |
| (0040,0245) | Performed Procedure Step Start Time |                     |                   |          |           |                          |
| (0040,0275) | Request Attributes Sequence         |                     |                   |          |           |                          |

**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 |
|-------------|------------------------------|---------------------|-------------------|----------|-----------|--------------------------|
| (0008,0008) | Image Type                   |                     |                   |          |           |                          |
| (0008,0012) | Instance Creation Date       |                     |                   |          |           |                          |
| (0008,0013) | Instance Creation Time       |                     |                   |          |           |                          |
| (0008,0016) | SOP Class UID                |                     |                   |          |           |                          |
| (0008,0018) | SOP Instance UID             |                     |                   |          |           |                          |
| (0008,002A) | Acquisition DateTime         | RNG                 |                   |          |           |                          |
| (0008,114A) | Referenced Instance Sequence |                     |                   |          |           |                          |



|              |                             |  |  |  |  |  |
|--------------|-----------------------------|--|--|--|--|--|
| >(0008,1150) | Referenced SOP Class UID    |  |  |  |  |  |
| >(0008,1155) | Referenced SOP Instance UID |  |  |  |  |  |
| (0020,0013)  | Instance Number             |  |  |  |  |  |
| (0020,0062)  | Image Laterality            |  |  |  |  |  |

**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.

**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 default value is empty string.<br>Only family name and given name can be used as query keys.<br>See Table 4-25 Query key – Patient's Name - Wildcard details.<br>This is a DICOM Standard query key on Patient level. |
| (0010,0020) | Patient ID                  | The default value is empty string.<br>The operator can enter each value that conforms to the Value Representation LO.<br>This is a DICOM Standard query key on Patient level.   |
| (0010,0030) | Patient's Birth Date        | The default value is empty date.<br>The operator can enter a specific value that conforms to the Value Representation DA. The operator can also select from a range of dates.   |

|             |   |   |
|-------------|---|---|
|             |   | 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.   |
| (0008,0050) | Accession Number                        | The default value is empty string.<br>The operator can enter each value that conforms to the Value Representation SH.<br>This is a DICOM Standard query key on Study level.   |
| (0008,0090) | Referring Physician's Name <sup>2</sup> | The default value is empty string.<br>Only family name can be used as query key.<br>This is a DICOM Optional query key on Study level, thus the effect of this query key on the query depends on Service Provider implementation.                                       |
| (0008,0060) | Modality                                | The default value is empty string.<br>The operator can select from a list of pre-defined values and the application software will convert the selection to a value that conforms to the Value Representation CS.<br>This is a DICOM Standard query key on Series level. |

Note 1: If the multicomponent name representation is enabled than the name component what have been entered as query key (Alphabetic, Ideographic or Phonetic) will be always sent in the Alphabetic group of the C-Find-RQ (see section 4.4.2.1 for the setting of multicomponent group names).

Note 2: Only Alphabetic part of the multicomponent group name is used as query key

**Table 4-25 Query key – Patient's Name - Wildcard details**

| Multicomponent Group Name Representation                                     |                          | Search on Patient's Name – Search string entered in GUI: "Quincy" | Query key – Value in attribute (0010,0010) Patient's Name |
|--|--------------------------|---|---|
| Disabled   |                          | Last Name   | Quincy*   |
|  |                          | First Name  | **Quincy*   |
| Enabled (see section 4.4.2.1 for the setting of multicomponent group names). | Priority 1 - Ideographic | Last Name   | *=Quincy*   |
|  |                          | First Name  | *=**Quincy*   |
|  | Priority 1 - Phonetic    | Last Name   | *=*=Quincy*   |
|  |                          | First Name  | *=*=*Quincy*  |
|  | Priority 1 - Alphabetic  | Last Name   | Quincy*   |
|  |                          | First Name  | **Quincy*   |

#### 4.2.1.3.4 Activity - Acquire/Calculate data

Operator can invoke "Acquire/Calculate data" at any time if no other activity is in progress.

This activity has no direct relation to DICOM messaging.

The "Acquire/Calculate data" activity is always started by either selecting one item from the result lists of "Query Modality Worklist" or "Query remote AE for patients" or by entering new patient information in the "Patient details" screen.

During this activity, the Application Software creates Biometry measurement data, reference images, and/or IOL calculation results. Data created by this activity might become subject of the activity "Store data to remote AE".

#### 4.2.1.3.5 Activity - Create report

Operator can invoke the creation of a report based on measured and calculated data. This report can be printed out directly.

Furthermore, reports are created on-the-fly and without any manual intervention whenever measurement data and/or IOL calculation results are about to be archived during activity "Store data to remote AE". This is necessary since this data is always archived along with an electronic report.

#### 4.2.1.3.6 Activity - Store data to remote AE

This activity can be invoked manually by the operator by

- selecting an existing measurement from the measurements list and pressing "Export"
- finishing the "Patient > Measurement > Analysis > IOL Calculation" workflow with pressing "Save & Export"

In case of measurement data and/or calculation results the "Store data to remote AE" activity automatically creates an electronic report in the background (see 4.2.1.3.5 Activity - Create report).

This activity will pause for benefit of high priority activities (e.g. "Acquire/Calculate data") and resume after such activities has been finished.

Depending on quality of measured data and user export configuration during the "Store data to remote AE" activity the following instances are transferred to the configured Storage Provider:

- 1 Encapsulated Pdf SOP instances containing acquired data, calculation results and evidence reports
- 0..2 Ophthalmic Photography 8 Bit Image SOP instances containing reference images
- 0..1 Ophthalmic Axial Measurements SOP instances containing acquired axial length data
- 0..2 Multi-frame True Color Secondary Capture Image SOP instances containing axial quality control images
- 0..1 Keratometry Measurements SOP containing acquired keratometric data
- 0..2 Multi-frame True Color Secondary Capture Image SOP instances containing corneal quality control images
- 0..2 Ophthalmic Photography 8 Bit Image SOP instances containing white-to-white images
- 0..1 Intraocular Lens Calculations SOP instance containing IOL calculation results

After a configurable amount of time, the 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.

#### 4.2.1.3.6.1 Description and Sequencing of Activities

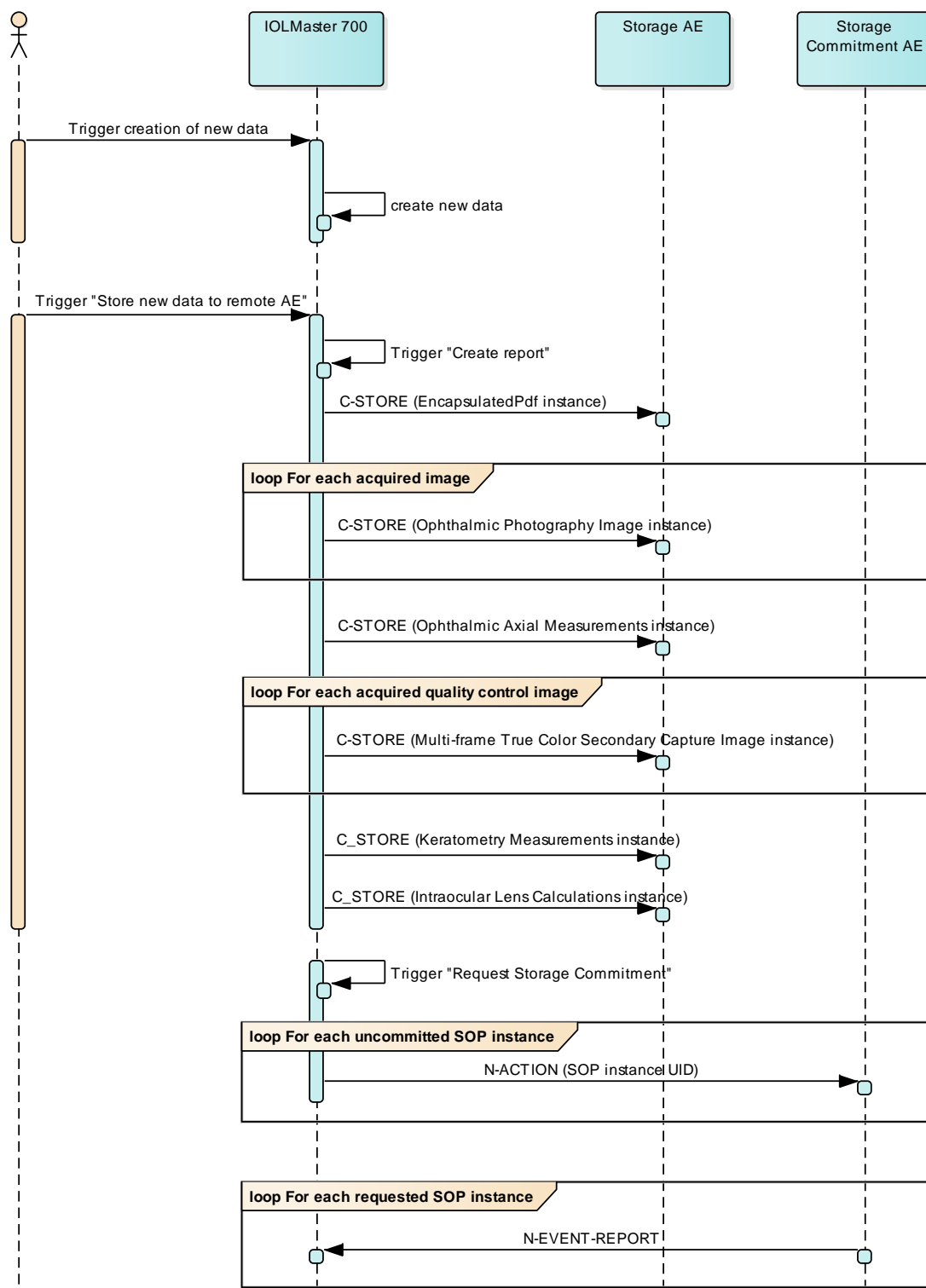


Figure 4-8 Store data to remote AE

#### Trigger "Store new data to remote AE"

This activity can be invoked manually by the operator by

- selecting an existing measurement from the measurements list and pressing "Export"

- finishing the "Patient > Measurement > Analysis > IOL Calculation" workflow with pressing "Save & Export"

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

For measurement data and/or calculation results the activity automatically creates an electronic report in the background (see 4.2.1.3.5 Activity – Create report).

#### 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.

Data that has been successfully archived (stored and successfully committed) might be subject to be deleted at shutdown after a configurable caching time.

#### 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

- Multi-frame True Color Secondary Capture Image Storage with Transfer Syntax JPG-1 as SCU
- OP 8Bit Image Storage with Transfer Syntax JPG-1 as SCU
- Keratometry Measurements Storage with Transfer Syntax ELE (Transfer Syntax ILE as fallback) as SCU
- Ophthalmic Axial Measurements Storage with Transfer Syntax ELE (Transfer Syntax ILE as fallback) as SCU
- Intraocular Lens Calculations Storage with Transfer Syntax ELE (Transfer Syntax ILE as fallback) as SCU
- Encapsulated PDF Storage with Transfer Syntax ELE (Transfer Syntax ILE as fallback) as SCU
- Storage Commitment Push Model with Transfer Syntax ILE as SCU

**Table 4-26 Proposed Presentation Contexts for Activity Archive data**

| Presentation Context Table                             |                           |                 |                                |      |                   |
|--|---------------------------|-----------------|--------------------------------|------|-------------------|
| Abstract Syntax  |                           | Transfer Syntax |                                | Role | Ext. Neg.         |
| Name   | UID<br>1.2.840.10008. ... | Name List       | UID List<br>1.2.840.10008. ... |      |                   |
| Verification   | 1.1                       | ILE             | 1.2                            | BOTH | None              |
| Storage Commitment Push Model                          | 1.20.1                    | ILE             | 1.2                            | SCU  | None              |
| Multi-frame True Color Secondary Capture Image Storage | 5.1.4.1.1.7.4             | JPG-1           | 1.2.4.50                       | SCU  | None              |
| Ophthalmic Photography 8 Bit Image Storage             | 5.1.4.1.1.77.1.5.1        | JPG-1           | 1.2.4.50                       | SCU  | None              |
| Keratometry Measurements Storage                       | 5.1.4.1.1.78.3            | ILE             | 1.2                            | SCU  | None              |
|  |                           | ELE             | 1.2.1                          | SCU  | None              |
| Ophthalmic Axial Measurements Storage                  | 5.1.4.1.1.78.7            | ILE             | 1.2                            | SCU  | None              |
|  |                           | ELE             | 1.2.1                          | SCU  | None              |
| Intraocular Lens Calculations Storage                  | 5.1.4.1.1.78.8            | ILE             | 1.2                            | SCU  | None              |
|  |                           | ELE             | 1.2.1                          | 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 – FIND | 5.1.4.1.2.2.1 | ILE | 1.2 | SCU | Yes <sup>1)</sup> |
| Modality Worklist IM – FIND         | 5.1.4.31      | ILE | 1.2 | SCU | None              |

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

**Table 4-27 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           |
| Study Root Query/Retrieve IM - FIND   | 1.2.840.10008.5.1.4.1.2.2.1 | See Note 1, 2        |

Note 1: Extended negotiation for relational-queries is offered. Relational-query support by the SCP is required for successful Patient Root Query issued by the IOLMaster 700.

Note 2: Study Root Query/Retrieve Information Model – FIND is negotiated but not used by IOLMaster 700.

#### 4.2.1.3.6.3 SOP Specific Conformance for Storage SOP Classes

**Table 4-28 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.                         |

#### 4.2.1.3.6.4 SOP Specific Conformance for Storage Commitment SOP Class

##### 4.2.1.3.6.4.1 Storage Commitment Operations (N-ACTION)

The Application Software will request storage commitment for instances of the Ophthalmic Photography 8 Bit Image Storage and Encapsulated PDF Storage IOD 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 4-29 Storage Commitment N-ACTION Response Status Handling Behavior**

| Service Status | Further Meaning                                | Status Code | Behavior   |
|----------------|--|-------------|--|
| Failure        | Class-instance conflict                        | 0119        | Log message and display user alert.                                |
| Failure        | Duplicate invocation                           | 0210        | Log message.   |
| Failure        | Invalid argument value                         | 0115        | Log message and display user alert.                                |
| Failure        | Invalid SOP Instance                           | 0117        | Log message and display user alert.                                |
| Failure        | Mistyped argument                              | 0212        | Log message and display user alert.                                |
| Failure        | No such action                                 | 0123        | Log message and display user alert.                                |
| Failure        | No such argument                               | 0114        | Log message and display user alert.                                |
| Failure        | No such SOP class                              | 0118        | Log message and display user alert.                                |
| Failure        | No such SOP Instance                           | 0112        | Log message.   |
| Failure        | Processing failure                             | 0110        | Log message and display user alert.                                |
| Failure        | Resource limitation                            | 0213        | Log message.   |
| Failure        | Unrecognized operation                         | 0211        | Log message and display user alert.                                |
| Success        | Success  | 0000        | The Application Software will wait for an incoming N-EVENT-REPORT. |
| Unknown        | All other responses with unknown code meaning. | xxxx        | Log message and display user alert.                                |

**Table 4-30 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.  |

#### 4.2.1.3.6.4.2 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.

#### 4.2.1.3.7 Activity - Delete data

This activity removes selected data from the AE. It must be triggered manually by the operator by selecting an item from either the "Today", "Search results" or "Measured Exams" list of the "Patient" screen.

Scope of selection and deletion can be:

- a single patient (all data belonging to this patient and all associated measurements will be removed)
- a series of measurements of a patient of one day (all measurements of the patient of this day will be removed)
- a single measurement (all data belonging to this single measurement will be removed)

Deletion of data does not depend on the archive status of the selected data. Thus, the operator must ensure in advance that data has been successfully archived before invoking this activity.

Deletion of data does not remove any data from the configured Storage AE but only from the local data storage.

This activity can only be invoked manually by the operator, the AE does not support any automatic deletion of data.

#### 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 4-31 Presentation Context accepted for Activity Verify Communication**

| 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      |

##### 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 - Store data to remote AE

This chapter describes the aspect of association acceptance of the activity "Store data to remote AE".

The activity stores biometry measurement data, IOL calculation results, evidence reports, reference images and quality control images as described in chapter "4.2.1.3.6 Activity - Store data to remote AE".

After a configurable amount of time, the 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.

##### 4.2.1.4.2.1 Description and Sequencing of Activities

The description and sequencing of activities is covered by chapter "4.2.1.3.6 Activity - Store data to remote AE".



#### 4.2.1.4.2.2 Accepted Presentation Contexts

**Table 4-32 Presentation Contexts accepted for Activity Archive data**

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

#### 4.2.1.4.2.3 SOP Specific Conformance for Storage SOP Class as SCP

The Application Software AE provides standard conformance.

#### 4.2.1.4.2.4 SOP Specific Conformance for Storage Commitment SOP Class

##### 4.2.1.4.2.4.1 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 4-33 Storage Commitment N-EVENT-REPORT Request Failure Reasons**

| Service Status | Further Meaning                    | Status Code | Behavior   |
|----------------|------------------------------------|-------------|--|
| Failure        | Processing Failure                 | 0110        | The SOP Instance is also considered as not being committed. For a configurable amount of re-trials the SOP Instance is subject of a future Storage Commitment service request. It will be included again within next call of these activities.<br><br>In addition, the application software writes the SOP Instance UID to the log file with the failure reason. |
| Failure        | No such object instance            | 0112        | The SOP Instance is also considered as neither being archived nor being committed. The application will re-archive the original instance (for OP IOD) or a new instance based on the same measurement (for ePdf IOD).<br><br>In addition, the application software writes the SOP Instance UID to the log file with the failure reason.                          |
| Failure        | Resource limitation                | 0213        | The SOP Instance is also considered as not being committed. For a configurable amount of re-trials the SOP Instance is subject of a future Storage Commitment service request. It will be included again within next call of these activities.<br><br>In addition, the application software writes the SOP Instance UID to the log file with the failure reason. |
| Failure        | Referenced SOP Class not supported | 0122        | The application software writes the SOP Instance UID to the log file with the failure reason.  |

|         |   |      |  |
|---------|---|------|--|
| Failure | Class / Instance conflict                     | 0119 | The SOP Instance is also considered as not being committed. For a configurable amount of re-trials the SOP Instance is subject of a future Storage Commitment service request. It will be included again within next call of these activities.<br><br>In addition, the application software writes the SOP Instance UID to the log file with the failure reason. |
| Failure | Duplicate transaction UID                     | 0131 | The SOP Instance is also considered as not being committed. For a configurable amount of re-trials the SOP Instance is subject of a future Storage Commitment service request. It will be included again within next call of these activities.<br><br>In addition, the application software writes the SOP Instance UID to the log file with the failure reason. |
| Unknown | All other responses with unknown code meaning | xxxx | Log message and retry storage commit for failed sop instance(s).   |

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 instrument application. The instrument application 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 Networking section of the software application's "Settings" dialog. This dialog does also allow other networking and DICOM related settings like networking timeouts, worklist and patient query item limit parameters.

For institution related settings like Institution Name or Station Name an administrator can use the "General" 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 IOLMaster 700 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 IOLMaster 700 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 IOLMaster 700 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 4-34 Configuration Parameters Table**

| Parameter  | Configurable<br>(Yes/No)        | Default Value                           |
|--|---------------------------------|---|
| <b>General Parameters</b>  |                                 |   |
| DIMSE RSP Timeout  | Yes<br>(10 – 60 sec.)           | 20 sec                                  |
| Network Timeout  | Yes<br>(5-20 sec.)              | 20 sec.                                 |
| Max. Association Idle Time   | Yes<br>(10 – 60 sec.)           | 30 sec                                  |
| Network log level  | Yes                             | Warning                                 |
| Storage Commitment for failed instances  | No <sup>1)</sup>                | Re-archive                              |
| (0008,0080) Institution Name   | Yes                             | EMPTY                                   |
| (0008,1040) Institutional Department Name  | Yes                             | EMPTY                                   |
| (0008,0081) Institution Address  | Yes                             | EMPTY                                   |
| (0008,1010) Station Name   | Yes                             | EMPTY                                   |
| (0010,0021) Issuer of Patient ID   | Yes                             | IOLMaster-700 + Device<br>Serial Number |
| Use multicomponent group name representation   | Yes                             | Disabled                                |
| DICOM Export   | Yes<br>(Disabled, File, Server) | Disabled                                |
| <b>AE Specific Parameters</b>  |                                 |   |
| Number of simultaneous Associations by Service<br>and/or SOP Class?                          | No                              | 50                                      |
| <b>Verification SCU Parameters</b>   |                                 |   |
| No specific configuration required.  |                                 |   |
| <b>Modality Worklist SCU Parameters</b>  |                                 |   |
| Maximum Query Responses (Modality Worklist IM,<br>Patient Root Q/R IM and Study Root Q/R IM) | Yes<br>(10-999)                 | 200                                     |
| Automatic MWL update   | Yes                             | Enabled                                 |
| Today's Patient List Refresh Rate (Modality<br>Worklist Polling Interval)                    | Yes                             | 5 min                                   |

|   |  |  |
|---|--|--|
|   | (Min. – Max.)  |  |
| Scheduled Station AE Title (Today's Patient Query)  | Yes<br>Possible values:<br>- Use local AE Title<br>- Empty value<br>- User configurable value  | Same as Local AE Title (IOLMASTER)                   |
| Modality (Today's Patient Query)  | Yes<br>Possible Values:<br>- "All" (Empty)<br>- Value from pre-defined list (Table 4-15 Modality Worklist query key details - Broad Query) | EMPTY  |
| Scheduled Procedure Step Start Date (Today's Patient Query)   | Yes<br>Possible Values:<br>- Today<br>- Tomorrow<br>- Week (Today – Today + 7 days)<br>- All dates   | Today  |
| Specific Character Set <sup>2</sup>   | Yes<br>(by service personnel only)   | None (IOLMaster 700 Application Software uses UTF-8) |
| <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<br>(10-999)  | 200  |
| Extended Negotiation – relational query support negotiation<br>(Patient Root Q/R IM and Study Root Q/R IM)                                    | Yes  | Enabled  |
| Specific Character Set <sup>2</sup>   | Yes<br>(by service personnel only)   | None (IOLMaster 700 Application Software uses UTF-8) |
| <b>Storage Commitment SCU Parameters</b>  |  |  |
| Storage Commitment enable/disable   | Yes  | Enabled  |
| Storage Commitment Interval   | Yes  | 15 min   |
| Re-archive or Delete instances after N-EVENT-REPORT with Failure Reason "0112H"   | No <sup>1</sup>  | Re-Archive   |
| <b>Storage SCU Parameters</b>   |  |  |
| The configuration of port number and Application Entity Title are part of the Remote Application Entity setup (see 4.4.1.2 Remote AE Titles). |  |  |
| Specific Character Set <sup>2</sup>   | Yes<br>(by service personnel only)   | None (IOLMaster 700 Application Software uses UTF-8) |
| Export biometry measurement data.<br>Create following SOP instances during export:<br>• Ophthalmic Axial Measurements Storage                 | Yes  | Disabled   |

|  |   |                             |
|--|---|-----------------------------|
| <ul style="list-style-type: none"> <li>Multi-frame True Color Secondary Capture Image Storage containing axial quality control images</li> </ul>   |   |                             |
| Export keratometry measurement data.<br>Create following SOP instances during export: <ul style="list-style-type: none"> <li>Keratometry Measurements Storage</li> <li>Multi-frame True Color Secondary Capture Image Storage containing corneal quality control images</li> </ul> | Yes   | Disabled                    |
| Export sclera reference images.<br>Create following SOP instances during export: <ul style="list-style-type: none"> <li>Ophthalmic Photography 8 Bit Image Storage (Image type: SCLERA)</li> </ul>   | Yes   | Enabled                     |
| Export white-to-white images.<br>Create following SOP instances during export: <ul style="list-style-type: none"> <li>Ophthalmic Photography 8 Bit Image Storage (Image type: WHITE_TO_WHITE)</li> </ul>   | Yes   | Enabled                     |
| Export IOL calculation results.<br>Create following SOP instances during export: <ul style="list-style-type: none"> <li>Intraocular Lens Calculations Storage</li> </ul>   | Yes   | Disabled                    |
| Content of export IOL calculation results.   | Yes<br>(Selected result current eye   Selected results for both eyes   All calculated results for current eye   All calculated results for both eyes) | Selected result current eye |
| <b>Verification SCP Parameters</b>   |   |                             |
| No specific configuration required<br>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: This setting is not supported by the application software. Although there is a UI configurable parameter it'll always default to "Re-Archive instance".

Note 2: DICOM Specific Character Set (Configuration settings available for Service user only)

**Table 4-35 Specific Character Set**

| Parameter   |                      | Default Value |
|---|----------------------|---------------|
| Available DICOM character set for Modality Worklist, Query, Retrieve, Storage |                      |               |
| Defined Term  | Description          |               |
| None <sup>3</sup>   |                      | None          |
| ISO_IR 100  | Latin alphabet No. 1 |               |
| ISO_IR 101  | Latin alphabet No. 2 |               |
| ISO_IR 109  | Latin alphabet No. 3 |               |
| ISO_IR 110  | Latin alphabet No. 4 |               |
| ISO_IR 148  | Latin alphabet No. 5 |               |
| ISO_IR 144  | Cyrillic             |               |
| ISO_IR 127  | Arabic               |               |
| ISO_IR 126  | Greek                |               |
| ISO_IR 138  | Hebrew               |               |

|            |                  |  |
|------------|------------------|--|
| ISO_IR 13  | Japanese         |  |
| ISO_IR 166 | Thai             |  |
| GB18030    | Chinese          |  |
| ISO_IR 192 | Unicode in UTF-8 |  |

Note 3: Per default the IOLMaster 700 Application Software uses ISO\_IR 192 (UTF-8), (Setting is "None"). Modification to the default settings is only recommended in case of integration issues which result in incorrect interpretation of transmitted characters. See chapter 6 Support of Character Sets for more information.

## 5 Media Interchange

Media Interchange is not scope of this document since Media Interchange is not supported by IOLMaster 700 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. IOLMaster 700 Application Software does not support Code Extension techniques via configuration, so ISO 2022 standard cannot be used.

**Table 6-1 Supported Character Set**

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

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

Configuration of Specific Character Sets can only be performed by a Service User (Table 4-34 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 IOLMaster 700 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 DICOM capabilities of the IOLMaster 700 Application Software do not support any specific security measures.

It is assumed that IOLMaster 700 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 IOLMaster 700 Application Software
- Firewall or router protections to ensure that IOLMaster 700 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.

## 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

###### MWL, MPPS, etc.

The attribute value is the same as the value received using a DICOM service such as Modality Worklist, Modality Performed Procedure Step, etc.

###### CONFIG

The attribute value source is a configurable parameter

###### ACQUISITION

The attribute value is generated from a data acquisition/measurement process

###### ANALYSIS

The attribute value is generated from a post-acquisition data analysis/calculation

###### PRQ

The attribute value is same as the value received using a DICOM service such as Patient Root Query.

##### 8.1.1.1 Encapsulated PDF Information Object Definition

| IE                    | Module                                  | Reference  | Presence of Module                                      |
|-----------------------|---|------------|---|
| Patient               | Patient                                 | Table 8-1  | ALWAYS  |
| Study                 | General Study                           | Table 8-2  | ALWAYS  |
| Series                | Encapsulated Document Series            | Table 8-7  | ALWAYS  |
| Equipment             | General Equipment                       | Table 8-4  | ALWAYS  |
|                       | SC Equipment                            | Table 8-8  | ALWAYS  |
| Encapsulated Document | Encapsulated Document                   | Table 8-9  | ALWAYS  |
|                       | SOP Common                              | Table 8-10 | ALWAYS  |
|                       | CZM Encapsulated Pdf Instance Extension | Table 8-11 | Only if Reference Image acquisition has been performed. |
|                       | CZM IOL Measured Values                 | Table 8-12 | ALWAYS  |

|  |                  |            |   |
|--|------------------|------------|---|
|  | CZM IOL Haigis-T | Table 8-13 | Only if Toric IOL calculation has been performed. |
|--|------------------|------------|---|

#### 8.1.1.2 Ophthalmic Photography 8 Bit Information Object Definition

| IE                 | Module  | Reference  | Presence of Module |
|--------------------|---|------------|--------------------|
| Patient            | Patient                                       | Table 8-1  | ALWAYS             |
| Study              | General Study                                 | Table 8-2  | ALWAYS             |
| Series             | General Series                                | Table 8-3  | ALWAYS             |
|                    | Ophthalmic Photography Series                 | Table 8-14 | ALWAYS             |
| Frame Of Reference | Synchronization                               | Table 8-15 | ALWAYS             |
| Equipment          | General Equipment                             | Table 8-4  | ALWAYS             |
| Image              | General Image                                 | Table 8-16 | ALWAYS             |
|                    | Image Pixel                                   | Table 8-17 | ALWAYS             |
|                    | Cine  | Table 8-18 | ALWAYS             |
|                    | Multi-frame                                   | Table 8-19 | ALWAYS             |
|                    | Acquisition Context                           | Table 8-20 | ALWAYS             |
|                    | Ophthalmic Photography Image                  | Table 8-21 | ALWAYS             |
|                    | Ocular Region Imaged                          | Table 8-22 | ALWAYS             |
|                    | Ophthalmic Photography Acquisition Parameters | Table 8-23 | ALWAYS             |
|                    | Ophthalmic Photographic Parameters            | Table 8-24 | ALWAYS             |
|                    | SOP Common                                    | Table 8-25 | ALWAYS             |

#### 8.1.1.3 Multi Frame True Color Sc Image Information Object Definition

| IE        | Module                | Reference  | Presence of Module |
|-----------|-----------------------|------------|--------------------|
| Patient   | Patient               | Table 8-1  | ALWAYS             |
| Study     | General Study         | Table 8-2  | ALWAYS             |
| Series    | General Series        | Table 8-3  | ALWAYS             |
| Equipment | General Equipment     | Table 8-4  | ALWAYS             |
|           | Sc Equipment          | Table 8-26 | ALWAYS             |
| Image     | General Image         | Table 8-27 | ALWAYS             |
|           | Image Pixel           | Table 8-28 | ALWAYS             |
|           | Multi-frame           | Table 8-29 | ALWAYS             |
|           | Frame Pointers        | Table 8-30 | ALWAYS             |
|           | Sc Multi Frame Image  | Table 8-31 | ALWAYS             |
|           | Sc Multi Frame Vector | Table 8-32 | ALWAYS             |

|  |   |            |        |
|--|---|------------|--------|
|  | Sop Common                                    | Table 8-33 | ALWAYS |
|  | Czm Multi Frame True Color Sc Image Extension | Table 8-34 | ALWAYS |

#### 8.1.1.4 Ophthalmic Axial Measurements Information Object Definition

| IE           | Module                                     | Reference  | Presence of Module   |
|--------------|--|------------|--|
| Patient      | Patient                                    | Table 8-1  | ALWAYS   |
| Study        | General Study                              | Table 8-2  | ALWAYS   |
| Series       | General Series                             | Table 8-3  | ALWAYS   |
|              | Ophthalmic Axial Measurements Series       | Table 8-35 | ALWAYS   |
| Equipment    | General Equipment                          | Table 8-4  | ALWAYS   |
|              | Enhanced General Equipment                 | Table 8-5  | ALWAYS   |
| Measurements | Ophthalmic Axial Measurements              | Table 8-35 | ALWAYS   |
|              | General Ophthalmic Refractive Measurements | Table 8-6  | ALWAYS   |
|              | SOP Common                                 | Table 8-37 | ALWAYS   |
|              | CZM IOLM Clinical Patient Information      | Table 8-38 | Only if ophthalmic clinical patient information were acquired. |

#### 8.1.1.5 Keratometry Measurements Information Object Definition

| IE           | Module   | Reference  | Presence of Module   |
|--------------|--|------------|--|
| Patient      | Patient  | Table 8-1  | ALWAYS   |
| Study        | General Study                                  | Table 8-2  | ALWAYS   |
| Series       | General Series                                 | Table 8-3  | ALWAYS   |
|              | Keratometry Measurements Series                | Table 8-39 | ALWAYS   |
| Equipment    | General Equipment                              | Table 8-4  | ALWAYS   |
|              | Enhanced General Equipment                     | Table 8-5  | ALWAYS   |
| Measurements | General Ophthalmic Refractive Measurements     | Table 8-6  | ALWAYS   |
|              | Keratometry Measurements                       | Table 8-40 | ALWAYS   |
|              | Sop Common                                     | Table 8-41 | ALWAYS   |
|              | CZM IOLM Keratometry Quality                   | Table 8-42 | Only if keratometry quality was acquired.  |
|              | CZM IOLM Posterior Cornea Surface Measurements | Table 8-43 | Only if posterior cornea surface measurements were acquired.<br><i>Note: These values require are a separate software license, which might not yet be available in your country due to regulatory reasons.</i> |

|  |   |            |   |
|--|---|------------|---|
|  | CZM IOLM True Keratometric Power Measurements | Table 8-44 | Only if true keratometric power measurements were acquired.<br><i>Note: These values require are a separate software license, which might not yet be available in your country due to regulatory reasons.</i> |
|  | CZM IOLM Clinical Patient Information         | Table 8-45 | Only if ophthalmic clinical patient information were acquired.  |

#### 8.1.1.6 Intraocular Lens Calculations Information Object Definition

| IE           | Module                                     | Reference  | Presence of Module |
|--------------|--|------------|--------------------|
| Patient      | Patient                                    | Table 8-1  | ALWAYS             |
| Study        | General Study                              | Table 8-2  | ALWAYS             |
| Series       | General Series                             | Table 8-3  | ALWAYS             |
|              | Intraocular Lens Calculations Series       | Table 8-46 | ALWAYS             |
| Equipment    | General Equipment                          | Table 8-4  | ALWAYS             |
|              | Enhanced General Equipment                 | Table 8-5  | ALWAYS             |
| Measurements | Intraocular Lens Calculations              | Table 8-47 | ALWAYS             |
|              | General Ophthalmic Refractive Measurements | Table 8-6  | ALWAYS             |
|              | Sop Common                                 | Table 8-48 | ALWAYS             |

### 8.1.1.7 Common Modules

**Table 8-1 Common Modules - Module "Patient"**

| Tag         | Type | VR | Name                 | Description   | PoV    | Source           |
|-------------|------|----|----------------------|---|--------|------------------|
| (0010,0010) | 2    | PN | Patient's Name       | Patient's full name.  | VNAP   | MWL, PRQ, USER   |
| (0010,0020) | 2    | LO | Patient ID           | Primary hospital identification number or code for the patient.   | ALWAYS | MWL, PRQ, USER   |
| (0010,0021) | 3    | LO | Issuer of Patient ID | Identifier of the Assigning Authority (system, organization, agency, or department) that issued the Patient ID. Note: Equivalent to HL7 v2 CX component 4 subcomponent 1. | ANAP   | MWL, PRQ, CONFIG |
| (0010,0030) | 2    | DA | Patient's Birth Date | Birth date of the patient.  | VNAP   | MWL, PRQ, USER   |
| (0010,0040) | 2    | CS | Patient's Sex        | Sex of the named patient. Enumerated Values: M = male F = female O = other  | VNAP   | MWL, PRQ, USER   |
| (0010,1000) | 3    | LO | Other Patient IDs    | Other identification numbers or codes used to identify the patient.   | ANAP   | MWL, PRQ         |
| (0010,2160) | 3    | SH | Ethnic Group         | Ethnic group or race of the patient.  | ANAP   | MWL, PRQ         |
| (0010,4000) | 3    | LT | Patient Comments     | User-defined additional information about the patient.  | ANAP   | MWL, PRQ         |

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

| Tag         | Type | VR | Name               | Description  | PoV    | Source    |
|-------------|------|----|--------------------|--|--------|-----------|
| (0020,000D) | 1    | UI | Study Instance UID | Unique identifier for the Study.<br>In unscheduled case IOLMaster 700 uses a constant prefix of "1.2.276.0.75.2.1.11.1.1." followed by a date/time stamp and machine specific identifier.<br>In scheduled case the value is copied from the Modality Worklist. | ALWAYS | MWL, AUTO |

|              |    |    |                             |   |        |              |
|--------------|----|----|-----------------------------|---|--------|--------------|
| (0008,0020)  | 2  | DA | Study Date                  | Date the Study started.   | ALWAYS | AUTO         |
| (0008,0030)  | 2  | TM | Study Time                  | Time the Study started.   | ALWAYS | AUTO         |
| (0008,0090)  | 2  | PN | Referring Physician's Name  | Name of the patient's referring physician.  | VNAP   | MWL          |
| (0020,0010)  | 2  | SH | Study ID                    | User or equipment generated Study identifier.<br>In scheduled case the source attribute for this value is Requested Procedure ID.<br>In unscheduled case the value is an Equipment generated Study identifier.                    | ALWAYS | MWL,<br>AUTO |
| (0008,0050)  | 2  | SH | Accession Number            | A RIS generated number that identifies the order for the Study.<br>Value does not exist in unscheduled case.  | VNAP   | MWL          |
| (0008,1030)  | 3  | LO | Study Description           | Institution-generated description or classification of the Study (component) performed.<br>In scheduled case the source attribute for this value is Requested Procedure Description.<br>Value does not exist in unscheduled case. | ANAP   | MWL          |
| (0008,1110)  | 3  | SQ | Referenced Study Sequence   | A sequence that provides reference to a Study SOP Class/Instance pair. The sequence may have zero or more Items.  | ANAP   | MWL          |
| >(0008,1150) | 1  | UI | Referenced SOP Class UID    | Uniquely identifies the referenced SOP Class.   | ALWAYS | MWL          |
| >(0008,1155) | 1  | UI | Referenced SOP Instance UID | Uniquely identifies the referenced SOP Instance.  | ALWAYS | MWL          |
| (0008,1032)  | 3  | SQ | Procedure Code Sequence     | A Sequence that conveys the type of procedure performed. One or more Items may be included in this Sequence.<br>Attribute does not exist in unscheduled case.   | ANAP   | MWL          |
| >(0008,0100) | 1  | SH | Code Value                  | See NEMA PS3.3 Section 8.1.   | ALWAYS | MWL          |
| >(0008,0102) | 1  | SH | Coding Scheme Designator    | See NEMA PS3.3 Section 8.2.   | ALWAYS | MWL          |
| >(0008,0103) | 1C | SH | Coding Scheme Version       | Required if the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.   | ANAP   | MWL          |
| >(0008,0104) | 1  | LO | Code Meaning                | See NEMA PS3.3 Section 8.3.   | ALWAYS | MWL          |

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

| Tag           | Type | VR | Name                              | Description  | PoV    | Source |
|---------------|------|----|-----------------------------------|--|--------|--------|
| (0020,000E)   | 1    | UI | Series Instance UID               | Unique identifier of the Series.<br>IOLMaster 700 uses a constant prefix of "1.2.276.0.75.2.1.11.1.2." followed by a date/time stamp and a machine specific identifier.  | ALWAYS | AUTO   |
| (0020,0011)   | 2    | IS | Series Number                     | A number that identifies this Series.  | ALWAYS | AUTO   |
| (0008,0021)   | 3    | DA | Series Date                       | Date the Series started.   | ALWAYS | AUTO   |
| (0008,0031)   | 3    | TM | Series Time                       | Time the Series started.   | ALWAYS | AUTO   |
| (0018,0015)   | 3    | CS | Body Part Examined                | 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 Region Sequence (0008,2218), which can provide a more comprehensive mechanism for specifying the body part being examined.<br><br>Always "EYE"  | ALWAYS | AUTO   |
| (0040,0275)   | 3    | SQ | Request Attributes Sequence       | Sequence that contains attributes from the Imaging Service Request. The sequence may have one or more Items.<br>The Request Attributes Sequence is only included in Scheduled Case.  | ANAP   | MWL    |
| >(0040,1001)  | 1C   | SH | Requested Procedure ID            | Identifier that identifies the Requested Procedure in the Imaging Service Request. Required if procedure was scheduled. May be present otherwise. Note: The condition is to allow the contents of this macro to be present (e.g., to convey the reason for the procedure, such as whether a mammogram is for screening or diagnostic purposes) even when the procedure was not formally scheduled and a value for this identifier is unknown, rather than making up a dummy value. | ALWAYS | MWL    |
| >(0032,1060)  | 3    | LO | Requested Procedure Description   | Institution-generated administrative description or classification of Requested Procedure.   | ANAP   | MWL    |
| >(0032,1064)  | 3    | SQ | Requested Procedure Code Sequence | A sequence that conveys the Procedure Type of the requested procedure. Only a single Item is permitted in this sequence.   | ANAP   | MWL    |
| >>(0008,0100) | 1    | SH | Code Value                        | See NEMA PS3.3 Section 8.1.  | ALWAYS | MWL    |



|               |    |    |                                      |   |        |      |
|---------------|----|----|--------------------------------------|---|--------|------|
| >>(0008,0102) | 1  | SH | Coding Scheme Designator             | See NEMA PS3.3 Section 8.2.   | ALWAYS | MWL  |
| >>(0008,0103) | 1C | SH | Coding Scheme Version                | See NEMA PS3.3 Section 8.2. Required if the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously. May be present otherwise.   | ANAP   | MWL  |
| >>(0008,0104) | 1  | LO | Code Meaning                         | See NEMA PS3.3 Section 8.3.   | ALWAYS | MWL  |
| >(0040,0009)  | 1C | SH | Scheduled Procedure Step ID          | Identifier that identifies the Scheduled Procedure Step. Required if procedure was scheduled. Note: The condition is to allow the contents of this macro to be present (e.g., to convey the reason for the procedure, such as whether a mammogram is for screening or diagnostic purposes) even when the procedure step was not formally scheduled and a value for this identifier is unknown, rather than making up a dummy value. | ALWAYS | MWL  |
| >(0040,0007)  | 3  | LO | Scheduled Procedure Step Description | Institution-generated description or classification of the Scheduled Procedure Step to be performed.  | ANAP   | MWL  |
| >(0040,0008)  | 3  | SQ | Scheduled Protocol Code Sequence     | Sequence describing the Scheduled Protocol following a specific coding scheme. One or more Items are permitted in this sequence.  | ANAP   | MWL  |
| >>(0008,0100) | 1  | SH | Code Value                           | See NEMA PS3.3 Section 8.1.   | ALWAYS | MWL  |
| >>(0008,0102) | 1  | SH | Coding Scheme Designator             | See NEMA PS3.3 Section 8.2.   | ALWAYS | MWL  |
| >>(0008,0103) | 1C | SH | Coding Scheme Version                | See NEMA PS3.3 Section 8.2. Required if the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously. May be present otherwise.   | ANAP   | MWL  |
| >>(0008,0104) | 1  | LO | Code Meaning                         | See NEMA PS3.3 Section 8.3.   | ALWAYS | MWL  |
| (0040,0253)   | 3  | SH | Performed Procedure Step ID          | User or equipment generated identifier of that part of a Procedure that has been carried out within this step.<br>All instances created for a single IOLMaster 700 measurement share the same value for Performed Procedure Step ID.  | ALWAYS | AUTO |
| (0040,0244)   | 3  | DA | Performed Procedure Step Start Date  | Date on which the Performed Procedure Step started.   | ALWAYS | AUTO |
| (0040,0245)   | 3  | TM | Performed Procedure Step Start Time  | Time on which the Performed Procedure Step started.   | ALWAYS | AUTO |

|             |   |    |                                      |  |        |      |
|-------------|---|----|--------------------------------------|--|--------|------|
| (0040,0254) | 3 | LO | Performed Procedure Step Description | Institution-generated description or classification of the Procedure Step that was performed.<br>Always "Ophthalmic Biometry Measurement". | ALWAYS | AUTO |
|-------------|---|----|--------------------------------------|--|--------|------|

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

| Tag         | Type | VR | Name                          | Description  | PoV    | Source |
|-------------|------|----|-------------------------------|--|--------|--------|
| (0008,0070) | 2    | LO | Manufacturer                  | Manufacturer of the equipment that produced the composite instances<br><br>Always "Carl Zeiss Meditec"   | ALWAYS | AUTO   |
| (0008,0080) | 3    | LO | Institution Name              | Institution where the equipment that produced the composite instances is located.<br>Attribute does not exist if no Institution Name is configured.  | ANAP   | CONFIG |
| (0008,0081) | 3    | ST | Institution Address           | Mailing address of the institution where the equipment that produced the composite instances is located.<br>Attribute does not exist if no Institution Address is configured.  | ANAP   | CONFIG |
| (0008,1010) | 3    | SH | Station Name                  | User defined name identifying the machine that produced the composite instances.<br>Attribute does not exist if no Station Name is configured.   | ANAP   | CONFIG |
| (0008,1040) | 3    | LO | Institutional Department Name | Department in the institution where the equipment that produced the composite instances is located.<br>Attribute does not exist if no Institutional Department Name is configured.   | ANAP   | CONFIG |
| (0008,1090) | 3    | LO | Manufacturer's Model Name     | Manufacturer's model name of the equipment that produced the composite instances.<br><br>Always "IOLMaster 700"  | ALWAYS | AUTO   |
| (0018,1000) | 3    | LO | Device Serial Number          | 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   |
| (0018,1020) | 3    | LO | Software Version(s)           | Manufacturer's designation of software version of the equipment that produced the composite instances.<br><br>"1.88.1.64861\C80461"<br>higher versions:  | ALWAYS | AUTO   |

|  |  |  |  |  |  |
|--|--|--|--|--|--|
|  |  |  | "1.88.xx.yyyyy\Czzzzz" where xx denotes a patch version, yyyyy denotes a build version, zzzzz denotes a vendor specific identifier |  |  |
|--|--|--|--|--|--|

**Table 8-5 Common Modules - Module "Enhanced General Equipment"**

| Tag         | Type | VR | Name                      | Description  | PoV    | Source |
|-------------|------|----|---------------------------|--|--------|--------|
| (0008,0070) | 1    | LO | Manufacturer              | Manufacturer of the equipment that produced the composite instances.<br><br>Always "Carl Zeiss Meditec"  | ALWAYS | AUTO   |
| (0008,1090) | 1    | LO | Manufacturer's Model Name | Manufacturer's model name of the equipment that produced the composite instances.<br><br>Always "IOLMaster 700"  | ALWAYS | AUTO   |
| (0018,1000) | 1    | LO | Device Serial Number      | 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   |
| (0018,1020) | 1    | LO | Software Version(s)       | Manufacturer's designation of software version of the equipment that produced the composite instances.<br><br>"1.88.1.64861\C80461"<br>higher versions:<br>"1.88.xx.yyyyy\Czzzzz" where xx denotes a patch version, yyyyy denotes a build version, zzzzz denotes a vendor specific identifier  | ALWAYS | AUTO   |

**Table 8-6 Common Modules - Module "General Ophthalmic Refractive Measurements"**

| Tag         | Type | VR | Name                   | Description                                      | PoV    | Source |
|-------------|------|----|------------------------|--|--------|--------|
| (0020,0013) | 1    | IS | Instance Number        | A number that identifies these measurements.     | ALWAYS | AUTO   |
| (0008,0023) | 1    | DA | Content Date           | The date the measurements data creation started. | ALWAYS | AUTO   |
| (0008,0033) | 1    | TM | Content Time           | The time the measurements data creation started. | ALWAYS | AUTO   |
| (0024,0113) | 3    | CS | Measurement Laterality | Laterality of refractive measurement performed.  | ALWAYS | AUTO   |

|             |   |    |                |  |      |            |
|-------------|---|----|----------------|--|------|------------|
|             |   |    |                | <p>Enumerated Values:</p> <p>R - right</p> <p>L - left</p> <p>B - both left and right together</p> <p>Note</p> <p>Laterality (0020,0060) is a Series level Attribute and must be the same for all Measurements in the Series, hence it must be absent if multiple instances from different eyes or lenses are encoded.</p> <p>Needs to be consistent with any other laterality information contained at the Measurement level.</p> |      |            |
| (0020,4000) | 3 | LT | Image Comments | User-defined comments about the image as well as localized equipment generated warnings regarding validation results for the performed measurement.  | ANAP | USER, AUTO |

### 8.1.1.8 Encapsulated PDF Modules

**Table 8-7 Encapsulated PDF IOD - Module "Encapsulated Document Series"**

| Tag         | Type | VR | Name                        | Description  | PoV    | Source |
|-------------|------|----|-----------------------------|--|--------|--------|
| (0008,0060) | 1    | CS | Modality                    | <p>The modality appropriate for the encapsulated document. This Type definition shall override the definition in the SC Equipment Module.</p> <p>Always "OAM"</p>                | ALWAYS | AUTO   |
| (0020,000E) | 1    | UI | Series Instance UID         | <p>Unique identifier of the Series.</p> <p>IOLMaster 700 uses a constant prefix of "1.2.276.0.75.2.1.11.1.2." followed by a date/time stamp and machine specific identifier.</p> | ALWAYS | AUTO   |
| (0020,0011) | 1    | IS | Series Number               | A number that identifies the Series.   | ALWAYS | AUTO   |
| (0040,0275) | 3    | SQ | Request Attributes Sequence | Sequence that contains attributes from the Imaging Service Request. The sequence may have one or more Items.   | ANAP   | MWL    |

|               |    |    |                                      |  |        |     |
|---------------|----|----|--------------------------------------|--|--------|-----|
|               |    |    |                                      | The Request Attributes Sequence is only included in Scheduled Case.  |        |     |
| >(0040,1001)  | 1C | SH | Requested Procedure ID               | Identifier that identifies the Requested Procedure in the Imaging Service Request. Required if procedure was scheduled. May be present otherwise. Note: The condition is to allow the contents of this macro to be present (e.g., to convey the reason for the procedure, such as whether a mammogram is for screening or diagnostic purposes) even when the procedure was not formally scheduled and a value for this identifier is unknown, rather than making up a dummy value. | ALWAYS | MWL |
| >(0032,1060)  | 3  | LO | Requested Procedure Description      | Institution-generated administrative description or classification of Requested Procedure.   | ANAP   | MWL |
| >(0032,1064)  | 3  | SQ | Requested Procedure Code Sequence    | A sequence that conveys the Procedure Type of the requested procedure. The Requested Procedure Code Sequence shall contain only a single item.   | ANAP   | MWL |
| >>(0008,0100) | 1  | SH | Code Value                           | See NEMA PS3.3 Section 8.1.  | ALWAYS | MWL |
| >>(0008,0102) | 1  | SH | Coding Scheme Designator             | See NEMA PS3.3 Section 8.2.  | ALWAYS | MWL |
| >>(0008,0103) | 1C | SH | Coding Scheme Version                | See NEMA PS3.3 Section 8.2. Required if the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously. May be present otherwise.  | ANAP   | MWL |
| >>(0008,0104) | 1  | LO | Code Meaning                         | See NEMA PS3.3 Section 8.3.  | ALWAYS | MWL |
| >(0040,0009)  | 1C | SH | Scheduled Procedure Step ID          | Identifier that identifies the Scheduled Procedure Step. Required if procedure was scheduled. Note: The condition is to allow the contents of this macro to be present (e.g., to convey the reason for the procedure, such as whether a mammogram is for screening or diagnostic purposes) even when the procedure step was not formally scheduled and a value for this identifier is unknown, rather than making up a dummy value.  | ALWAYS | MWL |
| >(0040,0007)  | 3  | LO | Scheduled Procedure Step Description | Institution-generated description or classification of the Scheduled Procedure Step to be performed.   | ANAP   | MWL |
| >(0040,0008)  | 3  | SQ | Scheduled Protocol Code Sequence     | Sequence describing the Scheduled Protocol following a specific coding scheme. This sequence contains one or more Items.   | ANAP   | MWL |
| >>(0008,0100) | 1  | SH | Code Value                           | See NEMA PS3.3 Section 8.1.  | ALWAYS | MWL |
| >>(0008,0102) | 1  | SH | Coding Scheme Designator             | See NEMA PS3.3 Section 8.2.  | ALWAYS | MWL |

|               |    |    |                                      |  |        |      |
|---------------|----|----|--------------------------------------|--|--------|------|
| >>(0008,0103) | 1C | SH | Coding Scheme Version                | See NEMA PS3.3 Section 8.2. Required if the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously. May be present otherwise.  | ANAP   | MWL  |
| >>(0008,0104) | 1  | LO | Code Meaning                         | See NEMA PS3.3 Section 8.3.  | ALWAYS | MWL  |
| (0040,0253)   | 3  | SH | Performed Procedure Step ID          | User or equipment generated identifier of that part of a Procedure that has been carried out within this step.<br>All instances created for a single IOLMaster 700 measurement share the same value for Performed Procedure Step ID. | ALWAYS | AUTO |
| (0040,0244)   | 3  | DA | Performed Procedure Step Start Date  | Date on which the Performed Procedure Step started.  | ALWAYS | AUTO |
| (0040,0245)   | 3  | TM | Performed Procedure Step Start Time  | Time on which the Performed Procedure Step started.  | ALWAYS | AUTO |
| (0040,0254)   | 3  | LO | Performed Procedure Step Description | Institution-generated description or classification of the Procedure Step that was performed. Always "Ophthalmic Biometry Measurement".  | ALWAYS | AUTO |

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

| Tag         | Type | VR | Name            | Description  | PoV    | Source |
|-------------|------|----|-----------------|--|--------|--------|
| (0008,0064) | 1    | CS | Conversion Type | 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<br><br>Always "SYN" for Synthetic Image | ALWAYS | AUTO   |

**Table 8-9 Encapsulated PDF IOD - Module "Encapsulated Document"**

| Tag         | Type | VR | Name                 | Description  | PoV    | Source |
|-------------|------|----|----------------------|--|--------|--------|
| (0020,0013) | 1    | IS | Instance Number      | A number that identifies this SOP Instance. The value shall be unique within a series. | ALWAYS | AUTO   |
| (0008,0023) | 2    | DA | Content Date         | The date the document content creation was started.                                    | ALWAYS | AUTO   |
| (0008,0033) | 2    | TM | Content Time         | The time the document content creation was started.                                    | ALWAYS | AUTO   |
| (0008,002A) | 2    | DT | Acquisition Datetime | The date and time that the original generation of the data in the document started.    | ALWAYS | AUTO   |

|              |    |    |                                    |   |        |      |
|--------------|----|----|------------------------------------|---|--------|------|
| (0020,0062)  | 3  |    | Image Laterality                   | <p>Laterality of the (possibly paired) body part that is the subject of the encapsulated document.</p> <p>Enumerated Values:</p> <p>R = right</p> <p>L = left</p> <p>B = both left and right</p>  | ALWAYS | AUTO |
| (0028,0301)  | 1  | CS | Burned In Annotation               | <p>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</p> <p>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.</p> <p>Always "YES"</p> | ALWAYS | AUTO |
| (0042,0013)  | 1C | SQ | Source Instance Sequence           | <p>A sequence that identifies the set of Instances that were used to derive the encapsulated document. One or more Items may be included in this Sequence. Required if derived from one or more DICOM Instances. May be present otherwise.</p> <p>Attribute exists if there are any instances related to this encapsulated document.</p>  | ANAP   | AUTO |
| >(0008,1150) | 1  | UI | Referenced SOP Class UID           | Uniquely identifies the referenced SOP Class.   | ALWAYS | AUTO |
| >(0008,1155) | 1  | UI | Referenced SOP Instance UID        | Uniquely identifies the referenced SOP Instance.  | ALWAYS | AUTO |
| (0042,0010)  | 2  | ST | Document Title                     | <p>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.</p> <p>Always "IOLMaster 700 Report"</p>   | ALWAYS | AUTO |
| (0040,A043)  | 2  | SQ | Concept Name Code Sequence         | <p>A coded representation of the document title. Zero or one item may be present.</p> <p>Always empty sequence</p>  | EMPTY  | AUTO |
| (0042,0012)  | 1  | LO | MIME Type of Encapsulated Document | The type of the encapsulated document stream described using the MIME Media Type (see RFC 2046).  | ALWAYS | AUTO |

|             |   |    |                       |   |        |      |
|-------------|---|----|-----------------------|---|--------|------|
|             |   |    |                       | Always "application/pdf"  |        |      |
| (0042,0011) | 1 | OB | Encapsulated Document | Encapsulated Document stream, containing a document encoded according to the MIME Type. | ALWAYS | AUTO |

**Table 8-10 Encapsulated PDF IOD - Module "SOP Common"**

| Tag           | Type | VR | Name                               | Description   | PoV    | Source       |
|---------------|------|----|------------------------------------|---|--------|--------------|
| (0008,0016)   | 1    | UI | SOP Class UID                      | Uniquely identifies the SOP Class. See C.12.1.1.1 for further explanation. See also PS 3.4.<br><br>Always "1.2.840.10008.5.1.4.1.1.104.1"   | ALWAYS | AUTO         |
| (0008,0018)   | 1    | UI | SOP Instance UID                   | Uniquely identifies the SOP Instance. See C.12.1.1.1 for further explanation. See also PS 3.4.<br><br>IOLMaster 700 uses a constant prefix of "1.2.276.0.75.2.1.11.1.3." followed by a date/time stamp and machine specific identifier.   | ALWAYS | AUTO         |
| (0008,0005)   | 1C   | CS | Specific Character Set             | 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.<br><br>See 6 Support of Character Sets.   | ALWAYS | AUTO, CONFIG |
| (0008,0012)   | 3    | DA | Instance Creation Date             | Date the SOP Instance was created.  | ALWAYS | AUTO         |
| (0008,0013)   | 3    | TM | Instance Creation Time             | Time the SOP Instance was created.  | ALWAYS | AUTO         |
| (0018,A001)   | 3    | SQ | Contributing Equipment Sequence    | Sequence of Items containing descriptive attributes of related equipment which has contributed to the acquisition, creation or modification of the composite instance. One or more Items may be included in this Sequence. See NEMA PS3.3 Section C.12.1.1.5 for further explanation.<br><br>Sequence contains one single item defining the equipment which originally acquired the measurement data. | ALWAYS | AUTO         |
| >(0040,A170)  | 1    | SQ | Purpose of Reference Code Sequence | Describes the purpose for which the related equipment is being reference. Only a single Item shall be permitted in this sequence. See NEMA PS3.3 Section C.12.1.1.5 for further explanation.  | ALWAYS | AUTO         |
| >>(0008,0100) | 1    | SH | Code Value                         | See NEMA PS3.3 Section 8.1.   | ALWAYS | AUTO         |



|               |   |    |                               |  |        |      |
|---------------|---|----|-------------------------------|--|--------|------|
|               |   |    |                               | Always "109101"  |        |      |
| >>(0008,0102) | 1 | SH | Coding Scheme Designator      | See NEMA PS3.3 Section 8.2.<br>Always "DCM"  | ALWAYS | AUTO |
| >>(0008,0104) | 1 | LO | Code Meaning                  | See NEMA PS3.3 Section 8.3.<br>Always "Acquisition Equipment"  | ALWAYS | AUTO |
| >(0008,0070)  | 1 | LO | Manufacturer                  | Manufacturer of the equipment that contributed to the composite instance.<br>Always "Carl Zeiss Meditec"   | ALWAYS | AUTO |
| >(0008,0080)  | 3 | LO | Institution Name              | Institution where the equipment that contributed to the composite instance is located.<br>Attribute does not exist if no Institution Name is defined for contributing equipment.                                     | ANAP   | AUTO |
| >(0008,0081)  | 3 | ST | Institution Address           | Address of the institution where the equipment that contributed to the composite instance is located.<br>Attribute does not exist if no Institution Address is defined for contributing equipment.                   | ANAP   | AUTO |
| >(0008,1010)  | 3 | SH | Station Name                  | User defined name identifying the machine that contributed to the composite instance.<br>Attribute does not exist if no Station Name is defined for contributing equipment.  | ANAP   | AUTO |
| >(0008,1040)  | 3 | LO | Institutional Department Name | Department in the institution where the equipment that contributed to the composite instance is located.<br>Attribute does not exist if no Institutional Department Name is defined for contributing equipment.      | ANAP   | AUTO |
| >(0008,1090)  | 3 | LO | Manufacturer's Model Name     | Manufacturer's model name of the equipment that contributed to the composite instance.<br>Attribute does not exist if no Manufacturer's Model Name is defined for contributing equipment.                            | ANAP   | AUTO |
| >(0018,1000)  | 3 | LO | Device Serial Number          | Manufacturer's serial number of the equipment that contributed to the composite instance.<br>Attribute does not exist if no Device Serial Number is defined for contributing equipment.                              | ANAP   | AUTO |
| >(0018,1020)  | 3 | LO | Software Version(s)           | Manufacturer's designation of the software version of the equipment that contributed to the composite instance.<br>Attribute does not exist if no Software Version(s) is defined for contributing equipment.         | ANAP   | AUTO |
| >(0018,1200)  | 3 | DA | Date of Last Calibration      | Date when the image acquisition device calibration was last changed in any way. Multiple entries may be used for additional calibrations at other times. See NEMA PS3.3 Section C.7.5.1.1.1 for further explanation. | ANAP   | AUTO |

|              |   |    |                          |   |      |      |
|--------------|---|----|--------------------------|---|------|------|
|              |   |    |                          | Attribute does not exist if no Date of Last Calibration is defined for contributing equipment.  |      |      |
| >(0018,1201) | 3 | TM | Time of Last Calibration | Time when the image acquisition device calibration was last changed in any way. Multiple entries may be used. See NEMA PS3.3 Section C.7.5.1.1.1 for further explanation.<br>Attribute does not exist if no Time of Last Calibration is defined for contributing equipment. | ANAP | AUTO |

**Table 8-11 Encapsulated PDF IOD - Module "CZM Encapsulated Pdf Instance Extension"**

| Tag           | Type | VR | Name                               | Description  | PoV    | Source     |
|---------------|------|----|------------------------------------|--|--------|------------|
| (0020,4000)   | 3    | LT | Image Comments                     | User-defined comments about the image as well as localized equipment generated warnings regarding validation results for the performed measurement.  | ANAP   | USER, AUTO |
| (0008,1140)   | 3    | SQ | Referenced Image Sequence          | References images that are important for IOLs. The sequence may contain zero, one or more items.<br>Only present if Reference Image acquisition has been performed. References OP dataset containing scleral images. | ANAP   | AUTO       |
| >(0008,1150)  | 1    | UI | Referenced SOP Class UID           | Uniquely identifies the referenced SOP Class.<br><br>Always "1.2.840.10008.5.1.4.1.1.77.1.5.1"   | ALWAYS | AUTO       |
| >(0008,1155)  | 1    | UI | Referenced SOP Instance UID        | Uniquely identifies the referenced SOP Instance.<br><br>SOP Instance UID of the referenced OP dataset.   | ALWAYS | AUTO       |
| >(0040,A170)  | 3    | SQ | Purpose of Reference Code Sequence | Describes the purpose for which the reference is made. Only a single item is permitted in this sequence.   | ALWAYS | AUTO       |
| >>(0008,0100) | 1    | SH | Code Value                         | For possible values see section 8.3 Coded Terminology And Templates - Table 8-92 Coded Values -  | ALWAYS | AUTO       |
| >>(0008,0102) | 1    | SH | Coding Scheme Designator           | For possible values see section 8.3 Coded Terminology And Templates - Table 8-92 Coded Values -  | ALWAYS | AUTO       |
| >>(0008,0104) | 1    | LO | Code Meaning                       | For possible values see section 8.3 Coded Terminology And Templates - Table 8-92 Coded Values -  | ALWAYS | AUTO       |

**Table 8-12 Encapsulated PDF IOD - Module "CZM IOL Measured Values"**

| Tag           | Type | VR | Name                                | Description   | PoV    | Source |
|---------------|------|----|-------------------------------------|---|--------|--------|
| (771B,00xx)   | 3    | LO | Private Creator                     | 99CZM   | ALWAYS | AUTO   |
| (771B,xx30)   | 3    | SQ | Axial Length Values Sequence        | Sequence of axial length values measured for one eye, may contain 1 or 2 items<br>Sequence only exists if axial length values have been acquired. | ANAP   | AUTO   |
| >(771B,xx08)  | 3    | CS | IOL Laterality                      | Laterality<br>R = right, L = left   | ALWAYS | AUTO   |
| >(771B,xx31)  | 3    | SQ | Axial Length Values Triple Sequence | Sequence of single axial length measurements, may contain up to 6 items   | ALWAYS | AUTO   |
| >>(771B,xx0B) | 3    | FD | AL                                  | Axial length optical (single measurement) [mm]  | ALWAYS | AUTO   |
| >>(771B,xx0C) | 3    | FD | SNR                                 | Signal to noise ratio (single measurement)<br>Always "1.0" for compatibility reasons.   | ALWAYS | AUTO   |
| >>(771B,xx0D) | 3    | FD | Index tag                           | Index of single measurement   | ALWAYS | AUTO   |
| >(771B,xx43)  | 3    | FD | Mean Value AL                       | Axial length optical (composite value) [mm]<br>Attribute only exists if composite value could be calculated.                                      | ANAP   | AUTO   |
| >(771B,xx44)  | 3    | FD | Mean Value SNR                      | Signal to noise ratio (composite value)<br>Attribute only exists if composite value could be calculated.  | ANAP   | AUTO   |
| (771B,xx32)   | 3    | SQ | Keratometer Values Sequence         | Sequence of keratometry values measured for one eye, may contain 1 or 2 items<br>Sequence only exists if keratometry values have been acquired.   | ANAP   | AUTO   |
| >(771B,xx08)  | 3    | CS | IOL Laterality                      | Laterality<br>R = right, L = left   | ALWAYS | AUTO   |
| >(771B,xx33)  | 3    | SQ | Keratometer Values n-Tupel Sequence | Sequence of single keratometry measurements, may contain up to 3 items  | ALWAYS | AUTO   |
| >>(771B,xx0F) | 3    | FD | R1                                  | Corneal radius of curvature of flat meridian [mm]   | ALWAYS | AUTO   |
| >>(771B,xx11) | 3    | FD | D1                                  | Corneal refractive power of flat meridian [dpt]   | ALWAYS | AUTO   |
| >>(771B,xx13) | 3    | FD | A1                                  | Axis of flat meridian [°]   | ALWAYS | AUTO   |

|               |   |    |                               |  |        |      |
|---------------|---|----|-------------------------------|--|--------|------|
| >>(771B,xx10) | 3 | FD | R2                            | Corneal radius of curvature of steep meridian [mm]   | ALWAYS | AUTO |
| >>(771B,xx12) | 3 | FD | D2                            | Corneal refractive power of steep meridian [dpt]   | ALWAYS | AUTO |
| >>(771B,xx14) | 3 | FD | A2                            | Axis of steep meridian [°]   | ALWAYS | AUTO |
| >>(771B,xx15) | 3 | FD | Zyl                           | Difference between steep and flat keratometric power [dpt]   | ALWAYS | AUTO |
| >(771B,xx16)  | 3 | FD | Refractive Index              | Refractive index corneal power is based on   | ALWAYS | AUTO |
| >(771B,xx17)  | 3 | FD | Quali Tag                     | Standard deviation in series of measurements<br>Attribute only exists if composite value could be calculated.  | ANAP   | AUTO |
| >(771B,xx49)  | 3 | FD | Mean Value R1                 | Mean value of radius in flat meridian [mm]<br>Attribute only exists if composite value could be calculated.  | ANAP   | AUTO |
| >(771B,xx4A)  | 3 | FD | Mean Value D1                 | Mean value of power in flat meridian [dpt]<br>Attribute only exists if composite value could be calculated.  | ANAP   | AUTO |
| >(771B,xx4B)  | 3 | FD | Mean Value A1                 | Mean value of axis of flat meridian [°]<br>Attribute only exists if composite value could be calculated.   | ANAP   | AUTO |
| >(771B,xx4C)  | 3 | FD | Mean Value R2                 | Mean value of radius in steep meridian [mm]<br>Attribute only exists if composite value could be calculated.   | ANAP   | AUTO |
| >(771B,xx4D)  | 3 | FD | Mean Value D2                 | Mean value of power in steep meridian [dpt]<br>Attribute only exists if composite value could be calculated.   | ANAP   | AUTO |
| >(771B,xx4E)  | 3 | FD | Mean Value A2                 | Mean value of axis of steep meridian [°]<br>Attribute only exists if composite value could be calculated.  | ANAP   | AUTO |
| >(771B,xx4F)  | 3 | FD | Mean Value Zyl                | Mean value of difference between steep and flat keratometric power [dpt]<br>Attribute only exists if composite value could be calculated.                    | ANAP   | AUTO |
| (771B,xx34)   | 3 | SQ | Chamber Depth Values Sequence | Sequence of anterior chamber depth values measured for one eye, may contain 1 or 2 items<br>Sequence only exists if chamber depth values have been acquired. | ANAP   | AUTO |
| >(771B,xx08)  | 3 | CS | IOL Laterality                | Laterality<br>R = right, L = left  | ALWAYS | AUTO |

|               |   |    |                                |  |        |      |
|---------------|---|----|--------------------------------|--|--------|------|
| >(771B,xx18)  | 3 | FD | Num1                           | Measurement 1 of anterior chamber depth [mm]<br>Attribute only exists if chamber depth has been acquired.  | ANAP   | AUTO |
| >(771B,xx19)  | 3 | FD | Num2                           | Measurement 2 of anterior chamber depth [mm]<br>Attribute only exists if chamber depth has been acquired.  | ANAP   | AUTO |
| >(771B,xx1A)  | 3 | FD | Num3                           | Measurement 3 of anterior chamber depth [mm]<br>Attribute only exists if chamber depth has been acquired.  | ANAP   | AUTO |
| >(771B,xx1B)  | 3 | FD | Num4                           | Measurement 4 of anterior chamber depth [mm]<br>Attribute only exists if chamber depth has been acquired.  | ANAP   | AUTO |
| >(771B,xx1C)  | 3 | FD | Num5                           | Measurement 5 of anterior chamber depth [mm]<br>Attribute only exists if chamber depth has been acquired.  | ANAP   | AUTO |
| >(771B,xx0E)  | 3 | FD | Mean Value                     | Mean value of anterior chamber depth [mm]<br>Attribute only exists if composite value could be calculated.   | ANAP   | AUTO |
| (771B,xx35)   | 3 | SQ | White-to-white Sequence        | Sequence of white-to-white values measured for one eye, may contain 1 or 2 items<br>Sequence only exists if white-to-white values have been acquired.                      | ANAP   | AUTO |
| >(771B,xx08)  | 3 | CS | IOL Laterality                 | Laterality<br>R = right, L = left  | ALWAYS | AUTO |
| >(771B,xx3B)  | 3 | SQ | White-to-white Values Sequence | Sequence of single white-to-white measurements, contains one item  | ALWAYS | AUTO |
| >>(771B,xx1D) | 3 | FD | Wzw                            | White-to-white diameter [mm]<br>Attribute only exists if white-to-white value has been acquired.   | ANAP   | AUTO |
| >>(771B,xx1E) | 3 | FD | Fpx                            | Horizontal offset of the white-to-white center to the fixation point / visual axis (x-coordinate) [mm]<br>Attribute only exists if white-to-white value has been acquired. | ANAP   | AUTO |
| >>(771B,xx1F) | 3 | FD | Fpy                            | Vertical offset of the white-to-white center to the fixation point / visual axis (y-coordinate) [mm]<br>Attribute only exists if white-to-white value has been acquired.   | ANAP   | AUTO |
| >>(771B,xx50) | 3 | FD | Pup                            | Pupil diameter [mm]<br>Attribute only exists if white-to-white value has been acquired.  | ANAP   | AUTO |

|               |   |    |         |   |      |      |
|---------------|---|----|---------|---|------|------|
| >>(771B,xx51) | 3 | FD | Pup Fpx | Horizontal offset of the pupil center to the fixation point / visual axis (x-coordinate) [mm]<br>Attribute only exists if white-to-white value has been acquired. | ANAP | AUTO |
| >>(771B,xx52) | 3 | FD | Pup Fpy | Vertical offset of the pupil center to the fixation point / visual axis (y-coordinate) [mm]<br>Attribute only exists if white-to-white value has been acquired.   | ANAP | AUTO |

**Table 8-13 Encapsulated PDF IOD - Module "CZM IOL Haigis-T"**

| Tag            | Type | VR | Name                         | Description   | PoV    | Source |
|----------------|------|----|------------------------------|---|--------|--------|
| (771B,xx60)    | 3    | SQ | Haigis-T Sequence            | Sequence of toric IOL calculations<br>Only present if toric IOL calculation has been performed.   | ANAP   | AUTO   |
| >(771B,xx09)   | 3    | LO | Formula Denominator          | Name of formula<br>"Haigis Suite" if Haigis Suite formula was used.<br>"Barrett Suite" if Barrett Suite formula was used.<br>"Mixed Toric" if Haigis Suite formula was used for one and Barrett Toric formula was used for the other eye. | ALWAYS | AUTO   |
| >(771B,xx2C)   | 3    | LO | Surgeon                      | Name of surgeon   | ALWAYS | USER   |
| >(771B,xx61)   | 3    | SQ | Haigis-T Formula Sequence    | Sequence of toric IOL calculations for one eye, may contain 1 or 2 items  | ALWAYS | AUTO   |
| >>(771B,xx08)  | 3    | CS | IOL Laterality               | Laterality<br>R = right, L = left   | ALWAYS | AUTO   |
| >>(771B,xx62)  | 3    | SQ | Surgical Conditions Sequence | Sequence of general surgical conditions and parameters relevant to toric IOL calculations for one single eye. Contains only one item.   | ALWAYS | AUTO   |
| >>>(771B,xx63) | 3    | FD | SIA Cylinder                 | Cylinder of surgically induced astigmatism [dpt]  | ALWAYS | USER   |
| >>>(771B,xx64) | 3    | FD | SIA Axis                     | Axis of surgically induced astigmatism [°]  | ALWAYS | USER   |
| >>>(771B,xx65) | 3    | FD | Toric IOL Axis               | Toric IOL implantation axis in plus-cylinder notation [°]   | ALWAYS | AUTO   |

### 8.1.1.9 Ophthalmic Photography 8 Bit Modules

**Table 8-14 Ophthalmic Photography IOD - Module "Ophthalmic Photography Series"**

| Tag         | Type | VR | Name     | Description   | PoV    | Source |
|-------------|------|----|----------|---|--------|--------|
| (0008,0060) | 1    | CS | Modality | Source equipment that produced the Ophthalmic Photography Series. Enumerated Value: OP<br><br>Always "OP" | ALWAYS | AUTO   |

**Table 8-15 Ophthalmic Photography IOD - Module "Synchronization"**

| Tag         | Type | VR | Name                                   | Description   | PoV    | Source |
|-------------|------|----|--|---|--------|--------|
| (0020,0200) | 1    | UI | Synchronization Frame of Reference UID | UID of common synchronization environment. See C.7.4.2.1.1.<br>IOLMaster 700 uses a constant prefix of "1.2.276.0.75.2.1.11.1.5" followed by a date/time stamp and a machine specific identifier.   | ALWAYS | AUTO   |
| (0018,106A) | 1    | CS | Synchronization Trigger                | Data acquisition synchronization with external equipment Enumerated Values: SOURCE - this equipment provides synchronization channel or trigger to other equipment EXTERNAL - this equipment receives synchronization channel or trigger from other equipment PASSTHRU - this equipment receives synchronization channel or trigger and forwards it NO TRIGGER - data acquisition not synchronized by common channel or trigger.<br><br>Always "NO TRIGGER" | ALWAYS | AUTO   |
| (0018,1800) | 1    | CS | Acquisition Time Synchronized          | Acquisition DateTime (0008,002A) synchronized with external time reference. Enumerated Values: Y, N See C.7.4.2.1.4<br><br>Always "N"   | ALWAYS | AUTO   |

**Table 8-16 Ophthalmic Photography IOD - Module "General Image"**

| Tag         | Type | VR | Name                | Description   | PoV    | Source |
|-------------|------|----|---------------------|---|--------|--------|
| (0020,0020) | 2C   | CS | Patient Orientation | 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 | ALWAYS | AUTO   |

|             |   |    |                |  |      |               |
|-------------|---|----|----------------|--|------|---------------|
|             |   |    |                | 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.<br><br>Always "L\F" |      |               |
| (0020,4000) | 3 | LT | Image Comments | User-defined comments about the image as well as localized equipment generated warnings regarding validation results for the performed measurement.  | ANAP | USER,<br>AUTO |

**Table 8-17 Ophthalmic Photography IOD - Module "Image Pixel"**

| Tag         | Type | VR            | Name           | Description  | PoV    | Source          |
|-------------|------|---------------|----------------|--|--------|-----------------|
| (0028,0010) | 1    | US            | Rows           | Number of rows in the image.   | ALWAYS | AUTO            |
| (0028,0011) | 1    | US            | Columns        | Number of columns in the image   | ALWAYS | AUTO            |
| (0028,0100) | 1    | US            | Bits Allocated | Number of bits allocated for each pixel sample. Each sample shall have the same number of bits allocated. See PS 3.5 for further explanation.<br><br>Always "8"      | ALWAYS | AUTO            |
| (0028,0101) | 1    | US            | Bits Stored    | Number of bits stored for each pixel sample. Each sample shall have the same number of bits stored. See PS 3.5 for further explanation.<br><br>Always "8"            | ALWAYS | AUTO            |
| (0028,0102) | 1    | US            | High Bit       | Most significant bit for pixel sample data. Each sample shall have the same high bit. See PS 3.5 for further explanation.<br><br>Always "7"                          | ALWAYS | AUTO            |
| (7FE0,0010) | 1C   | OB<br>JO<br>W | Pixel Data     | 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 | ACQUISIT<br>ION |



**Table 8-18 Ophthalmic Photography IOD - Module "Cine"**

| Tag         | Type | VR | Name       | Description  | PoV    | Source |
|-------------|------|----|------------|--|--------|--------|
| (0018,1063) | 1C   | DS | Frame Time | Nominal time (in msec) per individual frame. See C.7.6.5.1.1 for further explanation.<br>Required if Frame Increment Pointer (0028,0009) points to Frame Time.<br><br>Always "0" | ALWAYS | AUTO   |

**Table 8-19 Ophthalmic Photography IOD - Module "Multi-frame"**

| Tag         | Type | VR | Name                    | Description   | PoV    | Source |
|-------------|------|----|-------------------------|---|--------|--------|
| (0028,0008) | 1    | IS | Number of Frames        | Number of frames in a Multi-frame Image. See C.7.6.6.1.1 for further explanation.<br><br>Always "1"   | ALWAYS | AUTO   |
| (0028,0009) | 1    | AT | Frame Increment Pointer | 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.<br><br>Always "(0018,1063)" for Frame Time | ALWAYS | AUTO   |

**Table 8-20 Ophthalmic Photography IOD - Module "Acquisition Context"**

| Tag          | Type | VR | Name                         | Description  | PoV    | Source |
|--------------|------|----|------------------------------|--|--------|--------|
| (0040,0555)  | 2    | SQ | Acquisition Context Sequence | 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.<br>This sequence is used by IOLMaster 700 to provide additional measurement values and conditions for acquired sclera images and white-to-white images. | ALWAYS | AUTO   |
| >(0040,A040) | 3    | CS | Value Type                   | The type of the value encoded in this Item. Defined Terms: TEXT NUMERIC CODE DATE TIME PNAME See NEMA PS3.3 Section 10.2.  | ANAP   | AUTO   |
| >(0040,A043) | 1    | SQ | Concept Name Code Sequence   | A concept that constrains the meaning of (i.e. defines the role of) the Observation Value. The "Name" component of a Name/Value pair. Only a single Item shall be included in this sequence.   | ALWAYS | AUTO   |

|               |    |    |                                 |  |        |      |
|---------------|----|----|---------------------------------|--|--------|------|
| >>(0008,0100) | 1  | SH | Code Value                      | For possible values see section 8.3 Coded Terminology And Templates<br>Sclera reference images: See Table 8-93 Coded Values - Acquisition Context Sequence – Sclera images<br>White-to-white images: See Table 8-94 Coded Values - Acquisition Context Sequence – White-to-white images  | ALWAYS | AUTO |
| >>(0008,0102) | 1  | SH | Coding Scheme Designator        | For possible values see section 8.3 Coded Terminology And Templates<br>Sclera reference images: See Table 8-93 Coded Values - Acquisition Context Sequence – Sclera images<br>White-to-white images: See Table 8-94 Coded Values - Acquisition Context Sequence – White-to-white images  | ALWAYS | AUTO |
| >>(0008,0104) | 1  | LO | Code Meaning                    | For possible values see section 8.3 Coded Terminology And Templates<br>Sclera reference images: See Table 8-93 Coded Values - Acquisition Context Sequence – Sclera images<br>White-to-white images: See Table 8-94 Coded Values - Acquisition Context Sequence – White-to-white images  | ALWAYS | AUTO |
| >(0040,A30A)  | 1C | DS | Numeric Value                   | This is the Value component of a Name/Value pair when the Concept implied by Concept Name Code Sequence (0040,A043) is a set of one or more numeric values. Required if the value that Concept Name Code Sequence (0040,A043) requires (implies) is a set of one or more integers or real numbers. Shall not be present otherwise. | ANAP   | AUTO |
| >(0040,08EA)  | 1C | SQ | Measurement Units Code Sequence | Units of measurement. Only a single Item shall be included in this Sequence. Required if Numeric Value (0040,A30A) is sent. Shall not be present otherwise.  | ANAP   | AUTO |
| >>(0008,0100) | 1  | SH | Code Value                      | For possible values see section 8.3 Coded Terminology And Templates<br>Sclera reference images: See Table 8-93 Coded Values - Acquisition Context Sequence – Sclera images<br>White-to-white images: See Table 8-94 Coded Values - Acquisition Context Sequence – White-to-white images  | ALWAYS | AUTO |
| >>(0008,0102) | 1  | SH | Coding Scheme Designator        | For possible values see section 8.3 Coded Terminology And Templates<br>Sclera reference images: See Table 8-93 Coded Values - Acquisition Context Sequence – Sclera images<br>White-to-white images: See Table 8-94 Coded Values - Acquisition Context Sequence – White-to-white images  | ALWAYS | AUTO |
| >>(0008,0104) | 1  | LO | Code Meaning                    | For possible values see section 8.3 Coded Terminology And Templates  | ALWAYS | AUTO |

|              |    |    |            |  |      |      |
|--------------|----|----|------------|--|------|------|
|              |    |    |            | <p>Sclera reference images: See Table 8-93 Coded Values - Acquisition Context Sequence – Sclera images</p> <p>White-to-white images: See Table 8-94 Coded Values - Acquisition Context Sequence – White-to-white images</p>  |      |      |
| >(0040,A160) | 1C | UT | Text Value | <p>This is the Value component of a Name/Value pair when the Concept implied by Concept Name Code Sequence (0040,A043) is a Text Observation Value. Required if Date (0040,A121), Time (0040,A122), and Person Name (0040,A123) do not fully describe the concept specified by Concept Name Code Sequence (0040,A043). Shall not be present otherwise.</p> | ANAP | AUTO |

**Table 8-21 Ophthalmic Photography IOD - Module "Ophthalmic Photography Image"**

| Tag         | Type | VR | Name                       | Description  | PoV    | Source |
|-------------|------|----|----------------------------|--|--------|--------|
| (0008,0008) | 1    | CS | Image Type                 | <p>Image identification characteristics. See C.8.17.2.1.4 for specialization.</p> <p>For sclera reference images always "ORIGINAL\PRIMARY\SCLERA"</p> <p>For white-to-white images always "ORIGINAL\PRIMARY\WHITE_TO_WHITE"</p>  | ALWAYS | AUTO   |
| (0020,0013) | 1    | IS | Instance Number            | A number that identifies this image.   | ALWAYS | AUTO   |
| (0028,0002) | 1    | US | Samples per Pixel          | <p>Number of samples (planes) in this image. Enumerated values: 1 or 3. See C.8.17.2.1.2 for further explanation.</p> <p>Always "1"</p>  | ALWAYS | AUTO   |
| (0028,0004) | 1    | CS | Photometric Interpretation | <p>Specifies the intended interpretation of the pixel data. See NEMA PS3.3 Section C.8.17.2.1.3</p> <p>Always "MONOCHROME2"</p>  | ALWAYS | AUTO   |
| (0028,0103) | 1    | US | Pixel Representation       | <p>Data representation of the pixel samples. Enumerated value: 0</p> <p>Always "0"</p>   | ALWAYS | AUTO   |
| (0028,0030) | 1C   | DS | Pixel Spacing              | Nominal physical distance at the focal plane (in the retina) between the center of each pixel, specified by a numeric pair - adjacent row spacing (delimiter) adjacent column spacing in mm. See 10.7.1.3 for further explanation of the value order. Note: These values are | ALWAYS | AUTO   |

|             |    |    |                                |   |        |      |
|-------------|----|----|--------------------------------|---|--------|------|
|             |    |    |                                | <p>specified as nominal because the physical distance may vary across the field of the images and the lens correction is likely to be imperfect. Required when Acquisition Device Type Code Sequence (0022,0015) contains an item with the value (SRT, R-1021A, "Fundus Camera"). May be present otherwise.</p> <p>Multi-value attribute containing 2 values:<br/> 1) adjacent row spacing in mm<br/> 2) adjacent column spacing in mm</p>  |        |      |
| (0008,0033) | 1  | TM | Content Time                   | The time the image pixel data creation started.   | ALWAYS | AUTO |
| (0008,0023) | 1  | DA | Content Date                   | The date the image pixel data creation started.   | ALWAYS | AUTO |
| (0008,002A) | 1C | DT | Acquisition Datetime           | 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). Required if Image Type (0008,0008) Value 1 is ORIGINAL. May be present otherwise.  | ALWAYS | AUTO |
| (0028,2110) | 1  | CS | Lossy Image Compression        | <p>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</p> <p>Always "01"</p>   | ALWAYS | AUTO |
| (0028,2112) | 1C | DS | Lossy Image Compression Ratio  | Describes the approximate lossy compression ratio(s) that have been applied to this image. See NEMA PS3.3 C.7.6.1.1.5 for further explanation. May be multivalued if successive lossy compression steps have been applied. Notes: 1. For example, a compression ratio of 30:1 would be described in this Attribute with a single value of 30. 2. For historical reasons, the lossy compression ratio should also be described in Derivation Description (0008,2111) Required if Lossy Image Compression (0028,2110) has a value of "01".          | ALWAYS | AUTO |
| (0028,2114) | 1C | CS | Lossy Image Compression Method | <p>A label for the lossy compression method(s) that have been applied to this image. See NEMA PS3.3 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). Required if Lossy Image Compression (0028,2110) has a value of "01". Note: For historical reasons, the lossy compression method should also be described in Derivation Description (0008,2111).</p> <p>Always "ISO_10918_1"</p> | ALWAYS | AUTO |

|             |    |    |                        |  |        |      |
|-------------|----|----|------------------------|--|--------|------|
| (2050,0020) | 1C | CS | Presentation LUT Shape | Specifies an identity transformation for the Presentation LUT, such that the output of all grayscale transformations defined in the IOD containing this Module are defined to be P-Values. Enumerated Values: IDENTITY - output is in P-Values. Required if Photometric Interpretation (0028,0004) is MONOCHROME2<br><br>Always "IDENTITY" | ALWAYS | AUTO |
| (0028,0301) | 1  | CS | Burned In Annotation   | Indicates whether or not image contains sufficient burned in annotation to identify the patient and date the image was acquired. Enumerated Value: YES NO<br><br>Always "NO"   | ALWAYS | AUTO |

**Table 8-22 Ophthalmic Photography IOD - Module "Ocular Region Imaged"**

| Tag          | Type | VR | Name                     | Description   | PoV    | Source |
|--------------|------|----|--------------------------|---|--------|--------|
| (0020,0062)  | 1    | CS | Image Laterality         | Laterality of object imaged (as described in Anatomic Region Sequence (0008,2218)) examined. Enumerated Values: R = right eye L = left eye B = both left and right eye Shall be consistent with any laterality information contained in Primary Anatomic Structure Modifier Sequence (0008,2230), if present. Note: Laterality (0020,0060) is a Series level Attribute and must be the same for all Images in the Series. Since most Ophthalmic Photographic Image studies contain images of both eyes, the series level attribute will rarely be present.<br><br>Always "L" or "R" depending on the eye examined | ALWAYS | AUTO   |
| (0008,2218)  | 1    | SQ | Anatomic Region Sequence | Sequence that identifies the anatomic region of interest in this Instance (i.e. external anatomy, surface anatomy, or general region of the body). Only a single Item shall be included in this sequence.   | ALWAYS | AUTO   |
| >(0008,0100) | 1    | SH | Code Value               | Always "T-AA000"  | ALWAYS | AUTO   |
| >(0008,0102) | 1    | SH | Coding Scheme Designator | Always "SRT"  | ALWAYS | AUTO   |
| >(0008,0104) | 1    | LO | Code Meaning             | Always "Eye"  | ALWAYS | AUTO   |

**Table 8-23 Ophthalmic Photography IOD - Module "Ophthalmic Photography Acquisition Parameters"**

| Tag         | Type | VR | Name                           | Description   | PoV   | Source |
|-------------|------|----|--------------------------------|---|-------|--------|
| (0022,0005) | 2    | CS | Patient Eye Movement Commanded | Always empty  | EMPTY | AUTO   |
| (0022,001B) | 2    | SQ | Refractive State Sequence      | The refractive state of the imaged eye at the time of acquisition. Zero or one Item shall be included in this sequence. Zero length means the refractive state was not measured.<br><br>Always empty sequence | EMPTY | AUTO   |
| (0022,000A) | 2    | FL | Emmetropic Magnification       | Emmetropic magnification value (dimensionless). Zero length means the emmetropic magnification was not measured.<br><br>Always empty  | EMPTY | AUTO   |
| (0022,000B) | 2    | FL | Intra Ocular Pressure          | Value of intraocular pressure in mmHg. Zero length means the pressure was not measured<br><br>Always empty  | EMPTY | AUTO   |
| (0022,000D) | 2    | CS | Pupil Dilated                  | Whether or not the patient's pupils were pharmacologically dilated for this acquisition. Enumerated Values: YES NO If this tag is empty, no information is available.<br><br>Always empty                     | EMPTY | AUTO   |

**Table 8-24 Ophthalmic Photography IOD - Module "Ophthalmic Photographic Parameters"**

| Tag          | Type | VR | Name                                  | Description   | PoV    | Source |
|--------------|------|----|---------------------------------------|---|--------|--------|
| (0022,0015)  | 1    | SQ | Acquisition Device Type Code Sequence | Describes the type of acquisition device. A single item shall be included in this sequence. | ALWAYS | AUTO   |
| >(0008,0100) | 1    | SH | Code Value                            | Always "OPTICAL_BIOMETRY"   | ALWAYS | AUTO   |
| >(0008,0102) | 1    | SH | Coding Scheme Designator              | Always "99CZM"  | ALWAYS | AUTO   |
| >(0008,0103) | 1C   | SH | Coding Scheme Version                 | Always " 20160301"  | ALWAYS | AUTO   |

|              |   |    |  |   |        |      |
|--------------|---|----|--|---|--------|------|
| >(0008,0104) | 1 | LO | Code Meaning                               | Always "Optical Biometry"   | ALWAYS | AUTO |
| (0022,0016)  | 2 | SQ | Illumination Type Code Sequence            | Coded value for illumination. Zero or one item shall be included in this sequence.<br>Always empty sequence   | EMPTY  | AUTO |
| (0022,0017)  | 2 | SQ | Light Path Filter Type Stack Code Sequence | Filters used in the light source path. Zero or more items may be included in this sequence.<br>Always empty sequence  | EMPTY  | AUTO |
| (0022,0018)  | 2 | SQ | Image Path Filter Type Stack Code Sequence | Describes stack of filters used in image path. Zero or more items shall be included in this sequence.<br>Always empty sequence                                | EMPTY  | AUTO |
| (0022,0019)  | 2 | SQ | Lenses Code Sequence                       | Lenses that were used during the image acquisition. Zero or more items shall be included in this sequence.<br>Always empty sequence                           | EMPTY  | AUTO |
| (0018,7004)  | 2 | CS | Detector Type                              | Type of detector used for creating this image. Defined terms: CCD = Charge Coupled Devices<br>CMOS = Complementary Metal Oxide Semiconductor<br>Always "CMOS" | ALWAYS | AUTO |

**Table 8-25 Ophthalmic Photography IOD - Module "SOP Common"**

| Tag         | Type | VR | Name             | Description  | PoV    | Source |
|-------------|------|----|------------------|--|--------|--------|
| (0008,0016) | 1    | UI | SOP Class UID    | Uniquely identifies the SOP Class. See C.12.1.1.1 for further explanation. See also PS 3.4.<br>Always "1.2.840.10008.5.1.4.1.1.77.1.5.1" | ALWAYS | AUTO   |
| (0008,0018) | 1    | UI | SOP Instance UID | Uniquely identifies the SOP Instance. See C.12.1.1.1 for further explanation. See also PS 3.4.   | ALWAYS | AUTO   |

|               |    |    |                                    |   |        |              |
|---------------|----|----|------------------------------------|---|--------|--------------|
|               |    |    |                                    | IOLMaster 700 uses a constant prefix of "1.2.276.0.75.2.1.11.1.3." followed by a date/time stamp and machine specific identifier.   |        |              |
| (0008,0005)   | 1C | CS | Specific Character Set             | 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.<br><br>See 6 Support of Character Sets.   | ALWAYS | AUTO, CONFIG |
| (0008,0012)   | 3  | DA | Instance Creation Date             | Date the SOP Instance was created.  | ALWAYS | AUTO         |
| (0008,0013)   | 3  | TM | Instance Creation Time             | Time the SOP Instance was created.  | ALWAYS | AUTO         |
| (0018,A001)   | 3  | SQ | Contributing Equipment Sequence    | Sequence of Items containing descriptive attributes of related equipment which has contributed to the acquisition, creation or modification of the composite instance. One or more Items may be included in this Sequence. See NEMA PS3.3 Section C.12.1.1.5 for further explanation.<br><br>Sequence contains one single item defining the equipment which originally acquired the measurement data. | ALWAYS | AUTO         |
| >(0040,A170)  | 1  | SQ | Purpose of Reference Code Sequence | Describes the purpose for which the related equipment is being reference. Only a single Item shall be permitted in this sequence. See NEMA PS3.3 Section C.12.1.1.5 for further explanation.  | ALWAYS | AUTO         |
| >>(0008,0100) | 1  | SH | Code Value                         | See NEMA PS3.3 Section 8.1.<br>Always "109101"  | ALWAYS | AUTO         |
| >>(0008,0102) | 1  | SH | Coding Scheme Designator           | See NEMA PS3.3 Section 8.2.<br>Always "DCM"   | ALWAYS | AUTO         |
| >>(0008,0104) | 1  | LO | Code Meaning                       | See NEMA PS3.3 Section 8.3.<br>Always "Acquisition Equipment"   | ALWAYS | AUTO         |
| >(0008,0070)  | 1  | LO | Manufacturer                       | Manufacturer of the equipment that contributed to the composite instance.<br>Always "Carl Zeiss Meditec"  | ALWAYS | AUTO         |
| >(0008,0080)  | 3  | LO | Institution Name                   | Institution where the equipment that contributed to the composite instance is located. Attribute does not exist if no Institution Name is defined for contributing equipment.   | ANAP   | AUTO         |
| >(0008,0081)  | 3  | ST | Institution Address                | Address of the institution where the equipment that contributed to the composite instance is located. Attribute does not exist if no Institution Address is defined for contributing equipment.   | ANAP   | AUTO         |



|              |   |    |                               |  |      |      |
|--------------|---|----|-------------------------------|--|------|------|
| >(0008,1010) | 3 | SH | Station Name                  | User defined name identifying the machine that contributed to the composite instance.<br>Attribute does not exist if no Station Name is defined for contributing equipment.  | ANAP | AUTO |
| >(0008,1040) | 3 | LO | Institutional Department Name | Department in the institution where the equipment that contributed to the composite instance is located.<br>Attribute does not exist if no Institutional Department Name is defined for contributing equipment.  | ANAP | AUTO |
| >(0008,1090) | 3 | LO | Manufacturer's Model Name     | Manufacturer's model name of the equipment that contributed to the composite instance.<br>Attribute does not exist if no Manufacturer's Model Name is defined for contributing equipment.  | ANAP | AUTO |
| >(0018,1000) | 3 | LO | Device Serial Number          | Manufacturer's serial number of the equipment that contributed to the composite instance.<br>Attribute does not exist if no Device Serial Number is defined for contributing equipment.  | ANAP | AUTO |
| >(0018,1020) | 3 | LO | Software Version(s)           | Manufacturer's designation of the software version of the equipment that contributed to the composite instance.<br>Attribute does not exist if no Software Version(s) is defined for contributing equipment.   | ANAP | AUTO |
| >(0018,1200) | 3 | DA | Date of Last Calibration      | Date when the image acquisition device calibration was last changed in any way. Multiple entries may be used for additional calibrations at other times. See NEMA PS3.3 Section C.7.5.1.1.1 for further explanation.<br>Attribute does not exist if no Date of Last Calibration is defined for contributing equipment. | ANAP | AUTO |
| >(0018,1201) | 3 | TM | Time of Last Calibration      | Time when the image acquisition device calibration was last changed in any way. Multiple entries may be used. See NEMA PS3.3 Section C.7.5.1.1.1 for further explanation.<br>Attribute does not exist if no Time of Last Calibration is defined for contributing equipment.  | ANAP | AUTO |

#### 8.1.1.10 Multi Frame True Color Sc Image Modules

**Table 8-26 Multi Frame True Color Sc Image IOD - Module "Sc Equipment"**

| Tag         | Type | VR | Name            | Description  | PoV    | Source |
|-------------|------|----|-----------------|--|--------|--------|
| (0008,0064) | 1    | CS | Conversion Type | 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 | AUTO   |

|             |   |    |          |  |        |      |
|-------------|---|----|----------|--|--------|------|
|             |   |    |          | <p>Always "SYN"</p> <p>Note:</p> <p>In case of Image Type (0008,0008) is "DERIVED\PRIMARY\OAM_QUALITY" the image is a synthesized multi-frame optical coherence tomography image.</p> <p>In case of Image Type (0008,0008) is "DERIVED\PRIMARY\KER_QUALITY" the image is a synthesized multi-frame difference image.</p> |        |      |
| (0008,0060) | 3 | CS | Modality | <p>Source equipment for the image. This type definition shall override the definition in the General Series Module. See NEMA PS3.3 C.7.3.1.1.1 for Defined Terms.</p> <p>"OAM" for Ophthalmic Axial Measurements Quality Control Images</p> <p>"KER" for Keratometry Measurements Quality Control Images</p>             | ALWAYS | AUTO |

**Table 8-27 Multi Frame True Color Sc Image IOD - Module "General Image"**

| Tag         | Type | VR | Name                | Description  | PoV    | Source |
|-------------|------|----|---------------------|--|--------|--------|
| (0020,0013) | 2    | IS | Instance Number     | A number that identifies this image. Note: This Attribute was named Image Number in earlier versions of this Standard.   | ALWAYS | AUTO   |
| (0020,0020) | 2C   | CS | Patient Orientation | <p>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.</p> <p>"P\R" for Ophthalmic Axial Measurements Quality Control Images</p> <p>"L\F" for Keratometry Measurements Quality Control Images</p> | ALWAYS | AUTO   |
| (0008,0023) | 2C   | DA | Content Date        | 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   |
| (0008,0033) | 2C   | TM | Content Time        | The time 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.  | ALWAYS | AUTO   |
| (0008,0008) | 3    | CS | Image Type          | Image identification characteristics. See NEMA PS3.3. C.7.6.1.1.2 for Defined Terms and further explanation.   | ALWAYS | AUTO   |

|               |    |    |                                    |   |        |      |
|---------------|----|----|------------------------------------|---|--------|------|
|               |    |    |                                    | "DERIVED\PRIMARY\OAM_QUALITY" for Ophthalmic Axial Measurements Quality Control Images<br>"DERIVED\PRIMARY\KER_QUALITY" for Keratometry Measurements Quality Control Images   |        |      |
| (0008,002A)   | 3  | DT | Acquisition Datetime               | 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 |
| (0008,114A)   | 3  | SQ | Referenced Instance Sequence       | Non-image composite SOP Instances that are significantly related to this Image, including waveforms that may or may not be temporally synchronized with this image. One or more Items are permitted in this sequence.<br><br>For Quality Control Images the Referenced Instance Sequence is used to refer to the associated measurement SOP Instance. | ALWAYS | AUTO |
| >(0008,1150)  | 1  | UI | Referenced SOP Class UID           | Uniquely identifies the referenced SOP Class.<br><br>"1.2.840.10008.5.1.4.1.1.78.7" for Ophthalmic Axial Measurements SOP Class (used by Ophthalmic Axial Measurements Quality Control Images)<br>"1.2.840.10008.5.1.4.1.1.78.3" for Keratometry Measurements SOP Class (used by Keratometry Measurements Quality Control Images)                     | ALWAYS | AUTO |
| >(0008,1155)  | 1  | UI | Referenced SOP Instance UID        | Uniquely identifies the referenced SOP Instance.  | ALWAYS | AUTO |
| >(0040,A170)  | 1  | SQ | Purpose of Reference Code Sequence | Code describing the purpose of the reference to the Instance(s). Only a single Item shall be included in this sequence.   | ALWAYS | AUTO |
| >>(0008,0100) | 1  | SH | Code Value                         | Always "MEASUREMENTS"   | ALWAYS | AUTO |
| >>(0008,0102) | 1  | SH | Coding Scheme Designator           | Always "99CZM"  | ALWAYS | AUTO |
| >>(0008,0103) | 1C | SH | Coding Scheme Version              | Always "20160301"   | ALWAYS | AUTO |
| >>(0008,0104) | 1  | LO | Code Meaning                       | Always "Measurements SOP Instance associated with this image"   | ALWAYS | AUTO |
| (0020,4000)   | 3  | LT | Image Comments                     | User-defined comments about the image as well as localized equipment generated warnings regarding validation results for the performed measurement.   | ANAP   | USER |

|             |   |    |                                |  |        |      |
|-------------|---|----|--------------------------------|--|--------|------|
|             |   |    |                                |  |        | AUTO |
| (0028,0300) | 3 | CS | Quality Control Image          | Indicates whether or not this image is a quality control or phantom image. Enumerated Values: YES NO If this Attribute is absent, then the image may or may not be a quality control or phantom image. The phantom device in the image can be described using the Device Module. See NEMA PS3.3 C.7.6.12<br><br>Always "YES"   | ALWAYS | AUTO |
| (0028,2110) | 3 | CS | Lossy Image Compression        | 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 PS 3.3 C.7.6.1.1.5<br><br>Always "01"  | ALWAYS | AUTO |
| (0028,2112) | 3 | DS | Lossy Image Compression Ratio  | Describes the approximate lossy compression ratio(s) that have been applied to this image. See NEMA PS3.3 C.7.6.1.1.5 for further explanation. May be multivalued if successive lossy compression steps have been applied. Notes: 1. For example, a compression ratio of 30:1 would be described in this Attribute with a single value of 30. 2. For historical reasons, the lossy compression ratio may also be described in Derivation Description (0008,2111).  | ALWAYS | AUTO |
| (0028,2114) | 3 | CS | Lossy Image Compression Method | A label for the lossy compression method(s) that have been applied to this image. See NEMA PS3.3 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).<br><br>Always "ISO_10918_1" | ALWAYS | AUTO |

**Table 8-28 Multi Frame True Color Sc Image IOD - Module "Image Pixel"**

| Tag         | Type | VR | Name              | Description   | PoV    | Source |
|-------------|------|----|-------------------|---|--------|--------|
| (0028,0002) | 1    | US | Samples per Pixel | Number of samples (planes) in this image. See NEMA PS3.3 C.7.6.3.1.1 for further explanation.<br><br>Always "1" | ALWAYS | AUTO   |

|             |    |              |                            |   |        |      |
|-------------|----|--------------|----------------------------|---|--------|------|
| (0028,0004) | 1  | CS           | Photometric Interpretation | Specifies the intended interpretation of the pixel data. See NEMA PS3.3 C.7.6.3.1.2 for further explanation.<br><br>Always "MONOCHROME2"                                      | ALWAYS | AUTO |
| (0028,0010) | 1  | US           | Rows                       | Number of rows in the image.  | ALWAYS | AUTO |
| (0028,0011) | 1  | US           | Columns                    | Number of columns in the image  | ALWAYS | AUTO |
| (0028,0100) | 1  | US           | Bits Allocated             | Number of bits allocated for each pixel sample. Each sample shall have the same number of bits allocated. See PS 3.5 for further explanation.<br><br>Always "8"               | ALWAYS | AUTO |
| (0028,0101) | 1  | US           | Bits Stored                | Number of bits stored for each pixel sample. Each sample shall have the same number of bits stored. See PS 3.5 for further explanation.<br><br>Always "8"                     | ALWAYS | AUTO |
| (0028,0102) | 1  | US           | High Bit                   | Most significant bit for pixel sample data. Each sample shall have the same high bit. See PS 3.5 for further explanation.<br><br>Always "7"                                   | ALWAYS | AUTO |
| (0028,0103) | 1  | US           | Pixel Representation       | Data representation of the pixel samples. Each sample shall have the same pixel representation. Enumerated Values: 0 = unsigned integer. 1 = 2's complement<br><br>Always "0" | ALWAYS | AUTO |
| (7FE0,0010) | 1C | O<br>W<br>OB | Pixel Data                 | 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 | AUTO |

**Table 8-29 Multi Frame True Color Sc Image IOD - Module "Multi-frame"**

| Tag         | Type | VR | Name             | Description  | PoV    | Source |
|-------------|------|----|------------------|--|--------|--------|
| (0028,0008) | 1    | IS | Number of Frames | Number of frames in a Multi-frame Image. See NEMA PS3.3 C.7.6.6.1.1 for further explanation. | ALWAYS | AUTO   |

**Table 8-30 Multi Frame True Color Sc Image IOD - Module "Frame Pointers"**

| Tag         | Type | VR | Name                        | Description  | PoV    | Source |
|-------------|------|----|-----------------------------|--|--------|--------|
| (0028,6010) | 3    | US | Representative Frame Number | The frame number selected for use as a pictorial representation (e.g. icon) of the Multi-frame Image | ALWAYS | AUTO   |

**Table 8-31 Multi Frame True Color Sc Image IOD - Module "Sc Multi Frame Image"**

| Tag         | Type | VR | Name                   | Description   | PoV    | Source |
|-------------|------|----|------------------------|---|--------|--------|
| (0028,0301) | 1    | CS | Burned In Annotation   | Indicates whether or not image contains sufficient burned in annotation to identify the patient and date the image was acquired. Enumerated Values: YES NO<br><br>Always "No"   | ALWAYS | AUTO   |
| (2050,0020) | 1C   | CS | Presentation LUT Shape | Specifies an identity transformation for the Presentation LUT, such that the output of all grayscale transformations defined in the IOD containing this Module are defined to be P-Values. Enumerated Values: IDENTITY - output is in P-Values. Required if Photometric Interpretation (0028,0004) is MONOCHROME2, and BitsStored (0028,0101) is greater than 1. Note: If the VOI LUT Module is required by the IOD but no VOI LUT Sequence (0028,3010) or Window Center (0028,1050) is present, then the VOI LUT stage is an identity transformation.<br><br>Always "IDENTITY" | ALWAYS | AUTO   |
| (0028,1052) | 1C   | DS | Rescale Intercept      | The value b in the relationship between stored values (SV) in Pixel Data (7FE0,0010) and the output units specified in Rescale Type (0028,1054). Output units = m*SV + b. Enumerated Value: 0 Required if Photometric Interpretation (0028,0004) is   | ALWAYS | AUTO   |

|             |    |    |                         |   |        |      |
|-------------|----|----|-------------------------|---|--------|------|
|             |    |    |                         | MONOCHROME2, and BitsStored (0028,0101) is greater than 1. Note: This specifies an identity Modality LUT transformation.<br><br>Always "0"  |        |      |
| (0028,1053) | 1C | DS | Rescale Slope           | m in the equation specified by Rescale Intercept (0028,1052). Enumerated Value: 1<br>Required if Photometric Interpretation (0028,0004) is MONOCHROME2, and BitsStored (0028,0101) is greater than 1. Note: This specifies an identity Modality LUT transformation.<br><br>Always "1"   | ALWAYS | AUTO |
| (0028,1054) | 1C | LO | Rescale Type            | Specifies the output units of Rescale Slope (0028,1053) and Rescale Intercept (0028,1052). Enumerated Value: US = Unspecified<br>Required if Photometric Interpretation (0028,0004) is MONOCHROME2, and BitsStored (0028,0101) is greater than 1. Note: This specifies an identity Modality LUT transformation.<br><br>Always "US"  | ALWAYS | AUTO |
| (0028,0009) | 1C | AT | Frame Increment Pointer | Contains the Data Element Tag of the attribute which is used as the frame increment in Multi-frame pixel data. See C.7.6.6.1.2 for further explanation. Shall be present if Number of Frames is greater than 1, overriding (specializing) the Type 1 requirement on this attribute in the Multi-frame Module.<br><br>Always "(0018,2002)" for Frame Label Vector                        | ALWAYS | AUTO |
| (0028,0030) | 1C | DS | Pixel Spacing           | Physical distance in the patient between the center of each pixel, specified by a numeric pair - adjacent row spacing (delimiter) adjacent column spacing in mm. See 10.7.1.1 and 10.7.1.3. Required if the image has been calibrated. May be present otherwise.<br><br>Multi-value attribute containing 2 values:<br>1) adjacent row spacing in mm<br>2) adjacent column spacing in mm | ALWAYS | AUTO |

**Table 8-32 Multi Frame True Color Sc Image IOD - Module "Sc Multi Frame Vector"**

| Tag         | Type | VR | Name               | Description   | PoV    | Source |
|-------------|------|----|--------------------|---|--------|--------|
| (0018,2002) | 1C   | SH | Frame Label Vector | An array which contains, for each of the image frames, a descriptive label. Required if Frame Increment Pointer (0028,0009) points to Frame Label Vector (0018,2002).<br><br>Contains <frame_number> values. The frame number starting with "1" is used as value for the label. | ALWAYS | AUTO   |

**Table 8-33 Multi Frame True Color Sc Image IOD - Module "Sop Common"**

| Tag         | Type | VR | Name                            | Description  | PoV    | Source       |
|-------------|------|----|---------------------------------|--|--------|--------------|
| (0008,0016) | 1    | UI | SOP Class UID                   | Uniquely identifies the SOP Class. See NEMA PS3.3 C.12.1.1.1 for further explanation. See also PS 3.4.<br><br>Always "1.2.840.10008.5.1.4.1.1.7.4"   | ALWAYS | AUTO         |
| (0008,0018) | 1    | UI | SOP Instance UID                | Uniquely identifies the SOP Instance. See NEMA PS3.3 C.12.1.1.1 for further explanation. See also PS 3.4.<br><br>IOLMaster 700 uses a constant prefix of "1.2.276.0.75.2.1.11.1.3." followed by a date/time stamp and machine specific identifier. | ALWAYS | AUTO         |
| (0008,0005) | 1C   | CS | Specific Character Set          | 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.<br><br>See 6 Support of Character Sets.  | ALWAYS | AUTO, CONFIG |
| (0008,0012) | 3    | DA | Instance Creation Date          | Date the SOP Instance was created.   | ALWAYS | AUTO         |
| (0008,0013) | 3    | TM | Instance Creation Time          | Time the SOP Instance was created.   | ALWAYS | AUTO         |
| (0018,A001) | 3    | SQ | Contributing Equipment Sequence | Sequence of Items containing descriptive attributes of related equipment which has contributed to the acquisition, creation or modification of the composite instance. One or  | ALWAYS | AUTO         |



|               |   |    |                                    |   |        |      |
|---------------|---|----|------------------------------------|---|--------|------|
|               |   |    |                                    | more Items may be included in this Sequence. See NEMA PS3.3 Section C.12.1.1.5 for further explanation.<br>Sequence contains one single item defining the equipment which originally acquired the measurement data. |        |      |
| >(0040,A170)  | 1 | SQ | Purpose of Reference Code Sequence | Describes the purpose for which the related equipment is being reference. Only a single Item shall be permitted in this sequence. See NEMA PS3.3 Section C.12.1.1.5 for further explanation.                        | ALWAYS | AUTO |
| >>(0008,0100) | 1 | SH | Code Value                         | See NEMA PS3.3 Section 8.1.<br>Always "109101"  | ALWAYS | AUTO |
| >>(0008,0102) | 1 | SH | Coding Scheme Designator           | See NEMA PS3.3 Section 8.2.<br>Always "DCM"   | ALWAYS | AUTO |
| >>(0008,0104) | 1 | LO | Code Meaning                       | See NEMA PS3.3 Section 8.3.<br>Always "Acquisition Equipment"   | ALWAYS | AUTO |
| >(0008,0070)  | 1 | LO | Manufacturer                       | Manufacturer of the equipment that contributed to the composite instance.<br>Always "Carl Zeiss Meditec"  | ALWAYS | AUTO |
| >(0008,0080)  | 3 | LO | Institution Name                   | Institution where the equipment that contributed to the composite instance is located.<br>Attribute does not exist if no Institution Name is defined for contributing equipment.                                    | ANAP   | AUTO |
| >(0008,0081)  | 3 | ST | Institution Address                | Address of the institution where the equipment that contributed to the composite instance is located.<br>Attribute does not exist if no Institution Address is defined for contributing equipment.                  | ANAP   | AUTO |
| >(0008,1010)  | 3 | SH | Station Name                       | User defined name identifying the machine that contributed to the composite instance.<br>Attribute does not exist if no Station Name is defined for contributing equipment.   | ANAP   | AUTO |
| >(0008,1040)  | 3 | LO | Institutional Department Name      | Department in the institution where the equipment that contributed to the composite instance is located.<br>Attribute does not exist if no Institutional Department Name is defined for contributing equipment.     | ANAP   | AUTO |
| >(0008,1090)  | 3 | LO | Manufacturer's Model Name          | Manufacturer's model name of the equipment that contributed to the composite instance.<br>Attribute does not exist if no Manufacturer's Model Name is defined for contributing equipment.                           | ANAP   | AUTO |

|              |   |    |                          |   |      |      |
|--------------|---|----|--------------------------|---|------|------|
| >(0018,1000) | 3 | LO | Device Serial Number     | Manufacturer's serial number of the equipment that contributed to the composite instance. Attribute does not exist if no Device Serial Number is defined for contributing equipment.  | ANAP | AUTO |
| >(0018,1020) | 3 | LO | Software Version(s)      | Manufacturer's designation of the software version of the equipment that contributed to the composite instance. Attribute does not exist if no Software Version(s) is defined for contributing equipment.   | ANAP | AUTO |
| >(0018,1200) | 3 | DA | Date of Last Calibration | Date when the image acquisition device calibration was last changed in any way. Multiple entries may be used for additional calibrations at other times. See NEMA PS3.3 Section C.7.5.1.1.1 for further explanation. Attribute does not exist if no Date of Last Calibration is defined for contributing equipment. | ANAP | AUTO |
| >(0018,1201) | 3 | TM | Time of Last Calibration | Time when the image acquisition device calibration was last changed in any way. Multiple entries may be used. See NEMA PS3.3 Section C.7.5.1.1.1 for further explanation. Attribute does not exist if no Time of Last Calibration is defined for contributing equipment.  | ANAP | AUTO |

**Table 8-34 Multi Frame True Color Sc Image IOD - Module "Czm Multi Frame True Color Sc Image Extension"**

| Tag         | Type | VR | Name             | Description  | PoV    | Source |
|-------------|------|----|------------------|--|--------|--------|
| (0020,0062) | 3    | CS | Image Laterality | Enumerated Values: R = right L = left U = unpaired B = both left and right | ALWAYS | AUTO   |

#### 8.1.1.11 Ophthalmic Axial Measurements Modules

**Table 8-35 Ophthalmic Axial Measurements IOD - Module "Ophthalmic Axial Measurements Series"**

| Tag         | Type | VR | Name     | Description  | PoV    | Source |
|-------------|------|----|----------|--|--------|--------|
| (0008,0060) | 1    | CS | Modality | Type of equipment that originally acquired the data used to create the measurements in this Series. Enumerated Values: OAM See section NEMA PS3.3 Section C.7.3.1.1.1 for further explanation.<br><br>Always "OAM" | ALWAYS | AUTO   |

**Table 8-36 Ophthalmic Axial Measurements IOD - Module "Ophthalmic Axial Measurements"**

| Tag             | Type | VR | Name  | Description   | PoV    | Source |
|-----------------|------|----|---|---|--------|--------|
| (0022,1009)     | 1    | CS | Ophthalmic Axial Measurements Device Type             | Describes the type of ophthalmic axial measurement acquisition device. Defined Terms:<br>ULTRASOUND OPTICAL<br><br>Always "OPTICAL"   | ALWAYS | AUTO   |
| >(0022,1025)    | 1    | SQ | Vitreous Status Code Sequence                         | Status of the vitreous cavity. See NEMA PS3.3 section C.8.25.14.1.1.2 for further explanation. Only a single Item shall be included in this sequence.   | ALWAYS | AUTO   |
| >>(0008,0100)   | 1    | SH | Code Value  | For possible values see section 8.3 Coded Terminology And Templates - Table 8-87 Coded Values -   | ALWAYS | USER   |
| >>(0008,0102)   | 1    | SH | Coding Scheme Designator                              | For possible values see section 8.3 Coded Terminology And Templates - Table 8-87 Coded Values -   | ALWAYS | USER   |
| >>(0008,0103)   | 1C   | SH | Coding Scheme Version                                 | For possible values see section 8.3 Coded Terminology And Templates - Table 8-87 Coded Values -   | ALWAYS | USER   |
| >>(0008,0104)   | 1    | LO | Code Meaning  | For possible values see section 8.3 Coded Terminology And Templates - Table 8-87 Coded Values -   | ALWAYS | USER   |
| >(0022,000D)    | 2    | CS | Pupil Dilated   | Whether or not the patient's pupils were pharmacologically dilated for this acquisition<br>Enumerated Values: YES NO If this tag is empty, no information is available.<br><br>Always empty.  | EMPTY  | AUTO   |
| >>>(0022,1225)  | 1C   | SQ | Optical Ophthalmic Axial Length Measurements Sequence | Related information about an axial length measurement being performed on an optical device. Only a single Item shall be included in this sequence. Required if Ophthalmic Axial Measurements Device Type (0022,1009) is OPTICAL.  | ALWAYS | AUTO   |
| >>>>(0022,1155) | 1C   | FL | Signal to Noise Ratio                                 | The ratio of signal power to the background noise power (P signal/ P noise). Required if Ophthalmic Axial Length Measurements Type (0022,1010) is TOTAL LENGTH. May be present otherwise.<br>IOLMaster 700 does not provide a SNR by design.<br>Always "NAN" (not a number) for TOTAL LENGTH measurement items. | ALWAYS | AUTO   |

|                  |    |    |   |   |        |      |
|------------------|----|----|---|---|--------|------|
| >>>>(0022,1150)  | 1  | SQ | Ophthalmic Axial Length Data Source Code Sequence               | The source of the value in Ophthalmic Axial Length (0022,1019). Only a single Item shall be included in this sequence.<br>The application software uses (0022,1150) Ophthalmic Axial Length Data Source Code Sequence to specify detailed information on the scan angle at which the measurement has been performed.  | ALWAYS | AUTO |
| >>>>>(0008,0100) | 1  | SH | Code Value  | For possible values see section 8.3 Coded Terminology And Templates - Table 8-87 Coded Values -   | ALWAYS | AUTO |
| >>>>>(0008,0102) | 1  | SH | Coding Scheme Designator  | For possible values see section 8.3 Coded Terminology And Templates - Table 8-87 Coded Values -   | ALWAYS | AUTO |
| >>>>>(0008,0103) | 1C | SH | Coding Scheme Version   | For possible values see section 8.3 Coded Terminology And Templates - Table 8-87 Coded Values -   | ALWAYS | AUTO |
| >>>>>(0008,0104) | 1  | LO | Code Meaning  | For possible values see section 8.3 Coded Terminology And Templates - Table 8-87 Coded Values -   | ALWAYS | AUTO |
| >>>(0022,1019)   | 1  | FL | Ophthalmic Axial Length   | The axial length measurement acquired, in mm. The type of measurement is specified in the Ophthalmic Axial Length Measurements Type (0022,1010). See NEMA PS3.3 sections C.8.25.14.1.1.3 and C.8.25.14.1.1.4 for further explanation.   | ALWAYS | AUTO |
| >>>(0022,1140)   | 1  | CS | Ophthalmic Axial Length Measurement Modified                    | Whether or not the clinician intervened to modify the output of the device. For example by forcing it to select a different peak in the display. Enumerated Values: YES NO<br><br>Always "NO"   | ALWAYS | AUTO |
| >>>(0022,1101)   | 1  | SQ | Ophthalmic Axial Length Measurements Segment Name Code Sequence | The name of the segment measured. See NEMA PS3.3 section C.8.25.14.1.1.4 for further explanation. Only a single Item shall be included in this sequence.<br>The application software uses (0022,1101) Ophthalmic Axial Length Measurements Segment Name Code Sequence to specify detailed information on the axial length segment of a patient's eye which has been measured. | ALWAYS | AUTO |
| >>>>>(0008,0100) | 1  | SH | Code Value  | For possible values see section 8.3 Coded Terminology And Templates - Table 8-80 Coded Values - Ophthalmic Axial Length Measurements Segment Names  | ALWAYS | AUTO |
| >>>>>(0008,0102) | 1  | SH | Coding Scheme Designator  | For possible values see section 8.3 Coded Terminology And Templates - Table 8-80 Coded Values - Ophthalmic Axial Length Measurements Segment Names  | ALWAYS | AUTO |
| >>>>>(0008,0103) | 1C | SH | Coding Scheme Version   | For possible values see section 8.3 Coded Terminology And Templates - Table 8-80 Coded Values - Ophthalmic Axial Length Measurements Segment Names  | ALWAYS | AUTO |

|                  |    |    |   |   |        |      |
|------------------|----|----|---|---|--------|------|
| >>>>(0008,0104)  | 1  | LO | Code Meaning  | For possible values see section 8.3 Coded Terminology And Templates - Table 8-80 Coded Values - Ophthalmic Axial Length Measurements Segment Names  | ALWAYS | AUTO |
| >>>(0022,1225)   | 1C | SQ | Optical Ophthalmic Axial Length Measurements Sequence | Related information about an axial length measurement being performed on an optical device. Only a single Item shall be included in this sequence. Required if Ophthalmic Axial Length Measurements Device Type (0022,1009) is OPTICAL.   | ALWAYS | AUTO |
| >>>>(0022,1150)  | 1  | SQ | Ophthalmic Axial Length Data Source Code Sequence     | The source of the value in Ophthalmic Axial Length (0022,1019). Only a single Item shall be included in this sequence.<br>The application software uses (0022,1150) Ophthalmic Axial Length Data Source Code Sequence to specify detailed information on the scan angle at which the measurement has been performed.  | ALWAYS | AUTO |
| >>>>>(0008,0100) | 1  | SH | Code Value  | For possible values see section 8.3 Coded Terminology And Templates - Table 8-87 Coded Values -   | ALWAYS | AUTO |
| >>>>>(0008,0102) | 1  | SH | Coding Scheme Designator                              | For possible values see section 8.3 Coded Terminology And Templates - Table 8-87 Coded Values -   | ALWAYS | AUTO |
| >>>>>(0008,0103) | 1C | SH | Coding Scheme Version                                 | For possible values see section 8.3 Coded Terminology And Templates - Table 8-87 Coded Values -   | ALWAYS | AUTO |
| >>>>>(0008,0104) | 1  | LO | Code Meaning  | For possible values see section 8.3 Coded Terminology And Templates - Table 8-87 Coded Values -   | ALWAYS | AUTO |
| >>>>(0022,1159)  | 3  | LO | Ophthalmic Axial Length Data Source Description       | A free text description of the axial length measurement data source.  | ALWAYS | AUTO |
| >(0022,1255)     | 1C | SQ | Optical Selected Ophthalmic Axial Length Sequence     | Information related to the selected axial length measurement(s) of the patient's eye when acquired on an optical device. One or more items shall be included in this sequence. Required if Ophthalmic Axial Length Measurements Device Type (0022,1009) is OPTICAL.<br>Application software processes all single measurements performed for a patient's eye to calculate a representative composite result. These composite values are stored to (0022,1255) Optical Selected Ophthalmic Axial Length Sequence. Depending on successful processing and calculation this sequence will contain one TOTAL LENGTH item for the selected total length and one SEGMENTAL LENGTH item for the selected segmental lengths. | ALWAYS | AUTO |
| >>(0022,1260)    | 1C | SQ | Selected Total Ophthalmic Axial Length Sequence       | Total axial length measurement selected for the patient's eye. Required if Ophthalmic Axial Length Measurements Type (0022,1010) is TOTAL LENGTH. Only a single Item shall be included in this sequence.  | ALWAYS | AUTO |

|                  |    |    |  |  |        |      |
|------------------|----|----|--|--|--------|------|
|                  |    |    |  | Sequence exists for TOTAL LENGTH composite value.  |        |      |
| >>>(0022,1019)   | 1  | FL | Ophthalmic Axial Length  | The axial length measurement, in mm. The type of measurement is specified in the Ophthalmic Axial Length Measurements Type (0022,1010). See NEMA PS3.3 sections C.8.25.14.1.1.3 and C.8.25.14.1.1.4 for further explanation.   | ALWAYS | AUTO |
| >>>(0022,1330)   | 1  | SQ | Referenced Ophthalmic Axial Length Measurement QC Image Sequence | Reference to the quality control image associated with this measurement. Only a single Item shall be included in this sequence. See NEMA PS3.3 section C.8.25.14.1.1.6 for further explanation.  | ALWAYS | AUTO |
| >>>>(0008,1150)  | 1  | UI | Referenced SOP Class UID   | Uniquely identifies the referenced SOP Class. Enumerated Values:<br>"1.2.840.10008.5.1.4.1.1.7.2" = Multi-frame Grayscale Byte Secondary Capture Image Storage<br>"1.2.840.10008.5.1.4.1.1.7.4" = Multi-frame True Color Secondary Capture Image Storage<br><br>Always "1.2.840.10008.5.1.4.1.1.7.4" | ALWAYS | AUTO |
| >>>>(0008,1155)  | 1  | UI | Referenced SOP Instance UID                                      | Uniquely identifies the referenced SOP Instance.   | ALWAYS | AUTO |
| >>>>(0008,1160)  | 1  | IS | Referenced Frame Number  | Identifies the frame number within the Referenced SOP Instance to which the reference applies. The first frame shall be denoted as frame number 1. Only a single value shall exist. Note: This Attribute is a multi-value field but for this Macro it can only contain one value.                    | ALWAYS | AUTO |
| >>>(0022,1262)   | 1  | SQ | Ophthalmic Axial Length Quality Metric Sequence                  | Information about the quality metric applied to Ophthalmic Axial Length (0022,1019). Only a single Item shall be included in this sequence.  | ALWAYS | AUTO |
| >>>>(0040,A043)  | 1  | SQ | Concept Name Code Sequence                                       | Type of metric used to evaluate the quality of the ophthalmic axial length. Only a single Item shall be included in this sequence.   | ALWAYS | AUTO |
| >>>>>(0008,0100) | 1  | SH | Code Value   | For possible values see section 8.3 Coded Terminology And Templates - Table 8-89 Coded Values -  | ALWAYS | AUTO |
| >>>>>(0008,0102) | 1  | SH | Coding Scheme Designator   | For possible values see section 8.3 Coded Terminology And Templates - Table 8-89 Coded Values -  | ALWAYS | AUTO |
| >>>>>(0008,0103) | 1C | SH | Coding Scheme Version  | For possible values see section 8.3 Coded Terminology And Templates - Table 8-89 Coded Values -  | ALWAYS | AUTO |
| >>>>>(0008,0104) | 1  | LO | Code Meaning   | For possible values see section 8.3 Coded Terminology And Templates - Table 8-89 Coded Values -  | ALWAYS | AUTO |

|                  |    |    |   |   |        |      |
|------------------|----|----|---|---|--------|------|
| >>>>(0040,A30A)  | 1  | DS | Numeric Value   | Value for quality metric applied to axial length values.  | ALWAYS | AUTO |
| >>>>(0040,08EA)  | 1  | SQ | Measurement Units Code Sequence                                 | Units of Numeric Value (0040,A30A). Only a single Item shall be included in this sequence.  | ALWAYS | AUTO |
| >>>>>(0008,0100) | 1  | SH | Code Value  | Always "1"  | ALWAYS | AUTO |
| >>>>>(0008,0102) | 1  | SH | Coding Scheme Designator  | Always "UCUM"   | ALWAYS | AUTO |
| >>>>>(0008,0104) | 1  | LO | Code Meaning  | Always "no units"   | ALWAYS | AUTO |
| >>(0022,1257)    | 1C | SQ | Selected Segmental Ophthalmic Axial Length Sequence             | Segmental axial length measurement(s) selected for the patient's eye. One or more items shall be included in this sequence. Required if Ophthalmic Axial Length Measurements Type (0022,1010) is SEGMENTAL LENGTH. May be present otherwise. Sequence exists for SEGMENTAL LENGTH composite value.  | ALWAYS | AUTO |
| >>>(0022,1101)   | 1  | SQ | Ophthalmic Axial Length Measurements Segment Name Code Sequence | The name of the segment measured. See NEMA PS3.3 section C.8.25.14.1.1.4 for further explanation. Only a single Item shall be included in this sequence.<br>The application software uses (0022,1101) Ophthalmic Axial Length Measurements Segment Name Code Sequence to specify detailed information on the axial length segment of a patient's eye which has been measured. | ALWAYS | AUTO |
| >>>>(0008,0100)  | 1  | SH | Code Value  | For possible values see section 8.3 Coded Terminology And Templates - Table 8-80 Coded Values - Ophthalmic Axial Length Measurements Segment Names  | ALWAYS | AUTO |
| >>>>(0008,0102)  | 1  | SH | Coding Scheme Designator  | For possible values see section 8.3 Coded Terminology And Templates - Table 8-80 Coded Values - Ophthalmic Axial Length Measurements Segment Names  | ALWAYS | AUTO |
| >>>>(0008,0103)  | 1C | SH | Coding Scheme Version   | For possible values see section 8.3 Coded Terminology And Templates - Table 8-80 Coded Values - Ophthalmic Axial Length Measurements Segment Names  | ALWAYS | AUTO |
| >>>>(0008,0104)  | 1  | LO | Code Meaning  | For possible values see section 8.3 Coded Terminology And Templates - Table 8-80 Coded Values - Ophthalmic Axial Length Measurements Segment Names  | ALWAYS | AUTO |
| >>>(0022,1019)   | 1  | FL | Ophthalmic Axial Length   | The axial length measurement, in mm. The type of measurement is specified in the Ophthalmic Axial Length Measurements Type (0022,1010). See sections C.8.25.14.1.1.3 and C.8.25.14.1.1.4 for further explanation.   | ALWAYS | AUTO |
| >>>(0022,1330)   | 1  | SQ | Referenced Ophthalmic Axial Length                              | Reference to the quality control image associated with this measurement. Only a single Item shall be included in this sequence. See NEMA PS3.3 section C.8.25.14.1.1.6 for further explanation.   | ALWAYS | AUTO |

|                  |    |    |   |  |        |      |
|------------------|----|----|---|--|--------|------|
|                  |    |    | Measurement QC Image Sequence                   |  |        |      |
| >>>>(0008,1150)  | 1  | UI | Referenced SOP Class UID                        | Uniquely identifies the referenced SOP Class. Enumerated Values:<br>"1.2.840.10008.5.1.4.1.1.7.2" = Multi-frame Grayscale Byte Secondary Capture Image Storage<br>"1.2.840.10008.5.1.4.1.1.7.4" = Multi-frame True Color Secondary Capture Image Storage<br><br>Always "1.2.840.10008.5.1.4.1.1.7.4" | ALWAYS | AUTO |
| >>>>(0008,1155)  | 1  | UI | Referenced SOP Instance UID                     | Uniquely identifies the referenced SOP Instance.   | ALWAYS | AUTO |
| >>>>(0008,1160)  | 1  | IS | Referenced Frame Number                         | Identifies the frame number within the Referenced SOP Instance to which the reference applies. The first frame shall be denoted as frame number 1. Only a single value shall exist. Note: This Attribute is a multi-value field but for this Macro it can only contain one value.                    | ALWAYS | AUTO |
| >>>(0022,1262)   | 1  | SQ | Ophthalmic Axial Length Quality Metric Sequence | Information about the quality metric applied to Ophthalmic Axial Length (0022,1019). Only a single Item shall be included in this sequence.  | ALWAYS | AUTO |
| >>>>(0040,A043)  | 1  | SQ | Concept Name Code Sequence                      | Type of metric used to evaluate the quality of the ophthalmic axial length. Only a single Item shall be included in this sequence.   | ALWAYS | AUTO |
| >>>>>(0008,0100) | 1  | SH | Code Value                                      | For possible values see section 8.3 Coded Terminology And Templates - Table 8-89 Coded Values -  | ALWAYS | AUTO |
| >>>>>(0008,0102) | 1  | SH | Coding Scheme Designator                        | For possible values see section 8.3 Coded Terminology And Templates - Table 8-89 Coded Values -  | ALWAYS | AUTO |
| >>>>>(0008,0103) | 1C | SH | Coding Scheme Version                           | For possible values see section 8.3 Coded Terminology And Templates - Table 8-89 Coded Values -  | ALWAYS | AUTO |
| >>>>>(0008,0104) | 1  | LO | Code Meaning                                    | For possible values see section 8.3 Coded Terminology And Templates - Table 8-89 Coded Values -  | ALWAYS | AUTO |
| >>>>(0040,A30A)  | 1  | DS | Numeric Value                                   | Value for quality metric applied to axial length values.   | ALWAYS | AUTO |
| >>>>(0040,08EA)  | 1  | SQ | Measurement Units Code Sequence                 | Units of Numeric Value (0040,A30A). Only a single Item shall be included in this sequence.   | ALWAYS | AUTO |
| >>>>>(0008,0100) | 1  | SH | Code Value                                      | Always "1"   | ALWAYS | AUTO |



|                 |    |    |   |   |        |      |
|-----------------|----|----|---|---|--------|------|
| >>>>(0008,0102) | 1  | SH | Coding Scheme Designator                              | Always "UCUM"   | ALWAYS | AUTO |
| >>>>(0008,0104) | 1  | LO | Code Meaning  | Always "no units"   | ALWAYS | AUTO |
| (0022,1008)     | 1C | SQ | Ophthalmic Axial Measurements Left Eye Sequence       | Axial measurements of a patient's left eye. Only a single Item shall be included in this sequence. Required if the left eye is measured.  | ANAP   | AUTO |
| >(0022,1025)    | 1  | SQ | Vitreous Status Code Sequence                         | Status of the vitreous cavity. See NEMA PS3.3 section C.8.25.14.1.1.2 for further explanation. Only a single Item shall be included in this sequence.   | ALWAYS | AUTO |
| >>(0008,0100)   | 1  | SH | Code Value  | For possible values see section 8.3 Coded Terminology And Templates - Table 8-87 Coded Values -   | ALWAYS | USER |
| >>(0008,0102)   | 1  | SH | Coding Scheme Designator                              | For possible values see section 8.3 Coded Terminology And Templates - Table 8-87 Coded Values -   | ALWAYS | USER |
| >>(0008,0103)   | 1C | SH | Coding Scheme Version                                 | For possible values see section 8.3 Coded Terminology And Templates - Table 8-87 Coded Values -   | ALWAYS | USER |
| >>(0008,0104)   | 1  | LO | Code Meaning  | For possible values see section 8.3 Coded Terminology And Templates - Table 8-87 Coded Values -   | ALWAYS | USER |
| >(0022,000D)    | 2  | CS | Pupil Dilated   | Whether or not the patient's pupils were pharmacologically dilated for this acquisition<br>Enumerated Values: YES NO If this tag is empty, no information is available.<br><br>Always empty.  | EMPTY  | AUTO |
| >>>(0022,1225)  | 1C | SQ | Optical Ophthalmic Axial Length Measurements Sequence | Related information about an axial length measurement being performed on an optical device. Only a single Item shall be included in this sequence. Required if Ophthalmic Axial Measurements Device Type (0022,1009) is OPTICAL.  | ALWAYS | AUTO |
| >>>>(0022,1155) | 1C | FL | Signal to Noise Ratio                                 | The ratio of signal power to the background noise power (P signal/ P noise). Required if Ophthalmic Axial Length Measurements Type (0022,1010) is TOTAL LENGTH. May be present otherwise.<br>IOLMaster 700 does not provide a SNR by design.<br>Always "NAN" (not a number) for TOTAL LENGTH measurement items. | ALWAYS | AUTO |

|                  |    |    |   |   |        |      |
|------------------|----|----|---|---|--------|------|
| >>>>(0022,1150)  | 1  | SQ | Ophthalmic Axial Length Data Source Code Sequence               | The source of the value in Ophthalmic Axial Length (0022,1019). Only a single Item shall be included in this sequence.<br>The application software uses (0022,1150) Ophthalmic Axial Length Data Source Code Sequence to specify detailed information on the scan angle at which the measurement has been performed.  | ALWAYS | AUTO |
| >>>>>(0008,0100) | 1  | SH | Code Value  | For possible values see section 8.3 Coded Terminology And Templates - Table 8-87 Coded Values -   | ALWAYS | AUTO |
| >>>>>(0008,0102) | 1  | SH | Coding Scheme Designator  | For possible values see section 8.3 Coded Terminology And Templates - Table 8-87 Coded Values -   | ALWAYS | AUTO |
| >>>>>(0008,0103) | 1C | SH | Coding Scheme Version   | For possible values see section 8.3 Coded Terminology And Templates - Table 8-87 Coded Values -   | ALWAYS | AUTO |
| >>>>>(0008,0104) | 1  | LO | Code Meaning  | For possible values see section 8.3 Coded Terminology And Templates - Table 8-87 Coded Values -   | ALWAYS | AUTO |
| >>>(0022,1019)   | 1  | FL | Ophthalmic Axial Length   | The axial length measurement acquired, in mm. The type of measurement is specified in the Ophthalmic Axial Length Measurements Type (0022,1010). See NEMA PS3.3 sections C.8.25.14.1.1.3 and C.8.25.14.1.1.4 for further explanation.   | ALWAYS | AUTO |
| >>>(0022,1140)   | 1  | CS | Ophthalmic Axial Length Measurement Modified                    | Whether or not the clinician intervened to modify the output of the device. For example by forcing it to select a different peak in the display. Enumerated Values: YES NO<br><br>Always "NO"   | ALWAYS | AUTO |
| >>>(0022,1101)   | 1  | SQ | Ophthalmic Axial Length Measurements Segment Name Code Sequence | The name of the segment measured. See NEMA PS3.3 section C.8.25.14.1.1.4 for further explanation. Only a single Item shall be included in this sequence.<br>The application software uses (0022,1101) Ophthalmic Axial Length Measurements Segment Name Code Sequence to specify detailed information on the axial length segment of a patient's eye which has been measured. | ALWAYS | AUTO |
| >>>>>(0008,0100) | 1  | SH | Code Value  | For possible values see section 8.3 Coded Terminology And Templates - Table 8-80 Coded Values - Ophthalmic Axial Length Measurements Segment Names  | ALWAYS | AUTO |
| >>>>>(0008,0102) | 1  | SH | Coding Scheme Designator  | For possible values see section 8.3 Coded Terminology And Templates - Table 8-80 Coded Values - Ophthalmic Axial Length Measurements Segment Names  | ALWAYS | AUTO |
| >>>>>(0008,0103) | 1C | SH | Coding Scheme Version   | For possible values see section 8.3 Coded Terminology And Templates - Table 8-80 Coded Values - Ophthalmic Axial Length Measurements Segment Names  | ALWAYS | AUTO |

|                  |    |    |   |   |        |      |
|------------------|----|----|---|---|--------|------|
| >>>>(0008,0104)  | 1  | LO | Code Meaning  | For possible values see section 8.3 Coded Terminology And Templates - Table 8-80 Coded Values - Ophthalmic Axial Length Measurements Segment Names  | ALWAYS | AUTO |
| >>>(0022,1225)   | 1C | SQ | Optical Ophthalmic Axial Length Measurements Sequence | Related information about an axial length measurement being performed on an optical device. Only a single Item shall be included in this sequence. Required if Ophthalmic Axial Length Measurements Device Type (0022,1009) is OPTICAL.   | ALWAYS | AUTO |
| >>>>(0022,1150)  | 1  | SQ | Ophthalmic Axial Length Data Source Code Sequence     | The source of the value in Ophthalmic Axial Length (0022,1019). Only a single Item shall be included in this sequence.<br>The application software uses (0022,1150) Ophthalmic Axial Length Data Source Code Sequence to specify detailed information on the scan angle at which the measurement has been performed.  | ALWAYS | AUTO |
| >>>>>(0008,0100) | 1  | SH | Code Value  | For possible values see section 8.3 Coded Terminology And Templates - Table 8-87 Coded Values -   | ALWAYS | AUTO |
| >>>>>(0008,0102) | 1  | SH | Coding Scheme Designator                              | For possible values see section 8.3 Coded Terminology And Templates - Table 8-87 Coded Values -   | ALWAYS | AUTO |
| >>>>>(0008,0103) | 1C | SH | Coding Scheme Version                                 | For possible values see section 8.3 Coded Terminology And Templates - Table 8-87 Coded Values -   | ALWAYS | AUTO |
| >>>>>(0008,0104) | 1  | LO | Code Meaning  | For possible values see section 8.3 Coded Terminology And Templates - Table 8-87 Coded Values -   | ALWAYS | AUTO |
| >>>>(0022,1159)  | 3  | LO | Ophthalmic Axial Length Data Source Description       | A free text description of the axial length measurement data source.  | ALWAYS | AUTO |
| >(0022,1255)     | 1C | SQ | Optical Selected Ophthalmic Axial Length Sequence     | Information related to the selected axial length measurement(s) of the patient's eye when acquired on an optical device. One or more items shall be included in this sequence. Required if Ophthalmic Axial Length Measurements Device Type (0022,1009) is OPTICAL.<br>Application software processes all single measurements performed for a patient's eye to calculate a representative composite result. These composite values are stored to (0022,1255) Optical Selected Ophthalmic Axial Length Sequence. Depending on successful processing and calculation this sequence will contain one TOTAL LENGTH item for the selected total length and one SEGMENTAL LENGTH item for the selected segmental lengths. | ALWAYS | AUTO |
| >>(0022,1260)    | 1C | SQ | Selected Total Ophthalmic Axial Length Sequence       | Total axial length measurement selected for the patient's eye. Required if Ophthalmic Axial Length Measurements Type (0022,1010) is TOTAL LENGTH. Only a single Item shall be included in this sequence.  | ALWAYS | AUTO |

|                  |    |    |  |  |        |      |
|------------------|----|----|--|--|--------|------|
|                  |    |    |  | Sequence exists for TOTAL LENGTH composite value.  |        |      |
| >>>(0022,1019)   | 1  | FL | Ophthalmic Axial Length  | The axial length measurement, in mm. The type of measurement is specified in the Ophthalmic Axial Length Measurements Type (0022,1010). See NEMA PS3.3 sections C.8.25.14.1.1.3 and C.8.25.14.1.1.4 for further explanation.   | ALWAYS | AUTO |
| >>>(0022,1330)   | 1  | SQ | Referenced Ophthalmic Axial Length Measurement QC Image Sequence | Reference to the quality control image associated with this measurement. Only a single Item shall be included in this sequence. See NEMA PS3.3 section C.8.25.14.1.1.6 for further explanation.  | ALWAYS | AUTO |
| >>>>(0008,1150)  | 1  | UI | Referenced SOP Class UID   | Uniquely identifies the referenced SOP Class. Enumerated Values:<br>"1.2.840.10008.5.1.4.1.1.7.2" = Multi-frame Grayscale Byte Secondary Capture Image Storage<br>"1.2.840.10008.5.1.4.1.1.7.4" = Multi-frame True Color Secondary Capture Image Storage<br><br>Always "1.2.840.10008.5.1.4.1.1.7.4" | ALWAYS | AUTO |
| >>>>(0008,1155)  | 1  | UI | Referenced SOP Instance UID                                      | Uniquely identifies the referenced SOP Instance.   | ALWAYS | AUTO |
| >>>>(0008,1160)  | 1  | IS | Referenced Frame Number  | Identifies the frame number within the Referenced SOP Instance to which the reference applies. The first frame shall be denoted as frame number 1. Only a single value shall exist. Note: This Attribute is a multi-value field but for this Macro it can only contain one value.                    | ALWAYS | AUTO |
| >>>(0022,1262)   | 1  | SQ | Ophthalmic Axial Length Quality Metric Sequence                  | Information about the quality metric applied to Ophthalmic Axial Length (0022,1019). Only a single Item shall be included in this sequence.  | ALWAYS | AUTO |
| >>>>(0040,A043)  | 1  | SQ | Concept Name Code Sequence                                       | Type of metric used to evaluate the quality of the ophthalmic axial length. Only a single Item shall be included in this sequence.   | ALWAYS | AUTO |
| >>>>>(0008,0100) | 1  | SH | Code Value   | For possible values see section 8.3 Coded Terminology And Templates - Table 8-89 Coded Values -  | ALWAYS | AUTO |
| >>>>>(0008,0102) | 1  | SH | Coding Scheme Designator   | For possible values see section 8.3 Coded Terminology And Templates - Table 8-89 Coded Values -  | ALWAYS | AUTO |
| >>>>>(0008,0103) | 1C | SH | Coding Scheme Version  | For possible values see section 8.3 Coded Terminology And Templates - Table 8-89 Coded Values -  | ALWAYS | AUTO |
| >>>>>(0008,0104) | 1  | LO | Code Meaning   | For possible values see section 8.3 Coded Terminology And Templates - Table 8-89 Coded Values -  | ALWAYS | AUTO |

|                  |    |    |   |   |        |      |
|------------------|----|----|---|---|--------|------|
| >>>>(0040,A30A)  | 1  | DS | Numeric Value   | Value for quality metric applied to axial length values.  | ALWAYS | AUTO |
| >>>>(0040,08EA)  | 1  | SQ | Measurement Units Code Sequence                                 | Units of Numeric Value (0040,A30A). Only a single Item shall be included in this sequence.  | ALWAYS | AUTO |
| >>>>>(0008,0100) | 1  | SH | Code Value  | Always "1"  | ALWAYS | AUTO |
| >>>>>(0008,0102) | 1  | SH | Coding Scheme Designator  | Always "UCUM"   | ALWAYS | AUTO |
| >>>>>(0008,0104) | 1  | LO | Code Meaning  | Always "no units"   | ALWAYS | AUTO |
| >>(0022,1257)    | 1C | SQ | Selected Segmental Ophthalmic Axial Length Sequence             | Segmental axial length measurement(s) selected for the patient's eye. One or more items shall be included in this sequence. Required if Ophthalmic Axial Length Measurements Type (0022,1010) is SEGMENTAL LENGTH. May be present otherwise. Sequence exists for SEGMENTAL LENGTH composite value.  | ALWAYS | AUTO |
| >>>(0022,1101)   | 1  | SQ | Ophthalmic Axial Length Measurements Segment Name Code Sequence | The name of the segment measured. See NEMA PS3.3 section C.8.25.14.1.1.4 for further explanation. Only a single Item shall be included in this sequence.<br>The application software uses (0022,1101) Ophthalmic Axial Length Measurements Segment Name Code Sequence to specify detailed information on the axial length segment of a patient's eye which has been measured. | ALWAYS | AUTO |
| >>>>(0008,0100)  | 1  | SH | Code Value  | For possible values see section 8.3 Coded Terminology And Templates - Table 8-80 Coded Values - Ophthalmic Axial Length Measurements Segment Names  | ALWAYS | AUTO |
| >>>>(0008,0102)  | 1  | SH | Coding Scheme Designator  | For possible values see section 8.3 Coded Terminology And Templates - Table 8-80 Coded Values - Ophthalmic Axial Length Measurements Segment Names  | ALWAYS | AUTO |
| >>>>(0008,0103)  | 1C | SH | Coding Scheme Version   | For possible values see section 8.3 Coded Terminology And Templates - Table 8-80 Coded Values - Ophthalmic Axial Length Measurements Segment Names  | ALWAYS | AUTO |
| >>>>(0008,0104)  | 1  | LO | Code Meaning  | For possible values see section 8.3 Coded Terminology And Templates - Table 8-80 Coded Values - Ophthalmic Axial Length Measurements Segment Names  | ALWAYS | AUTO |
| >>>(0022,1019)   | 1  | FL | Ophthalmic Axial Length   | The axial length measurement, in mm. The type of measurement is specified in the Ophthalmic Axial Length Measurements Type (0022,1010). See sections C.8.25.14.1.1.3 and C.8.25.14.1.1.4 for further explanation.   | ALWAYS | AUTO |
| >>>(0022,1330)   | 1  | SQ | Referenced Ophthalmic Axial Length                              | Reference to the quality control image associated with this measurement. Only a single Item shall be included in this sequence. See NEMA PS3.3 section C.8.25.14.1.1.6 for further explanation.   | ALWAYS | AUTO |

|                  |    |    |   |  |        |      |
|------------------|----|----|---|--|--------|------|
|                  |    |    | Measurement QC Image Sequence                   |  |        |      |
| >>>>(0008,1150)  | 1  | UI | Referenced SOP Class UID                        | Uniquely identifies the referenced SOP Class. Enumerated Values:<br>"1.2.840.10008.5.1.4.1.1.7.2" = Multi-frame Grayscale Byte Secondary Capture Image Storage<br>"1.2.840.10008.5.1.4.1.1.7.4" = Multi-frame True Color Secondary Capture Image Storage<br><br>Always "1.2.840.10008.5.1.4.1.1.7.4" | ALWAYS | AUTO |
| >>>>(0008,1155)  | 1  | UI | Referenced SOP Instance UID                     | Uniquely identifies the referenced SOP Instance.   | ALWAYS | AUTO |
| >>>>(0008,1160)  | 1  | IS | Referenced Frame Number                         | Identifies the frame number within the Referenced SOP Instance to which the reference applies. The first frame shall be denoted as frame number 1. Only a single value shall exist. Note: This Attribute is a multi-value field but for this Macro it can only contain one value.                    | ALWAYS | AUTO |
| >>>(0022,1262)   | 1  | SQ | Ophthalmic Axial Length Quality Metric Sequence | Information about the quality metric applied to Ophthalmic Axial Length (0022,1019). Only a single Item shall be included in this sequence.  | ALWAYS | AUTO |
| >>>>(0040,A043)  | 1  | SQ | Concept Name Code Sequence                      | Type of metric used to evaluate the quality of the ophthalmic axial length. Only a single Item shall be included in this sequence.   | ALWAYS | AUTO |
| >>>>>(0008,0100) | 1  | SH | Code Value                                      | For possible values see section 8.3 Coded Terminology And Templates - Table 8-89 Coded Values -  | ALWAYS | AUTO |
| >>>>>(0008,0102) | 1  | SH | Coding Scheme Designator                        | For possible values see section 8.3 Coded Terminology And Templates - Table 8-89 Coded Values -  | ALWAYS | AUTO |
| >>>>>(0008,0103) | 1C | SH | Coding Scheme Version                           | For possible values see section 8.3 Coded Terminology And Templates - Table 8-89 Coded Values -  | ALWAYS | AUTO |
| >>>>>(0008,0104) | 1  | LO | Code Meaning                                    | For possible values see section 8.3 Coded Terminology And Templates - Table 8-89 Coded Values -  | ALWAYS | AUTO |
| >>>>(0040,A30A)  | 1  | DS | Numeric Value                                   | Value for quality metric applied to axial length values.   | ALWAYS | AUTO |
| >>>>(0040,08EA)  | 1  | SQ | Measurement Units Code Sequence                 | Units of Numeric Value (0040,A30A). Only a single Item shall be included in this sequence.   | ALWAYS | AUTO |
| >>>>>(0008,0100) | 1  | SH | Code Value                                      | Always "1"   | ALWAYS | AUTO |

|                  |   |    |                          |                   |        |      |
|------------------|---|----|--------------------------|-------------------|--------|------|
| >>>>>(0008,0102) | 1 | SH | Coding Scheme Designator | Always "UCUM"     | ALWAYS | AUTO |
| >>>>>(0008,0104) | 1 | LO | Code Meaning             | Always "no units" | ALWAYS | AUTO |

**Table 8-37 Ophthalmic Axial Measurements IOD - Module "Sop Common"**

| Tag          | Type | VR | Name                               | Description   | PoV    | Source       |
|--------------|------|----|------------------------------------|---|--------|--------------|
| (0008,0016)  | 1    | UI | SOP Class UID                      | Uniquely identifies the SOP Class. See NEMA PS3.3 C.12.1.1.1 for further explanation. See also PS 3.4.<br><br>Always "1.2.840.10008.5.1.4.1.1.78.7"   | ALWAYS | AUTO         |
| (0008,0018)  | 1    | UI | SOP Instance UID                   | Uniquely identifies the SOP Instance. See NEMA PS3.3 C.12.1.1.1 for further explanation. See also PS 3.4.<br><br>IOLMaster 700 uses a constant prefix of "1.2.276.0.75.2.1.11.1.3." followed by a date/time stamp and machine specific identifier.  | ALWAYS | AUTO         |
| (0008,0005)  | 1C   | CS | Specific Character Set             | 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.<br><br>See 6 Support of Character Sets.   | ALWAYS | AUTO, CONFIG |
| (0008,0012)  | 3    | DA | Instance Creation Date             | Date the SOP Instance was created.  | ALWAYS | AUTO         |
| (0008,0013)  | 3    | TM | Instance Creation Time             | Time the SOP Instance was created.  | ALWAYS | AUTO         |
| (0018,A001)  | 3    | SQ | Contributing Equipment Sequence    | Sequence of Items containing descriptive attributes of related equipment which has contributed to the acquisition, creation or modification of the composite instance. One or more Items may be included in this Sequence. See NEMA PS3.3 Section C.12.1.1.5 for further explanation.<br><br>Sequence contains one single item defining the equipment which originally acquired the measurement data. | ALWAYS | AUTO         |
| >(0040,A170) | 1    | SQ | Purpose of Reference Code Sequence | Describes the purpose for which the related equipment is being reference. Only a single Item shall be permitted in this sequence. See NEMA PS3.3 Section C.12.1.1.5 for further explanation.  | ALWAYS | AUTO         |

|               |   |    |                               |   |        |      |
|---------------|---|----|-------------------------------|---|--------|------|
| >>(0008,0100) | 1 | SH | Code Value                    | See NEMA PS3.3 Section 8.1.<br>Always "109101"  | ALWAYS | AUTO |
| >>(0008,0102) | 1 | SH | Coding Scheme Designator      | See NEMA PS3.3 Section 8.2.<br>Always "DCM"   | ALWAYS | AUTO |
| >>(0008,0104) | 1 | LO | Code Meaning                  | See NEMA PS3.3 Section 8.3.<br>Always "Acquisition Equipment"   | ALWAYS | AUTO |
| >(0008,0070)  | 1 | LO | Manufacturer                  | Manufacturer of the equipment that contributed to the composite instance.<br>Always "Carl Zeiss Meditec"  | ALWAYS | AUTO |
| >(0008,0080)  | 3 | LO | Institution Name              | Institution where the equipment that contributed to the composite instance is located.<br>Attribute does not exist if no Institution Name is defined for contributing equipment.                                | ANAP   | AUTO |
| >(0008,0081)  | 3 | ST | Institution Address           | Address of the institution where the equipment that contributed to the composite instance is located.<br>Attribute does not exist if no Institution Address is defined for contributing equipment.              | ANAP   | AUTO |
| >(0008,1010)  | 3 | SH | Station Name                  | User defined name identifying the machine that contributed to the composite instance.<br>Attribute does not exist if no Station Name is defined for contributing equipment.                                     | ANAP   | AUTO |
| >(0008,1040)  | 3 | LO | Institutional Department Name | Department in the institution where the equipment that contributed to the composite instance is located.<br>Attribute does not exist if no Institutional Department Name is defined for contributing equipment. | ANAP   | AUTO |
| >(0008,1090)  | 3 | LO | Manufacturer's Model Name     | Manufacturer's model name of the equipment that contributed to the composite instance.<br>Attribute does not exist if no Manufacturer's Model Name is defined for contributing equipment.                       | ANAP   | AUTO |
| >(0018,1000)  | 3 | LO | Device Serial Number          | Manufacturer's serial number of the equipment that contributed to the composite instance.<br>Attribute does not exist if no Device Serial Number is defined for contributing equipment.                         | ANAP   | AUTO |
| >(0018,1020)  | 3 | LO | Software Version(s)           | Manufacturer's designation of the software version of the equipment that contributed to the composite instance.<br>Attribute does not exist if no Software Version(s) is defined for contributing equipment.    | ANAP   | AUTO |



|              |   |    |                          |  |      |      |
|--------------|---|----|--------------------------|--|------|------|
| >(0018,1200) | 3 | DA | Date of Last Calibration | Date when the image acquisition device calibration was last changed in any way. Multiple entries may be used for additional calibrations at other times. See NEMA PS3.3 Section C.7.5.1.1.1 for further explanation.<br>Attribute does not exist if no Date of Last Calibration is defined for contributing equipment. | ANAP | AUTO |
| >(0018,1201) | 3 | TM | Time of Last Calibration | Time when the image acquisition device calibration was last changed in any way. Multiple entries may be used. See NEMA PS3.3 Section C.7.5.1.1.1 for further explanation.<br>Attribute does not exist if no Time of Last Calibration is defined for contributing equipment.  | ANAP | AUTO |

**Table 8-38 Ophthalmic Axial Measurements IOD - Module "CZM IOLM Clinical Patient Information"**

| Tag           | Type | VR | Name  | Description   | PoV    | Source |
|---------------|------|----|---|---|--------|--------|
| (1203,xx01)   | 3    | SQ | IOLMaster Clinical Patient Information Right Eye Sequence | Information used to represent ophthalmic clinical information during an ophthalmic measurement of a patient's right eye. Only a single item shall be included in this sequence. Required if Measurement Laterality (0024,0113) is R or B.   | ANAP   | AUTO   |
| >(1203,xx03)  | 3    | SQ | Refractive State Sequence                                 | Refractive state of the measured eye at the time of acquisition. Only one item shall be included in this sequence.  | ANAP   | AUTO   |
| >>(1203,xx04) | 1    | FD | Sphere Power  | Sphere value in diopters.   | ALWAYS | USER   |
| >>(1203,xx05) | 1    | FD | Cylinder Power  | Cylinder value in diopters.   | ALWAYS | USER   |
| >>(1203,xx06) | 1    | FD | Cylinder Axis   | Axis value in degrees.  | ALWAYS | USER   |
| >>(1203,xx07) | 1    | FD | Vertex Distance   | Vertex distance in millimeters  | ALWAYS | CONFIG |
| >(1203,xx08)  | 3    | SQ | Visual Acuity Sequence                                    | Visual acuity of a patient's eye at the time of measurement. Only one Item shall be included in this sequence.  | ANAP   | AUTO   |
| >>(1203,xx09) | 1    | FD | Decimal Visual Acuity                                     | A patient's visual acuity specified in decimal. See PS 3.17 Ophthalmic Refractive Reports Use Cases for guidance in converting Decimal Visual Acuity to other customarily used display notation such as 20/20 in the US and 6/6 in Britain. | ALWAYS | USER   |
| >(1203,xx0A)  | 3    | SQ | Refractive Surgery State Sequence                         | Refractive surgery state of a patient's eye at the time of measurement. Only one Item shall be included in this sequence.   | ANAP   | AUTO   |
| >>(1203,xx0B) | 1    | CS | Refractive Procedure Occurred                             | Whether or not a patient has had refractive surgery.<br>Enumerated Values: YES NO   | ALWAYS | USER   |

|                |    |    |  |  |        |        |
|----------------|----|----|--|--|--------|--------|
| >>(1203,xx0C)  | 2C | SQ | Refractive Surgery Type Code Sequence                    | Type of refractive surgery a patient has had. Zero or more Items shall be included in this sequence.<br>Required if the value of Refractive Procedure Occurred (1203,xx0B) is YES.   | VNAP   | USER   |
| >>>(1203,xx0D) | 1  | SH | Code Value   | For possible values see section 8.3 Coded Terminology And Templates - Table 8-81 Coded Values - Refractive Surgery Types   | ALWAYS | USER   |
| >>>(1203,xx0E) | 1  | SH | Coding Scheme Designator                                 | For possible values see section 8.3 Coded Terminology And Templates - Table 8-81 Coded Values - Refractive Surgery Types   | ALWAYS | USER   |
| >>>(1203,xx10) | 1  | LO | Code Meaning   | For possible values see section 8.3 Coded Terminology And Templates - Table 8-81 Coded Values - Refractive Surgery Types   | ALWAYS | USER   |
| (1203,xx02)    | 3  | SQ | IOLMaster Clinical Patient Information Left Eye Sequence | Information used to represent ophthalmic clinical information during an ophthalmic measurement of a patient's right eye. Only a single item shall be included in this sequence.<br>Required if Measurement Laterality (0024,0113) is R or B. | ANAP   | AUTO   |
| >(1203,xx03)   | 3  | SQ | Refractive State Sequence                                | Refractive state of the measured eye at the time of acquisition. Only one item shall be included in this sequence.   | ANAP   | AUTO   |
| >>(1203,xx04)  | 1  | FD | Sphere Power   | Sphere value in diopters.  | ALWAYS | USER   |
| >>(1203,xx05)  | 1  | FD | Cylinder Power   | Cylinder value in diopters.  | ALWAYS | USER   |
| >>(1203,xx06)  | 1  | FD | Cylinder Axis  | Axis value in degrees.   | ALWAYS | USER   |
| >>(1203,xx07)  | 1  | FD | Vertex Distance  | Vertex distance in millimeters   | ALWAYS | CONFIG |
| >(1203,xx08)   | 3  | SQ | Visual Acuity Sequence                                   | Visual acuity of a patient's eye at the time of measurement. Only one Item shall be included in this sequence.   | ANAP   | AUTO   |
| >>(1203,xx09)  | 1  | FD | Decimal Visual Acuity                                    | A patient's visual acuity specified in decimal. See PS 3.17 Ophthalmic Refractive Reports Use Cases for guidance in converting Decimal Visual Acuity to other customarily used display notation such as 20/20 in the US and 6/6 in Britain.  | ALWAYS | USER   |
| >(1203,xx0A)   | 3  | SQ | Refractive Surgery State Sequence                        | Refractive surgery state of a patient's eye at the time of measurement. Only one Item shall be included in this sequence.  | ANAP   | AUTO   |
| >>(1203,xx0B)  | 1  | CS | Refractive Procedure Occurred                            | Whether or not a patient has had refractive surgery.<br>Enumerated Values: YES NO  | ALWAYS | USER   |

|                |    |    |                                       |  |        |      |
|----------------|----|----|---------------------------------------|--|--------|------|
| >>(1203,xx0C)  | 2C | SQ | Refractive Surgery Type Code Sequence | Type of refractive surgery a patient has had. Zero or more Items shall be included in this sequence.<br>Required if the value of Refractive Procedure Occurred (1203,xx0B) is YES. | VNAP   | USER |
| >>>(1203,xx0D) | 1  | SH | Code Value                            | For possible values see section 8.3 Coded Terminology And Templates - Table 8-81 Coded Values - Refractive Surgery Types   | ALWAYS | USER |
| >>>(1203,xx0E) | 1  | SH | Coding Scheme Designator              | For possible values see section 8.3 Coded Terminology And Templates - Table 8-81 Coded Values - Refractive Surgery Types   | ALWAYS | USER |
| >>>(1203,xx10) | 1  | LO | Code Meaning                          | For possible values see section 8.3 Coded Terminology And Templates - Table 8-81 Coded Values - Refractive Surgery Types   | ALWAYS | USER |

#### 8.1.1.12 Keratometry Measurements Modules

**Table 8-39 Keratometry Measurements IOD - Module "Keratometry Measurements Series"**

| Tag         | Type | VR | Name     | Description   | PoV    | Source |
|-------------|------|----|----------|---|--------|--------|
| (0008,0060) | 1    | CS | Modality | Type of equipment that originally acquired the data used to create the images in this Series.<br>Enumerated Values: KER See NEMA PS3.3 Section C.7.3.1.1.1 for further explanation.<br><br>Always "KER" | ALWAYS | AUTO   |

**Table 8-40 Keratometry Measurements IOD - Module "Keratometry Measurements"**

| Tag          | Type | VR | Name                             | Description  | PoV    | Source |
|--------------|------|----|----------------------------------|--|--------|--------|
| (0046,0070)  | 1C   | SQ | Keratometry Right Eye Sequence   | A sequence that specifies keratometric measurements of a patient's right eye, defining principal meridians wherein the steepest meridian is separated by 90 degrees from the flattest. Only a single item shall be included in this sequence. Required if the right eye is measured. Note: Consideration for steep, flat, and spherical meridians is made. For instances where spherical keratometric measurements are obtained, values specified in the steep and flat Attributes are equivalent. | ANAP   | AUTO   |
| >(0046,0074) | 1    | SQ | Steep Keratometric Axis Sequence | 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   |

|               |    |    |                                  |  |        |      |
|---------------|----|----|----------------------------------|--|--------|------|
| >>(0046,0075) | 1  | FD | Radius of Curvature              | The radius of curvature of the principal meridians of the cornea, measured in mm.  | ALWAYS | AUTO |
| >>(0046,0076) | 1  | FD | Keratometric Power               | The refractive power of the cornea at the principal meridians, measured in diopters.   | ALWAYS | AUTO |
| >>(0046,0077) | 1  | FD | Keratometric Axis                | The meridian where the keratometric radius of curvature or power is measured, in degrees.  | ALWAYS | AUTO |
| >(0046,0080)  | 1  | SQ | Flat Keratometric Axis Sequence  | 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 |
| >>(0046,0075) | 1  | FD | Radius of Curvature              | The radius of curvature of the principal meridians of the cornea, measured in mm.  | ALWAYS | AUTO |
| >>(0046,0076) | 1  | FD | Keratometric Power               | The refractive power of the cornea at the principal meridians, measured in diopters.   | ALWAYS | AUTO |
| >>(0046,0077) | 1  | FD | Keratometric Axis                | The meridian where the keratometric radius of curvature or power is measured, in degrees.  | ALWAYS | AUTO |
| (0046,0071)   | 1C | SQ | Keratometry Left Eye Sequence    | A sequence that specifies keratometric measurements of a patient's left eye, defining principal meridians wherein the steepest meridian is separated by 90 degrees from the flattest. Only a single item shall be included in this sequence. Required if the left eye is measured. Note: See Note for attribute Keratometry Right Eye Sequence (0046,0070) | ANAP   | AUTO |
| >(0046,0074)  | 1  | SQ | Steep Keratometric Axis Sequence | 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 |
| >>(0046,0075) | 1  | FD | Radius of Curvature              | The radius of curvature of the principal meridians of the cornea, measured in mm.  | ALWAYS | AUTO |
| >>(0046,0076) | 1  | FD | Keratometric Power               | The refractive power of the cornea at the principal meridians, measured in diopters.   | ALWAYS | AUTO |
| >>(0046,0077) | 1  | FD | Keratometric Axis                | The meridian where the keratometric radius of curvature or power is measured, in degrees.  | ALWAYS | AUTO |
| >(0046,0080)  | 1  | SQ | Flat Keratometric Axis Sequence  | 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 |
| >>(0046,0075) | 1  | FD | Radius of Curvature              | The radius of curvature of the principal meridians of the cornea, measured in mm.  | ALWAYS | AUTO |
| >>(0046,0076) | 1  | FD | Keratometric Power               | The refractive power of the cornea at the principal meridians, measured in diopters.   | ALWAYS | AUTO |
| >>(0046,0077) | 1  | FD | Keratometric Axis                | The meridian where the keratometric radius of curvature or power is measured, in degrees.  | ALWAYS | AUTO |

**Table 8-41 Keratometry Measurements IOD - Module "Sop Common"**

| Tag           | Type | VR | Name                               | Description   | PoV    | Source       |
|---------------|------|----|------------------------------------|---|--------|--------------|
| (0008,0016)   | 1    | UI | SOP Class UID                      | Uniquely identifies the SOP Class. See NEMA PS3.3 C.12.1.1.1 for further explanation. See also PS 3.4.<br><br>Always "1.2.840.10008.5.1.4.1.1.78.3"   | ALWAYS | AUTO         |
| (0008,0018)   | 1    | UI | SOP Instance UID                   | Uniquely identifies the SOP Instance. See NEMA PS3.3 C.12.1.1.1 for further explanation. See also PS 3.4.<br><br>IOLMaster 700 uses a constant prefix of "1.2.276.0.75.2.1.11.1.3." followed by a date/time stamp and machine specific identifier.  | ALWAYS | AUTO         |
| (0008,0005)   | 1C   | CS | Specific Character Set             | 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.<br><br>See 6 Support of Character Sets.   | ALWAYS | AUTO, CONFIG |
| (0008,0012)   | 3    | DA | Instance Creation Date             | Date the SOP Instance was created.  | ALWAYS | AUTO         |
| (0008,0013)   | 3    | TM | Instance Creation Time             | Time the SOP Instance was created.  | ALWAYS | AUTO         |
| (0018,A001)   | 3    | SQ | Contributing Equipment Sequence    | Sequence of Items containing descriptive attributes of related equipment which has contributed to the acquisition, creation or modification of the composite instance. One or more Items may be included in this Sequence. See NEMA PS3.3 Section C.12.1.1.5 for further explanation.<br><br>Sequence contains one single item defining the equipment which originally acquired the measurement data. | ALWAYS | AUTO         |
| >(0040,A170)  | 1    | SQ | Purpose of Reference Code Sequence | Describes the purpose for which the related equipment is being reference. Only a single Item shall be permitted in this sequence. See NEMA PS3.3 Section C.12.1.1.5 for further explanation.  | ALWAYS | AUTO         |
| >>(0008,0100) | 1    | SH | Code Value                         | See NEMA PS3.3 Section 8.1.<br>Always "109101"  | ALWAYS | AUTO         |

|               |   |    |                               |  |        |      |
|---------------|---|----|-------------------------------|--|--------|------|
| >>(0008,0102) | 1 | SH | Coding Scheme Designator      | See NEMA PS3.3 Section 8.2.<br>Always "DCM"  | ALWAYS | AUTO |
| >>(0008,0104) | 1 | LO | Code Meaning                  | See NEMA PS3.3 Section 8.3.<br>Always "Acquisition Equipment"  | ALWAYS | AUTO |
| >(0008,0070)  | 1 | LO | Manufacturer                  | Manufacturer of the equipment that contributed to the composite instance.<br>Always "Carl Zeiss Meditec"   | ALWAYS | AUTO |
| >(0008,0080)  | 3 | LO | Institution Name              | Institution where the equipment that contributed to the composite instance is located.<br>Attribute does not exist if no Institution Name is defined for contributing equipment.   | ANAP   | AUTO |
| >(0008,0081)  | 3 | ST | Institution Address           | Address of the institution where the equipment that contributed to the composite instance is located.<br>Attribute does not exist if no Institution Address is defined for contributing equipment.   | ANAP   | AUTO |
| >(0008,1010)  | 3 | SH | Station Name                  | User defined name identifying the machine that contributed to the composite instance.<br>Attribute does not exist if no Station Name is defined for contributing equipment.  | ANAP   | AUTO |
| >(0008,1040)  | 3 | LO | Institutional Department Name | Department in the institution where the equipment that contributed to the composite instance is located.<br>Attribute does not exist if no Institutional Department Name is defined for contributing equipment.  | ANAP   | AUTO |
| >(0008,1090)  | 3 | LO | Manufacturer's Model Name     | Manufacturer's model name of the equipment that contributed to the composite instance.<br>Attribute does not exist if no Manufacturer's Model Name is defined for contributing equipment.  | ANAP   | AUTO |
| >(0018,1000)  | 3 | LO | Device Serial Number          | Manufacturer's serial number of the equipment that contributed to the composite instance.<br>Attribute does not exist if no Device Serial Number is defined for contributing equipment.  | ANAP   | AUTO |
| >(0018,1020)  | 3 | LO | Software Version(s)           | Manufacturer's designation of the software version of the equipment that contributed to the composite instance.<br>Attribute does not exist if no Software Version(s) is defined for contributing equipment.   | ANAP   | AUTO |
| >(0018,1200)  | 3 | DA | Date of Last Calibration      | Date when the image acquisition device calibration was last changed in any way. Multiple entries may be used for additional calibrations at other times. See NEMA PS3.3 Section C.7.5.1.1.1 for further explanation.<br>Attribute does not exist if no Date of Last Calibration is defined for contributing equipment. | ANAP   | AUTO |

|              |   |    |                          |   |      |      |
|--------------|---|----|--------------------------|---|------|------|
| >(0018,1201) | 3 | TM | Time of Last Calibration | Time when the image acquisition device calibration was last changed in any way. Multiple entries may be used. See NEMA PS3.3 Section C.7.5.1.1.1 for further explanation.<br>Attribute does not exist if no Time of Last Calibration is defined for contributing equipment. | ANAP | AUTO |
|--------------|---|----|--------------------------|---|------|------|

**Table 8-42 Keratometry Measurements IOD - Module "CZM IOLM Keratometry Quality"**

| Tag           | Type | VR | Name   | Description  | PoV    | Source |
|---------------|------|----|--|--|--------|--------|
| (1201,xx01)   | 3    | SQ | IOLMaster Keratometry Quality Right Eye Sequence     | A sequence that specifies additional quality information for keratometric measurements of a patient's right eye. Only a single item shall be included in this sequence.<br>Sequence exists if the right eye quality is measured.   | ANAP   | AUTO   |
| >(1201,xx03)  | 3    | SQ | Extended Steep Keratometric Axis Sequence            | A sequence that specifies extended measurement data for 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.   | ANAP   | AUTO   |
| >>(1201,xx05) | 3    | FD | Standard Deviation of Keratometry Measurement        | The standard deviation of the corneal curvature, in millimeters.<br>Attribute only exists if this quality metric has been applied.   | ANAP   | AUTO   |
| >(1201,xx04)  | 3    | SQ | Extended Flat Keratometric Axis Sequence             | A sequence that specifies extended measurement data for 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.   | ANAP   | AUTO   |
| >>(1201,xx05) | 3    | FD | Standard Deviation of Keratometry Measurement        | The standard deviation of the corneal curvature, in millimeters.<br>Attribute only exists if this quality metric has been applied.   | ANAP   | AUTO   |
| >(1201,xx06)  | 3    | CS | IOLMaster Quality Indicator                          | The IOLMaster quality indicator for the keratometry measurement.<br>Enumerated values: SUCCESSFUL WARNING FAILED NONE<br>Attribute only exists if IOLMaster quality metric has been applied.   | ANAP   | AUTO   |
| >(1201,xx07)  | 3    | FD | Standard Deviation of Spherical Equivalent           | The standard deviation of spherical equivalent, in millimeters.<br>Attribute only exists if this quality metric has been applied.  | ANAP   | AUTO   |
| >(1201,xx1D)  | 1    | SQ | Referenced Keratometry Measurement QC Image Sequence | Reference to the quality control image associated with this measurement. Only a single item shall be included in this sequence.<br>The referenced image contains up to three frames each showing a synthesized digital subtraction image used for telecentric keratometry. | ALWAYS | AUTO   |

|               |   |    |  |  |        |      |
|---------------|---|----|--|--|--------|------|
| >>(1201,xx1E) | 1 | UI | Referenced SOP Class UID                             | Uniquely identifies the referenced SOP Class. Enumerated Values:<br>"1.2.840.10008.5.1.4.1.1.7.2" = Multi-frame Grayscale Byte Secondary Capture Image Storage<br>"1.2.840.10008.5.1.4.1.1.7.4" = Multi-frame True Color Secondary Capture Image Storage<br><br>Always "1.2.840.10008.5.1.4.1.1.7.4" | ALWAYS | AUTO |
| >>(1201,xx1F) | 1 | UI | Referenced SOP Instance UID                          | Uniquely identifies the referenced SOP Instance.   | ALWAYS | AUTO |
| (1201,xx02)   | 3 | SQ | IOLMaster Keratometry Quality Left Eye Sequence      | A sequence that specifies additional quality information for keratometric measurements of a patient's left eye. Only a single item shall be included in this sequence. Exists if the left eye quality is measured.   | ANAP   | AUTO |
| >(1201,xx03)  | 3 | SQ | Extended Steep Keratometric Axis Sequence            | A sequence that specifies extended measurement data for 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.   | ANAP   | AUTO |
| >>(1201,xx05) | 3 | FD | Standard Deviation of Keratometry Measurement        | The standard deviation of the corneal curvature, in millimeters.<br>Attribute only exists if this quality metric has been applied.   | ANAP   | AUTO |
| >(1201,xx04)  | 3 | SQ | Extended Flat Keratometric Axis Sequence             | A sequence that specifies extended measurement data for 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.   | ANAP   | AUTO |
| >>(1201,xx05) | 3 | FD | Standard Deviation of Keratometry Measurement        | The standard deviation of the corneal curvature, in millimeters.<br>Attribute only exists if this quality metric has been applied.   | ANAP   | AUTO |
| >(1201,xx06)  | 3 | CS | IOLMaster Quality Indicator                          | The IOLMaster quality indicator for the keratometry measurement.<br>Enumerated values: SUCCESSFUL WARNING FAILED NONE<br>Attribute only exists if IOLMaster quality metric has been applied.   | ANAP   | AUTO |
| >(1201,xx07)  | 3 | FD | Standard Deviation of Spherical Equivalent           | The standard deviation of spherical equivalent, in millimeters.<br>Attribute only exists if this quality metric has been applied.  | ANAP   | AUTO |
| >(1201,xx1D)  | 1 | SQ | Referenced Keratometry Measurement QC Image Sequence | Reference to the quality control image associated with this measurement. Only a single item shall be included in this sequence.  | ALWAYS | AUTO |



|               |   |    |                             |  |        |      |
|---------------|---|----|-----------------------------|--|--------|------|
|               |   |    |                             | The referenced image contains up to three frames each showing a synthesized digital subtraction image used for telecentric keratometry.  |        |      |
| >>(1201,xx1E) | 1 | UI | Referenced SOP Class UID    | Uniquely identifies the referenced SOP Class. Enumerated Values:<br>"1.2.840.10008.5.1.4.1.1.7.2" = Multi-frame Grayscale Byte Secondary Capture Image Storage<br>"1.2.840.10008.5.1.4.1.1.7.4" = Multi-frame True Color Secondary Capture Image Storage<br><br>Always "1.2.840.10008.5.1.4.1.1.7.4" | ALWAYS | AUTO |
| >>(1201,xx1F) | 1 | UI | Referenced SOP Instance UID | Uniquely identifies the referenced SOP Instance.   | ALWAYS | AUTO |

**Table 8-43 Keratometry Measurements IOD - Module "CZM IOLM Posterior Cornea Surface Measurements"**

| Tag           | Type | VR | Name   | Description   | PoV  | Source |
|---------------|------|----|--|---|------|--------|
| (1201,xx08)   | 3    | SQ | IOLMaster Posterior Cornea Surface Measurements Right Eye Sequence | A sequence that specifies information about posterior cornea surface (PCS) measurements of a patient's right eye. Only a single item shall be included in this sequence. Exists if the right eye's PCS is measured.<br><i>Note: These values require are a separate software license, which might not yet be available in your country due to regulatory reasons.</i> | ANAP | AUTO   |
| >(1201,xx0A)  | 3    | SQ | Steep Posterior Cornea Surface Sequence                            | A sequence that specifies the posterior cornea surface of the steepest meridian. Only a single item shall be included in this sequence.   | ANAP | AUTO   |
| >>(1201,xx0C) | 3    | FD | Posterior Radius of Curvature                                      | The radius of curvature of the principal meridians of the posterior cornea, in millimeters.   | ANAP | AUTO   |
| >>(1201,xx0D) | 3    | FD | Posterior Keratometric Power                                       | The refractive power of the posterior cornea at the principal meridians, in diopters.   | ANAP | AUTO   |
| >>(1201,xx0E) | 3    | FD | Posterior Keratometric Axis  | The meridian where the keratometric radius of curvature or power is measured, in degrees.   | ANAP | AUTO   |
| >>(1201,xx05) | 3    | FD | Standard Deviation of Keratometry Measurement                      | The standard deviation of the corneal curvature, in millimeters.<br>Attribute only exists if this quality metric has been applied.  | ANAP | AUTO   |
| >(1201,xx0B)  | 3    | SQ | Flat Posterior Cornea Surface Sequence                             | A sequence that specifies the posterior cornea surface of the flattest meridian. Only a single item shall be included in this sequence.   | ANAP | AUTO   |

|               |   |    |  |   |        |        |
|---------------|---|----|--|---|--------|--------|
| >>(1201,xx0C) | 3 | FD | Posterior Radius of Curvature                        | The radius of curvature of the principal meridians of the posterior cornea, in millimeters.   | ANAP   | AUTO   |
| >>(1201,xx0D) | 3 | FD | Posterior Keratometric Power                         | The refractive power of the posterior cornea at the principal meridians, in diopters.   | ANAP   | AUTO   |
| >>(1201,xx0E) | 3 | FD | Posterior Keratometric Axis                          | The meridian where the keratometric radius of curvature or power is measured, in degrees.   | ANAP   | AUTO   |
| >>(1201,xx05) | 3 | FD | Standard Deviation of Keratometry Measurement        | The standard deviation of the corneal curvature, in millimeters.<br>Attribute only exists if this quality metric has been applied.  | ANAP   | AUTO   |
| >(1201,xx06)  | 3 | CS | IOLMaster Quality Indicator                          | The IOLMaster quality indicator for the keratometry measurement.<br>Enumerated values: SUCCESSFUL WARNING FAILED NONE<br>Attribute only exists if IOLMaster quality metric has been applied.  | ANAP   | AUTO   |
| >(1201,xx07)  | 3 | FD | Standard Deviation of Spherical Equivalent           | The standard deviation of spherical equivalent, in millimeters.<br>Attribute only exists if this quality metric has been applied.   | ANAP   | AUTO   |
| >(1201,xx1B)  | 3 | FD | Index of Refraction of the Cornea                    | The index of refraction of the cornea used for posterior cornea surface analysis.   | ALWAYS | CONFIG |
| >(1201,xx1C)  | 3 | FD | Index of Refraction of the Aqueous Humor             | The index of refraction of the aqueous humor used for posterior cornea surface analysis.  | ALWAYS | CONFIG |
| (1201,xx09)   | 3 | SQ | IOLMaster Posterior Cornea Surface Left Eye Sequence | A sequence that specifies information about posterior cornea surface (PCS) measurements of a patient's left eye. Only a single item shall be included in this sequence. Exists if the left eye's PCS is measured.<br><i>Note: These values require are a separate software license, which might not yet be available in your country due to regulatory reasons.</i> | ANAP   | AUTO   |
| >(1201,xx0A)  | 3 | SQ | Steep Posterior Cornea Surface Sequence              | A sequence that specifies the posterior cornea surface of the steepest meridian. Only a single item shall be included in this sequence.   | ANAP   | AUTO   |
| >>(1201,xx0C) | 3 | FD | Posterior Radius of Curvature                        | The radius of curvature of the principal meridians of the posterior cornea, in millimeters.   | ANAP   | AUTO   |
| >>(1201,xx0D) | 3 | FD | Posterior Keratometric Power                         | The refractive power of the posterior cornea at the principal meridians, in diopters.   | ANAP   | AUTO   |

|               |   |    |   |  |        |        |
|---------------|---|----|---|--|--------|--------|
| >>(1201,xx0E) | 3 | FD | Posterior Keratometric Axis                   | The meridian where the keratometric radius of curvature or power is measured, in degrees.  | ANAP   | AUTO   |
| >>(1201,xx05) | 3 | FD | Standard Deviation of Keratometry Measurement | The standard deviation of the corneal curvature, in millimeters.<br>Attribute only exists if this quality metric has been applied.   | ANAP   | AUTO   |
| >(1201,xx0B)  | 3 | SQ | Flat Posterior Cornea Surface Sequence        | A sequence that specifies the posterior cornea surface of the flattest meridian. Only a single item shall be included in this sequence.  | ANAP   | AUTO   |
| >>(1201,xx0C) | 3 | FD | Posterior Radius of Curvature                 | The radius of curvature of the principal meridians of the posterior cornea, in millimeters.  | ANAP   | AUTO   |
| >>(1201,xx0D) | 3 | FD | Posterior Keratometric Power                  | The refractive power of the posterior cornea at the principal meridians, in diopters.  | ANAP   | AUTO   |
| >>(1201,xx0E) | 3 | FD | Posterior Keratometric Axis                   | The meridian where the keratometric radius of curvature or power is measured, in degrees.  | ANAP   | AUTO   |
| >>(1201,xx05) | 3 | FD | Standard Deviation of Keratometry Measurement | The standard deviation of the corneal curvature, in millimeters.<br>Attribute only exists if this quality metric has been applied.   | ANAP   | AUTO   |
| >(1201,xx06)  | 3 | CS | IOLMaster Quality Indicator                   | The IOLMaster quality indicator for the keratometry measurement.<br>Enumerated values: SUCCESSFUL WARNING FAILED NONE<br>Attribute only exists if IOLMaster quality metric has been applied. | ANAP   | AUTO   |
| >(1201,xx07)  | 3 | FD | Standard Deviation of Spherical Equivalent    | The standard deviation of spherical equivalent, in millimeters.<br>Attribute only exists if this quality metric has been applied.  | ANAP   | AUTO   |
| >(1201,xx1B)  | 3 | FD | Index of Refraction of the Cornea             | The index of refraction of the cornea used for posterior cornea surface analysis.  | ALWAYS | CONFIG |
| >(1201,xx1C)  | 3 | FD | Index of Refraction of the Aqueous Humor      | The index of refraction of the aqueous humor used for posterior cornea surface analysis.   | ALWAYS | CONFIG |

**Table 8-44 Keratometry Measurements IOD - Module "CZM IOLM True Keratometric Power Measurements"**

| Tag           | Type | VR | Name   | Description  | PoV    | Source |
|---------------|------|----|--|--|--------|--------|
| (1201,xx0F)   | 3    | SQ | IOLMaster True Keratometric Power Right Eye Sequence | A sequence that specifies information about true keratometric power (TKP) measurements of a patient's right eye. Only a single item shall be included in this sequence. Exists if the right eye's TKP is measured.<br><i>Note: These values require are a separate software license, which might not yet be available in your country due to regulatory reasons.</i> | ANAP   | AUTO   |
| >(1201,xx11)  | 3    | SQ | Steep True Keratometric Power Sequence               | A sequence that specifies the true keratometric power of the steepest meridian. Only a single item shall be included in this sequence.   | ALWAYS | AUTO   |
| >>(1201,xx13) | 3    | FD | True Radius of Curvature                             | Keratometer equivalent virtual radius of curvature of the principal meridians of the cornea, in millimeters.   | ALWAYS | AUTO   |
| >>(1201,xx14) | 3    | FD | True Keratometric Power                              | The true keratometric power of the cornea at the principal meridians, in diopters.   | ALWAYS | AUTO   |
| >>(1201,xx15) | 3    | FD | True Keratometric Axis                               | The meridian where the true keratometric power is measured, in degrees.  | ALWAYS | AUTO   |
| >>(1201,xx16) | 3    | FD | Standard Deviation of True Keratometric Power        | The standard deviation of the true corneal curvature, in millimeters.<br>Attribute only exists if this quality metric has been applied.  | ANAP   | AUTO   |
| >(1201,xx12)  | 3    | SQ | Flat True Keratometric Power Sequence                | A sequence that specifies the true keratometric power of the flattest meridian. Only a single item shall be included in this sequence.   | ALWAYS | AUTO   |
| >>(1201,xx13) | 3    | FD | True Radius of Curvature                             | Keratometer equivalent virtual radius of curvature of the principal meridians of the cornea, in millimeters.   | ALWAYS | AUTO   |
| >>(1201,xx14) | 3    | FD | True Keratometric Power                              | The true keratometric power of the cornea at the principal meridians, in diopters.   | ALWAYS | AUTO   |
| >>(1201,xx15) | 3    | FD | True Keratometric Axis                               | The meridian where the true keratometric power is measured, in degrees.  | ALWAYS | AUTO   |
| >>(1201,xx16) | 3    | FD | Standard Deviation of True Keratometric Power        | The standard deviation of the true corneal curvature, in millimeters.<br>Attribute only exists if this quality metric has been applied.  | ANAP   | AUTO   |
| >(1201,xx06)  | 3    | CS | IOLMaster Quality Indicator                          | The IOLMaster quality indicator for the keratometry measurement.<br>Enumerated values: SUCCESSFUL WARNING FAILED NONE<br>Attribute only exists if IOLMaster quality metric has been applied.   | ANAP   | AUTO   |

|               |   |    |   |  |        |      |
|---------------|---|----|---|--|--------|------|
| >(1201,xx17)  | 3 | FD | Standard Deviation of True Spherical Equivalent     | The standard deviation of the spherical equivalent for the true keratometric measurement, in millimeters.<br>Attribute only exists if this quality metric has been applied.  | ANAP   | AUTO |
| (1201,xx10)   | 3 | SQ | IOLMaster True Keratometric Power Left Eye Sequence | A sequence that specifies information about true keratometric power (TKP) measurements of a patient's left eye. Only a single item shall be included in this sequence. Exists if the left eye's TKP is measured.<br><i>Note: These values require are a separate software license, which might not yet be available in your country due to regulatory reasons.</i> | ANAP   | AUTO |
| >(1201,xx11)  | 3 | SQ | Steep True Keratometric Power Sequence              | A sequence that specifies the true keratometric power of the steepest meridian. Only a single item shall be included in this sequence.   | ALWAYS | AUTO |
| >>(1201,xx13) | 3 | FD | True Radius of Curvature                            | Keratometer equivalent virtual radius of curvature of the principal meridians of the cornea, in millimeters.   | ALWAYS | AUTO |
| >>(1201,xx14) | 3 | FD | True Keratometric Power                             | The true keratometric power of the cornea at the principal meridians, in diopters.   | ALWAYS | AUTO |
| >>(1201,xx15) | 3 | FD | True Keratometric Axis                              | The meridian where the true keratometric power is measured, in degrees.  | ALWAYS | AUTO |
| >>(1201,xx16) | 3 | FD | Standard Deviation of True Keratometric Power       | The standard deviation of the true corneal curvature, in millimeters.<br>Attribute only exists if this quality metric has been applied.  | ANAP   | AUTO |
| >(1201,xx12)  | 3 | SQ | Flat True Keratometric Power Sequence               | A sequence that specifies the true keratometric power of the flattest meridian. Only a single item shall be included in this sequence.   | ALWAYS | AUTO |
| >>(1201,xx13) | 3 | FD | True Radius of Curvature                            | Keratometer equivalent virtual radius of curvature of the principal meridians of the cornea, in millimeters.   | ALWAYS | AUTO |
| >>(1201,xx14) | 3 | FD | True Keratometric Power                             | The true keratometric power of the cornea at the principal meridians, in diopters.   | ALWAYS | AUTO |
| >>(1201,xx15) | 3 | FD | True Keratometric Axis                              | The meridian where the true keratometric power is measured, in degrees.  | ALWAYS | AUTO |
| >>(1201,xx16) | 3 | FD | Standard Deviation of True Keratometric Power       | The standard deviation of the true corneal curvature, in millimeters.<br>Attribute only exists if this quality metric has been applied.  | ANAP   | AUTO |
| >(1201,xx06)  | 3 | CS | IOLMaster Quality Indicator                         | The IOLMaster quality indicator for the keratometry measurement.<br>Enumerated values: SUCCESSFUL WARNING FAILED NONE<br>Attribute only exists if IOLMaster quality metric has been applied.   | ANAP   | AUTO |

|              |   |    |   |   |      |      |
|--------------|---|----|---|---|------|------|
| >(1201,xx17) | 3 | FD | Standard Deviation of True Spherical Equivalent | The standard deviation of the spherical equivalent for the true keratometric measurement, in millimeters.<br>Attribute only exists if this quality metric has been applied. | ANAP | AUTO |
|--------------|---|----|---|---|------|------|

**Table 8-45 Keratometry Measurements IOD - Module "CZM IOLM Clinical Patient Information"**

| Tag           | Type | VR | Name  | Description   | PoV    | Source |
|---------------|------|----|---|---|--------|--------|
| (1203,xx01)   | 3    | SQ | IOLMaster Clinical Patient Information Right Eye Sequence | Information used to represent ophthalmic clinical information during an ophthalmic measurement of a patient's right eye. Only a single item shall be included in this sequence. Required if Measurement Laterality (0024,0113) is R or B.   | ANAP   | AUTO   |
| >(1203,xx03)  | 3    | SQ | Refractive State Sequence                                 | Refractive state of the measured eye at the time of acquisition. Only one item shall be included in this sequence.  | ANAP   | AUTO   |
| >>(1203,xx04) | 1    | FD | Sphere Power  | Sphere value in diopters.   | ALWAYS | USER   |
| >>(1203,xx05) | 1    | FD | Cylinder Power  | Cylinder value in diopters.   | ALWAYS | USER   |
| >>(1203,xx06) | 1    | FD | Cylinder Axis   | Axis value in degrees.  | ALWAYS | USER   |
| >>(1203,xx07) | 1    | FD | Vertex Distance   | Vertex distance in millimeters  | ALWAYS | CONFIG |
| >(1203,xx08)  | 3    | SQ | Visual Acuity Sequence                                    | Visual acuity of a patient's eye at the time of measurement. Only one Item shall be included in this sequence.  | ANAP   | AUTO   |
| >>(1203,xx09) | 1    | FD | Decimal Visual Acuity                                     | A patient's visual acuity specified in decimal. See PS 3.17 Ophthalmic Refractive Reports Use Cases for guidance in converting Decimal Visual Acuity to other customarily used display notation such as 20/20 in the US and 6/6 in Britain. | ALWAYS | USER   |
| >(1203,xx0A)  | 3    | SQ | Refractive Surgery State Sequence                         | Refractive surgery state of a patient's eye at the time of measurement. Only one Item shall be included in this sequence.   | ANAP   | AUTO   |
| >>(1203,xx0B) | 1    | CS | Refractive Procedure Occurred                             | Whether or not a patient has had refractive surgery.<br>Enumerated Values: YES NO   | ALWAYS | USER   |
| >>(1203,xx0C) | 2C   | SQ | Refractive Surgery Type Code Sequence                     | Type of refractive surgery a patient has had. Zero or more Items shall be included in this sequence.<br>Required if the value of Refractive Procedure Occurred (1203,xx0B) is YES.  | VNAP   | USER   |

|                |    |    |  |   |        |        |
|----------------|----|----|--|---|--------|--------|
| >>>(1203,xx0D) | 1  | SH | Code Value   | For possible values see section 8.3 Coded Terminology And Templates - Table 8-81 Coded Values - Refractive Surgery Types  | ALWAYS | USER   |
| >>>(1203,xx0E) | 1  | SH | Coding Scheme Designator                                 | For possible values see section 8.3 Coded Terminology And Templates - Table 8-81 Coded Values - Refractive Surgery Types  | ALWAYS | USER   |
| >>>(1203,xx10) | 1  | LO | Code Meaning   | For possible values see section 8.3 Coded Terminology And Templates - Table 8-81 Coded Values - Refractive Surgery Types  | ALWAYS | USER   |
| (1203,xx02)    | 3  | SQ | IOLMaster Clinical Patient Information Left Eye Sequence | Information used to represent ophthalmic clinical information during an ophthalmic measurement of a patient's right eye. Only a single item shall be included in this sequence. Required if Measurement Laterality (0024,0113) is R or B.   | ANAP   | AUTO   |
| >(1203,xx03)   | 3  | SQ | Refractive State Sequence                                | Refractive state of the measured eye at the time of acquisition. Only one item shall be included in this sequence.  | ANAP   | AUTO   |
| >>(1203,xx04)  | 1  | FD | Sphere Power   | Sphere value in diopters.   | ALWAYS | USER   |
| >>(1203,xx05)  | 1  | FD | Cylinder Power   | Cylinder value in diopters.   | ALWAYS | USER   |
| >>(1203,xx06)  | 1  | FD | Cylinder Axis  | Axis value in degrees.  | ALWAYS | USER   |
| >>(1203,xx07)  | 1  | FD | Vertex Distance  | Vertex distance in millimeters  | ALWAYS | CONFIG |
| >(1203,xx08)   | 3  | SQ | Visual Acuity Sequence                                   | Visual acuity of a patient's eye at the time of measurement. Only one Item shall be included in this sequence.  | ANAP   | AUTO   |
| >>(1203,xx09)  | 1  | FD | Decimal Visual Acuity                                    | A patient's visual acuity specified in decimal. See PS 3.17 Ophthalmic Refractive Reports Use Cases for guidance in converting Decimal Visual Acuity to other customarily used display notation such as 20/20 in the US and 6/6 in Britain. | ALWAYS | USER   |
| >(1203,xx0A)   | 3  | SQ | Refractive Surgery State Sequence                        | Refractive surgery state of a patient's eye at the time of measurement. Only one Item shall be included in this sequence.   | ANAP   | AUTO   |
| >>(1203,xx0B)  | 1  | CS | Refractive Procedure Occurred                            | Whether or not a patient has had refractive surgery.<br>Enumerated Values: YES NO   | ALWAYS | USER   |
| >>(1203,xx0C)  | 2C | SQ | Refractive Surgery Type Code Sequence                    | Type of refractive surgery a patient has had. Zero or more Items shall be included in this sequence.<br>Required if the value of Refractive Procedure Occurred (1203,xx0B) is YES.  | VNAP   | USER   |

|                |   |    |                          |  |        |      |
|----------------|---|----|--------------------------|--|--------|------|
| >>>(1203,xx0D) | 1 | SH | Code Value               | For possible values see section 8.3 Coded Terminology And Templates - Table 8-81 Coded Values - Refractive Surgery Types | ALWAYS | USER |
| >>>(1203,xx0E) | 1 | SH | Coding Scheme Designator | For possible values see section 8.3 Coded Terminology And Templates - Table 8-81 Coded Values - Refractive Surgery Types | ALWAYS | USER |
| >>>(1203,xx10) | 1 | LO | Code Meaning             | For possible values see section 8.3 Coded Terminology And Templates - Table 8-81 Coded Values - Refractive Surgery Types | ALWAYS | USER |

### 8.1.1.13 Intraocular Lens Calculations Modules

**Table 8-46 Intraocular Lens Calculations IOD - Module "Intraocular Lens Calculations Series"**

| Tag         | Type | VR | Name     | Description   | PoV    | Source |
|-------------|------|----|----------|---|--------|--------|
| (0008,0060) | 1    | CS | Modality | Type of equipment that originally acquired the data used to create the images in this Series.<br>Enumerated Values: IOL See NEMA PS3.3 Section C.7.3.1.1.1 for further explanation.<br><br>Always "IOL" | ALWAYS | AUTO   |

**Table 8-47 Intraocular Lens Calculations IOD - Module "Intraocular Lens Calculations"**

| Tag          | Type | VR | Name   | Description   | PoV    | Source |
|--------------|------|----|--|---|--------|--------|
| (0022,1300)  | 1C   | SQ | Intraocular Lens Calculations Right Eye Sequence | Calculations of intraocular lens power for a patient's right eye. One or more Items shall be included in this sequence.<br>Required if the device calculated intraocular lens power for the right eye.<br>Note<br>If Intraocular Lens Calculations Right Eye Sequence (0022,1300) is present, Measurement Laterality (0024,0113), if present, will have a value of R or B as appropriate. | ANAP   | AUTO   |
| >(0022,1037) | 1    | FL | Target Refraction                                | The desired postoperative refractive error, in diopters.  | ALWAYS | USER   |
| >(0022,1039) | 2    | CS | Refractive Procedure Occurred                    | Whether or not a patient has had refractive surgery.<br>Enumerated Values:<br>YES<br>NO   | VNAP   | USER   |



|                |    |    |  |   |        |            |
|----------------|----|----|--|---|--------|------------|
| >(0022,1040)   | 2C | SQ | Refractive Surgery Type Code Sequence                    | Type of refractive surgery a patient has had. Zero or more Items shall be included in this sequence.<br>Required if the value of Refractive Procedure Occurred (0022,1039) is YES.  | ANAP   | AUTO       |
| >>(0008,0100)  | 1  | SH | Code Value   | See NEMA PS3.3 Section 8.1.   | ALWAYS | USER       |
| >>(0008,0102)  | 1  | SH | Coding Scheme Designator                                 | See NEMA PS3.3 Section 8.2.   | ALWAYS | USER       |
| >>(0008,0104)  | 1  | LO | Code Meaning   | See NEMA PS3.3 Section 8.3.   | ALWAYS | USER       |
| >(0022,1103)   | 2C | SQ | Refractive Error Before Refractive Surgery Code Sequence | The patient's refractive error before any of the refractive surgeries listed in Refractive Surgery Type Code Sequence (0022,1040) were performed.<br>Zero or one Item shall be included in this sequence.<br>Required if the value of Refractive Procedure Occurred (0022,1039) is YES. | ANAP   | AUTO       |
| >>(0008,0100)  | 1  | SH | Code Value   | See NEMA PS3.3 Section 8.1.   | ALWAYS | USER       |
| >>(0008,0102)  | 1  | SH | Coding Scheme Designator                                 | See NEMA PS3.3 Section 8.2.   | ALWAYS | USER       |
| >>(0008,0104)  | 1  | LO | Code Meaning   | See NEMA PS3.3 Section 8.3.   | ALWAYS | USER       |
| >(0046,0046)   | 3  | FD | Corneal Size   | The horizontal diameter measurement of the cornea, in mm.   | ANAP   | AUTO, USER |
| >(0022,1127)   | 3  | SQ | Lens Thickness Sequence                                  | Lens thickness value and source. Only a single Item is permitted in this sequence.  | ANAP   | AUTO       |
| >>(0022,1130)  | 1  | FL | Lens Thickness   | The value for axial length of the lens in a patient's eye, in mm.   | ALWAYS | AUTO, USER |
| >>(0022,1132)  | 1  | SQ | Source of Lens Thickness Data Code Sequence              | Source of the value of Lens Thickness (0022,1130). Only a single Item shall be included in this sequence.   | ALWAYS | AUTO       |
| >>>(0008,0100) | 1  | SH | Code Value   | See NEMA PS3.3 Section 8.1.   | ALWAYS | AUTO       |
| >>>(0008,0102) | 1  | SH | Coding Scheme Designator                                 | See NEMA PS3.3 Section 8.2.   | ALWAYS | AUTO       |
| >>>(0008,0104) | 1  | LO | Code Meaning   | See NEMA PS3.3 Section 8.3.   | ALWAYS | AUTO       |

|                 |   |    |   |  |        |            |
|-----------------|---|----|---|--|--------|------------|
| >(0022,1128)    | 3 | SQ | Anterior Chamber Depth Sequence                     | Anterior chamber depth value and source. Only a single Item is permitted in this sequence.   | ANAP   | AUTO       |
| >>(0022,1131)   | 1 | FL | Anterior Chamber Depth                              | The value for axial length of the anterior chamber, in mm.   | ALWAYS | AUTO, USER |
| >>(0022,1133)   | 1 | SQ | Source of Anterior Chamber Depth Data Code Sequence | Source of the value of Anterior Chamber Depth (0022,1131). Only a single Item shall be included in this sequence.  | ALWAYS | AUTO       |
| >>>(0008,0100)  | 1 | SH | Code Value  | See NEMA PS3.3 Section 8.1.  | ALWAYS | AUTO       |
| >>>(0008,0102)  | 1 | SH | Coding Scheme Designator                            | See NEMA PS3.3 Section 8.2.  | ALWAYS | AUTO       |
| >>>(0008,0104)  | 1 | LO | Code Meaning  | See NEMA PS3.3 Section 8.3.  | ALWAYS | AUTO       |
| >(0022,001B)    | 2 | SQ | Refractive State Sequence                           | Refractive state of the imaged eye at the time of acquisition. Zero or one Item shall be included in this sequence.                                      | VNAP   | AUTO       |
| >>(0022,0007)   | 1 | FL | Spherical Lens Power                                | Sphere value in diopters.  | ALWAYS | USER       |
| >>(0022,0008)   | 1 | FL | Cylinder Lens Power                                 | Cylinder value in diopters.  | ALWAYS | USER       |
| >>(0022,0009)   | 1 | FL | Cylinder Axis                                       | Axis value in degrees.   | ALWAYS | USER       |
| >>(0022,1134)   | 1 | SQ | Source of Refractive Measurements Sequence          | Refractive measurements source. Only a single Item shall be included in this sequence.   | ALWAYS | AUTO       |
| >>>(0022,1135)  | 1 | SQ | Source of Refractive Error Data Code Sequence       | Source of values in Refractive State Sequence (0022,101B). Only a single Item shall be included in this sequence.  | ALWAYS | AUTO       |
| >>>>(0008,0100) | 1 | SH | Code Value  | See NEMA PS3.3 Section 8.1.  | ALWAYS | AUTO       |
| >>>>(0008,0102) | 1 | SH | Coding Scheme Designator                            | See NEMA PS3.3 Section 8.2.  | ALWAYS | AUTO       |
| >>>>(0008,0104) | 1 | LO | Code Meaning  | See NEMA PS3.3 Section 8.3.  | ALWAYS | AUTO       |
| >(0046,0074)    | 1 | SQ | Steep Keratometric Axis Sequence                    | 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       |

|               |   |    |  |  |        |              |
|---------------|---|----|--|--|--------|--------------|
| >>(0046,0075) | 1 | FD | Radius of Curvature                        | The radius of curvature of the principal meridians of the cornea, measured in mm.  | ALWAYS | AUTO, USER   |
| >>(0046,0076) | 2 | FD | Keratometric Power                         | The refractive power of the cornea at the principal meridians, measured in diopters.   | ALWAYS | AUTO, USER   |
| >>(0046,0077) | 2 | FD | Keratometric Axis                          | The meridian where the keratometric radius of curvature or power is measured, in degrees.  | ALWAYS | AUTO, USER   |
| >(0046,0080)  | 1 | SQ | Flat Keratometric Axis Sequence            | 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         |
| >>(0046,0075) | 1 | FD | Radius of Curvature                        | The radius of curvature of the principal meridians of the cornea, measured in mm.  | ALWAYS | AUTO, USER   |
| >>(0046,0076) | 2 | FD | Keratometric Power                         | The refractive power of the cornea at the principal meridians, measured in diopters.   | ALWAYS | AUTO, USER   |
| >>(0046,0077) | 2 | FD | Keratometric Axis                          | The meridian where the keratometric radius of curvature or power is measured, in degrees.  | ALWAYS | AUTO, USER   |
| >(0022,1096)  | 2 | SQ | Keratometry Measurement Type Code Sequence | Descriptors relevant to keratometry data. Zero or one Item shall be included in this sequence.   | ALWAYS | AUTO         |
| >>(0008,0100) | 1 | SH | Code Value                                 | See NEMA PS3.3 Section 8.1.  | ALWAYS | AUTO         |
| >>(0008,0102) | 1 | SH | Coding Scheme Designator                   | See NEMA PS3.3 Section 8.2.  | ALWAYS | AUTO         |
| >>(0008,0104) | 1 | LO | Code Meaning                               | See NEMA PS3.3 Section 8.3.  | ALWAYS | AUTO         |
| >(0022,1033)  | 2 | FL | Keratometer Index                          | The translation factor specific to each keratometer that derives a number for power from the measured radius of curvature of the cornea.             | ALWAYS | AUTO, CONFIG |
| >(0022,1028)  | 1 | SQ | IOL Formula Code Sequence                  | Formula used to calculate IOL power. Only a single Item shall be included in this sequence.  | ALWAYS | USER         |
| >>(0008,0100) | 1 | SH | Code Value                                 | See NEMA PS3.3 Section 8.1.  | ALWAYS | AUTO         |
| >>(0008,0102) | 1 | SH | Coding Scheme Designator                   | See NEMA PS3.3 Section 8.2.  | ALWAYS | AUTO         |

|                |   |    |  |  |        |            |
|----------------|---|----|--|--|--------|------------|
| >>(0008,0104)  | 1 | LO | Code Meaning   | See NEMA PS3.3 Section 8.3.  | ALWAYS | AUTO       |
| >(0022,1012)   | 1 | SQ | Ophthalmic Axial Length Sequence                       | Axial length value and source that was used in calculation of IOL power. Only a single Item shall be included in this sequence.  | ALWAYS | AUTO       |
| >>(0022,1019)  | 1 | FL | Ophthalmic Axial Length                                | The axial length of a patient's eye, in mm, that was used in calculation of IOL power.   | ALWAYS | AUTO, USER |
| >>(0022,1250)  | 1 | SQ | Ophthalmic Axial Length Selection Method Code Sequence | Method used to select the value recorded in Ophthalmic Axial Length (0022,1019). Only a single Item shall be included in this sequence.  | ALWAYS | AUTO, USER |
| >>>(0008,0100) | 1 | SH | Code Value   | See NEMA PS3.3 Section 8.1.  | ALWAYS | AUTO       |
| >>>(0008,0102) | 1 | SH | Coding Scheme Designator                               | See NEMA PS3.3 Section 8.2.  | ALWAYS | AUTO       |
| >>>(0008,0104) | 1 | LO | Code Meaning   | See NEMA PS3.3 Section 8.3.  | ALWAYS | AUTO       |
| >>(0022,1035)  | 1 | SQ | Source of Ophthalmic Axial Length Code Sequence        | Source of the value of Ophthalmic Axial Length (0022,1019). Only a single Item shall be included in this sequence.   | ALWAYS | AUTO       |
| >>>(0008,0100) | 1 | SH | Code Value   | See NEMA PS3.3 Section 8.1.  | ALWAYS | AUTO       |
| >>>(0008,0102) | 1 | SH | Coding Scheme Designator                               | See NEMA PS3.3 Section 8.2.  | ALWAYS | AUTO       |
| >>>(0008,0104) | 1 | LO | Code Meaning   | See NEMA PS3.3 Section 8.3.  | ALWAYS | AUTO       |
| >(0022,1093)   | 1 | LO | IOL Manufacturer                                       | Name of the manufacturer that produced the lens.   | ALWAYS | USER       |
| >(0022,1095)   | 1 | LO | Implant Name   | The (product) name of the lens.  | ALWAYS | USER       |
| >(0022,1092)   | 1 | SQ | Lens Constant Sequence                                 | Constants used in calculation of intraocular lens power. These constants are a characteristic of the model of intraocular lens being considered for use in cataract surgery. One or more Items shall be included in this sequence. | ALWAYS | AUTO       |
| >>(0040,A043)  | 1 | SQ | Concept Name Code Sequence                             | Constant type used in calculation of intraocular lens power. Only a single Item shall be included in this sequence.  | ALWAYS | AUTO       |
| >>>(0008,0100) | 1 | SH | Code Value   | See NEMA PS3.3 Section 8.1.  | ALWAYS | AUTO       |

|                |    |    |   |  |        |      |
|----------------|----|----|---|--|--------|------|
| >>>(0008,0102) | 1  | SH | Coding Scheme Designator                        | See NEMA PS3.3 Section 8.2.  | ALWAYS | AUTO |
| >>>(0008,0104) | 1  | LO | Code Meaning                                    | See NEMA PS3.3 Section 8.3.  | ALWAYS | AUTO |
| >>(0040,A30A)  | 1  | DS | Numeric Value                                   | The value of the constant used.  | ALWAYS | AUTO |
| >(0022,1090)   | 1  | SQ | IOL Power Sequence                              | Information needed to select the intraocular lens power for cataract surgery. One or more Items shall be included in this sequence.  | ALWAYS | AUTO |
| >>(0022,1053)  | 1  | FL | IOL Power                                       | The intraocular lens power, in diopters.   | ALWAYS | AUTO |
| >>(0022,1054)  | 1  | FL | Predicted Refractive Error                      | The predicted postoperative refractive error (i.e. amount of near or far sightedness), in diopters.  | ALWAYS | AUTO |
| >>(0022,1097)  | 2  | LO | Implant Part Number                             | The (product) identifier of the lens.  | VNAP   | AUTO |
| >(0022,1121)   | 2  | FL | IOL Power For Exact Emmetropia                  | The IOL power that would be required to achieve exact emmetropia, or no need for glasses at distance after surgery, in diopters.   | VNAP   | AUTO |
| >(0022,1122)   | 2  | FL | IOL Power For Exact Target Refraction           | The IOL power that would be required to exactly achieve the Target Refraction (0022,1037), in diopters.  | EMPTY  | AUTO |
| (0022,1310)    | 1C | SQ | Intraocular Lens Calculations Left Eye Sequence | Calculations of intraocular lens power for a patient's left eye. One or more Items shall be included in this sequence.<br>Required if the device calculated intraocular lens power for the left eye.<br>Note<br>If Intraocular Lens Calculations Left Eye Sequence (0022,1310) is present, Measurement Laterality (0024,0113), if present, will have a value of L or B as appropriate. | ANAP   | AUTO |
| >(0022,1037)   | 1  | FL | Target Refraction                               | The desired postoperative refractive error, in diopters.   | ALWAYS | USER |
| >(0022,1039)   | 2  | CS | Refractive Procedure Occurred                   | Whether or not a patient has had refractive surgery.<br>Enumerated Values:<br>YES<br>NO  | VNAP   | USER |
| >(0022,1040)   | 2C | SQ | Refractive Surgery Type Code Sequence           | Type of refractive surgery a patient has had. Zero or more Items shall be included in this sequence.<br>Required if the value of Refractive Procedure Occurred (0022,1039) is YES.   | ANAP   | AUTO |

|                |    |    |  |   |        |            |
|----------------|----|----|--|---|--------|------------|
| >>(0008,0100)  | 1  | SH | Code Value   | See NEMA PS3.3 Section 8.1.   | ALWAYS | USER       |
| >>(0008,0102)  | 1  | SH | Coding Scheme Designator                                 | See NEMA PS3.3 Section 8.2.   | ALWAYS | USER       |
| >>(0008,0104)  | 1  | LO | Code Meaning   | See NEMA PS3.3 Section 8.3.   | ALWAYS | USER       |
| >(0022,1103)   | 2C | SQ | Refractive Error Before Refractive Surgery Code Sequence | The patient's refractive error before any of the refractive surgeries listed in Refractive Surgery Type Code Sequence (0022,1040) were performed.<br>Zero or one Item shall be included in this sequence.<br>Required if the value of Refractive Procedure Occurred (0022,1039) is YES. | ANAP   | AUTO       |
| >>(0008,0100)  | 1  | SH | Code Value   | See NEMA PS3.3 Section 8.1.   | ALWAYS | USER       |
| >>(0008,0102)  | 1  | SH | Coding Scheme Designator                                 | See NEMA PS3.3 Section 8.2.   | ALWAYS | USER       |
| >>(0008,0104)  | 1  | LO | Code Meaning   | See NEMA PS3.3 Section 8.3.   | ALWAYS | USER       |
| >(0046,0046)   | 3  | FD | Corneal Size   | The horizontal diameter measurement of the cornea, in mm.   | ANAP   | AUTO, USER |
| >(0022,1127)   | 3  | SQ | Lens Thickness Sequence                                  | Lens thickness value and source. Only a single Item is permitted in this sequence.  | ANAP   | AUTO       |
| >>(0022,1130)  | 1  | FL | Lens Thickness   | The value for axial length of the lens in a patient's eye, in mm.   | ALWAYS | AUTO, USER |
| >>(0022,1132)  | 1  | SQ | Source of Lens Thickness Data Code Sequence              | Source of the value of Lens Thickness (0022,1130). Only a single Item shall be included in this sequence.   | ALWAYS | AUTO       |
| >>>(0008,0100) | 1  | SH | Code Value   | See NEMA PS3.3 Section 8.1.   | ALWAYS | AUTO       |
| >>>(0008,0102) | 1  | SH | Coding Scheme Designator                                 | See NEMA PS3.3 Section 8.2.   | ALWAYS | AUTO       |
| >>>(0008,0104) | 1  | LO | Code Meaning   | See NEMA PS3.3 Section 8.3.   | ALWAYS | AUTO       |
| >(0022,1128)   | 3  | SQ | Anterior Chamber Depth Sequence                          | Anterior chamber depth value and source. Only a single Item is permitted in this sequence.  | ANAP   | AUTO       |

|                 |   |    |   |  |        |            |
|-----------------|---|----|---|--|--------|------------|
| >>(0022,1131)   | 1 | FL | Anterior Chamber Depth                              | The value for axial length of the anterior chamber, in mm.   | ALWAYS | AUTO, USER |
| >>(0022,1133)   | 1 | SQ | Source of Anterior Chamber Depth Data Code Sequence | Source of the value of Anterior Chamber Depth (0022,1131). Only a single Item shall be included in this sequence.  | ALWAYS | AUTO       |
| >>>(0008,0100)  | 1 | SH | Code Value  | See NEMA PS3.3 Section 8.1.  | ALWAYS | AUTO       |
| >>>(0008,0102)  | 1 | SH | Coding Scheme Designator                            | See NEMA PS3.3 Section 8.2.  | ALWAYS | AUTO       |
| >>>(0008,0104)  | 1 | LO | Code Meaning  | See NEMA PS3.3 Section 8.3.  | ALWAYS | AUTO       |
| >(0022,001B)    | 2 | SQ | Refractive State Sequence                           | Refractive state of the imaged eye at the time of acquisition. Zero or one Item shall be included in this sequence.                                      | VNAP   | AUTO       |
| >>(0022,0007)   | 1 | FL | Spherical Lens Power                                | Sphere value in diopters.  | ALWAYS | USER       |
| >>(0022,0008)   | 1 | FL | Cylinder Lens Power                                 | Cylinder value in diopters.  | ALWAYS | USER       |
| >>(0022,0009)   | 1 | FL | Cylinder Axis                                       | Axis value in degrees.   | ALWAYS | USER       |
| >>(0022,1134)   | 1 | SQ | Source of Refractive Measurements Sequence          | Refractive measurements source. Only a single Item shall be included in this sequence.   | ALWAYS | AUTO       |
| >>>(0022,1135)  | 1 | SQ | Source of Refractive Error Data Code Sequence       | Source of values in Refractive State Sequence (0022,101B). Only a single Item shall be included in this sequence.  | ALWAYS | AUTO       |
| >>>>(0008,0100) | 1 | SH | Code Value  | See NEMA PS3.3 Section 8.1.  | ALWAYS | AUTO       |
| >>>>(0008,0102) | 1 | SH | Coding Scheme Designator                            | See NEMA PS3.3 Section 8.2.  | ALWAYS | AUTO       |
| >>>>(0008,0104) | 1 | LO | Code Meaning  | See NEMA PS3.3 Section 8.3.  | ALWAYS | AUTO       |
| >(0046,0074)    | 1 | SQ | Steep Keratometric Axis Sequence                    | 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       |
| >>(0046,0075)   | 1 | FD | Radius of Curvature                                 | The radius of curvature of the principal meridians of the cornea, measured in mm.  | ALWAYS | AUTO, USER |

|               |   |    |  |  |        |              |
|---------------|---|----|--|--|--------|--------------|
| >>(0046,0076) | 2 | FD | Keratometric Power                         | The refractive power of the cornea at the principal meridians, measured in diopters.   | ALWAYS | AUTO, USER   |
| >>(0046,0077) | 2 | FD | Keratometric Axis                          | The meridian where the keratometric radius of curvature or power is measured, in degrees.  | ALWAYS | AUTO, USER   |
| >(0046,0080)  | 1 | SQ | Flat Keratometric Axis Sequence            | 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         |
| >>(0046,0075) | 1 | FD | Radius of Curvature                        | The radius of curvature of the principal meridians of the cornea, measured in mm.  | ALWAYS | AUTO, USER   |
| >>(0046,0076) | 2 | FD | Keratometric Power                         | The refractive power of the cornea at the principal meridians, measured in diopters.   | ALWAYS | AUTO, USER   |
| >>(0046,0077) | 2 | FD | Keratometric Axis                          | The meridian where the keratometric radius of curvature or power is measured, in degrees.  | ALWAYS | AUTO, USER   |
| >(0022,1096)  | 2 | SQ | Keratometry Measurement Type Code Sequence | Descriptors relevant to keratometry data. Zero or one Item shall be included in this sequence.   | ALWAYS | AUTO         |
| >>(0008,0100) | 1 | SH | Code Value                                 | See NEMA PS3.3 Section 8.1.  | ALWAYS | AUTO         |
| >>(0008,0102) | 1 | SH | Coding Scheme Designator                   | See NEMA PS3.3 Section 8.2.  | ALWAYS | AUTO         |
| >>(0008,0104) | 1 | LO | Code Meaning                               | See NEMA PS3.3 Section 8.3.  | ALWAYS | AUTO         |
| >(0022,1033)  | 2 | FL | Keratometer Index                          | The translation factor specific to each keratometer that derives a number for power from the measured radius of curvature of the cornea.             | ALWAYS | AUTO, CONFIG |
| >(0022,1028)  | 1 | SQ | IOL Formula Code Sequence                  | Formula used to calculate IOL power. Only a single Item shall be included in this sequence.  | ALWAYS | USER         |
| >>(0008,0100) | 1 | SH | Code Value                                 | See NEMA PS3.3 Section 8.1.  | ALWAYS | AUTO         |
| >>(0008,0102) | 1 | SH | Coding Scheme Designator                   | See NEMA PS3.3 Section 8.2.  | ALWAYS | AUTO         |
| >>(0008,0104) | 1 | LO | Code Meaning                               | See NEMA PS3.3 Section 8.3.  | ALWAYS | AUTO         |



|                |   |    |  |  |        |            |
|----------------|---|----|--|--|--------|------------|
| >(0022,1012)   | 1 | SQ | Ophthalmic Axial Length Sequence                       | Axial length value and source that was used in calculation of IOL power. Only a single Item shall be included in this sequence.  | ALWAYS | AUTO       |
| >>(0022,1019)  | 1 | FL | Ophthalmic Axial Length                                | The axial length of a patient's eye, in mm, that was used in calculation of IOL power.   | ALWAYS | AUTO, USER |
| >>(0022,1250)  | 1 | SQ | Ophthalmic Axial Length Selection Method Code Sequence | Method used to select the value recorded in Ophthalmic Axial Length (0022,1019). Only a single Item shall be included in this sequence.  | ALWAYS | AUTO, USER |
| >>>(0008,0100) | 1 | SH | Code Value   | See NEMA PS3.3 Section 8.1.  | ALWAYS | AUTO       |
| >>>(0008,0102) | 1 | SH | Coding Scheme Designator                               | See NEMA PS3.3 Section 8.2.  | ALWAYS | AUTO       |
| >>>(0008,0104) | 1 | LO | Code Meaning   | See NEMA PS3.3 Section 8.3.  | ALWAYS | AUTO       |
| >>(0022,1035)  | 1 | SQ | Source of Ophthalmic Axial Length Code Sequence        | Source of the value of Ophthalmic Axial Length (0022,1019). Only a single Item shall be included in this sequence.   | ALWAYS | AUTO       |
| >>>(0008,0100) | 1 | SH | Code Value   | See NEMA PS3.3 Section 8.1.  | ALWAYS | AUTO       |
| >>>(0008,0102) | 1 | SH | Coding Scheme Designator                               | See NEMA PS3.3 Section 8.2.  | ALWAYS | AUTO       |
| >>>(0008,0104) | 1 | LO | Code Meaning   | See NEMA PS3.3 Section 8.3.  | ALWAYS | AUTO       |
| >(0022,1093)   | 1 | LO | IOL Manufacturer                                       | Name of the manufacturer that produced the lens.   | ALWAYS | USER       |
| >(0022,1095)   | 1 | LO | Implant Name   | The (product) name of the lens.  | ALWAYS | USER       |
| >(0022,1092)   | 1 | SQ | Lens Constant Sequence                                 | Constants used in calculation of intraocular lens power. These constants are a characteristic of the model of intraocular lens being considered for use in cataract surgery. One or more Items shall be included in this sequence. | ALWAYS | AUTO       |
| >>(0040,A043)  | 1 | SQ | Concept Name Code Sequence                             | Constant type used in calculation of intraocular lens power. Only a single Item shall be included in this sequence.  | ALWAYS | AUTO       |
| >>>(0008,0100) | 1 | SH | Code Value   | See NEMA PS3.3 Section 8.1.  | ALWAYS | AUTO       |
| >>>(0008,0102) | 1 | SH | Coding Scheme Designator                               | See NEMA PS3.3 Section 8.2.  | ALWAYS | AUTO       |

|                |   |    |                                       |   |        |      |
|----------------|---|----|---------------------------------------|---|--------|------|
| >>>(0008,0104) | 1 | LO | Code Meaning                          | See NEMA PS3.3 Section 8.3.   | ALWAYS | AUTO |
| >>(0040,A30A)  | 1 | DS | Numeric Value                         | The value of the constant used.   | ALWAYS | AUTO |
| >(0022,1090)   | 1 | SQ | IOL Power Sequence                    | Information needed to select the intraocular lens power for cataract surgery. One or more Items shall be included in this sequence. | ALWAYS | AUTO |
| >>(0022,1053)  | 1 | FL | IOL Power                             | The intraocular lens power, in diopters.  | ALWAYS | AUTO |
| >>(0022,1054)  | 1 | FL | Predicted Refractive Error            | The predicted postoperative refractive error (i.e. amount of near or far sightedness), in diopters.                                 | ALWAYS | AUTO |
| >>(0022,1097)  | 2 | LO | Implant Part Number                   | The (product) identifier of the lens.   | VNAP   | AUTO |
| >(0022,1121)   | 2 | FL | IOL Power For Exact Emmetropia        | The IOL power that would be required to achieve exact emmetropia, or no need for glasses at distance after surgery, in diopters.    | VNAP   | AUTO |
| >(0022,1122)   | 2 | FL | IOL Power For Exact Target Refraction | The IOL power that would be required to exactly achieve the Target Refraction (0022,1037), in diopters.                             | EMPTY  | AUTO |

**Table 8-48 Intraocular Lens Calculations IOD - Module "Sop Common"**

| Tag         | Type | VR | Name                   | Description  | PoV    | Source          |
|-------------|------|----|------------------------|--|--------|-----------------|
| (0008,0016) | 1    | UI | SOP Class UID          | Uniquely identifies the SOP Class. See NEMA PS3.3 C.12.1.1.1 for further explanation. See also PS 3.4.<br><br>Always "1.2.840.10008.5.1.4.1.1.78.8"  | ALWAYS | AUTO            |
| (0008,0018) | 1    | UI | SOP Instance UID       | Uniquely identifies the SOP Instance. See NEMA PS3.3 C.12.1.1.1 for further explanation. See also PS 3.4.<br><br>IOLMaster 700 uses a constant prefix of "1.2.276.0.75.2.1.11.1.3." followed by a date/time stamp and machine specific identifier. | ALWAYS | AUTO            |
| (0008,0005) | 1C   | CS | Specific Character Set | 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.<br><br>See 6 Support of Character Sets.  | ALWAYS | AUTO,<br>CONFIG |

|               |   |    |                                    |   |        |      |
|---------------|---|----|------------------------------------|---|--------|------|
| (0008,0012)   | 3 | DA | Instance Creation Date             | Date the SOP Instance was created.  | ALWAYS | AUTO |
| (0008,0013)   | 3 | TM | Instance Creation Time             | Time the SOP Instance was created.  | ALWAYS | AUTO |
| (0018,A001)   | 3 | SQ | Contributing Equipment Sequence    | Sequence of Items containing descriptive attributes of related equipment which has contributed to the acquisition, creation or modification of the composite instance. One or more Items may be included in this Sequence. See NEMA PS3.3 Section C.12.1.1.5 for further explanation.<br>Sequence contains one single item defining the equipment which originally acquired the measurement data. | ALWAYS | AUTO |
| >(0040,A170)  | 1 | SQ | Purpose of Reference Code Sequence | Describes the purpose for which the related equipment is being reference. Only a single Item shall be permitted in this sequence. See NEMA PS3.3 Section C.12.1.1.5 for further explanation.  | ALWAYS | AUTO |
| >>(0008,0100) | 1 | SH | Code Value                         | See NEMA PS3.3 Section 8.1.<br>Always "109101"  | ALWAYS | AUTO |
| >>(0008,0102) | 1 | SH | Coding Scheme Designator           | See NEMA PS3.3 Section 8.2.<br>Always "DCM"   | ALWAYS | AUTO |
| >>(0008,0104) | 1 | LO | Code Meaning                       | See NEMA PS3.3 Section 8.3.<br>Always "Acquisition Equipment"   | ALWAYS | AUTO |
| >(0008,0070)  | 1 | LO | Manufacturer                       | Manufacturer of the equipment that contributed to the composite instance.<br>Always "Carl Zeiss Meditec"  | ALWAYS | AUTO |
| >(0008,0080)  | 3 | LO | Institution Name                   | Institution where the equipment that contributed to the composite instance is located.<br>Attribute does not exist if no Institution Name is defined for contributing equipment.  | ANAP   | AUTO |
| >(0008,0081)  | 3 | ST | Institution Address                | Address of the institution where the equipment that contributed to the composite instance is located.<br>Attribute does not exist if no Institution Address is defined for contributing equipment.  | ANAP   | AUTO |
| >(0008,1010)  | 3 | SH | Station Name                       | User defined name identifying the machine that contributed to the composite instance.<br>Attribute does not exist if no Station Name is defined for contributing equipment.   | ANAP   | AUTO |
| >(0008,1040)  | 3 | LO | Institutional Department Name      | Department in the institution where the equipment that contributed to the composite instance is located.  | ANAP   | AUTO |

|              |   |    |                           |   |      |      |
|--------------|---|----|---------------------------|---|------|------|
|              |   |    |                           | Attribute does not exist if no Institutional Department Name is defined for contributing equipment.   |      |      |
| >(0008,1090) | 3 | LO | Manufacturer's Model Name | Manufacturer's model name of the equipment that contributed to the composite instance. Attribute does not exist if no Manufacturer's Model Name is defined for contributing equipment.  | ANAP | AUTO |
| >(0018,1000) | 3 | LO | Device Serial Number      | Manufacturer's serial number of the equipment that contributed to the composite instance. Attribute does not exist if no Device Serial Number is defined for contributing equipment.  | ANAP | AUTO |
| >(0018,1020) | 3 | LO | Software Version(s)       | Manufacturer's designation of the software version of the equipment that contributed to the composite instance. Attribute does not exist if no Software Version(s) is defined for contributing equipment.   | ANAP | AUTO |
| >(0018,1200) | 3 | DA | Date of Last Calibration  | Date when the image acquisition device calibration was last changed in any way. Multiple entries may be used for additional calibrations at other times. See NEMA PS3.3 Section C.7.5.1.1.1 for further explanation. Attribute does not exist if no Date of Last Calibration is defined for contributing equipment. | ANAP | AUTO |
| >(0018,1201) | 3 | TM | Time of Last Calibration  | Time when the image acquisition device calibration was last changed in any way. Multiple entries may be used. See NEMA PS3.3 Section C.7.5.1.1.1 for further explanation. Attribute does not exist if no Time of Last Calibration is defined for contributing equipment.  | ANAP | AUTO |

### 8.1.2 Usage of Attributes from Received IOD's

The usage of attributes of Modality Worklist IODs is described in chapter 4.2.1.3.2 Activity - Query Modality Worklist.

### 8.1.3 Attribute Mapping

In scheduled case, the following attributes are mapped from Modality Worklist to any exported Storage SOP Class instance.

**Table 8-49 Modality Worklist Attribute Mapping**

| Modality Worklist |                                   | Instance IOD                |  | Editable |
|-------------------|-----------------------------------|-----------------------------|--|----------|
| (0010,0010)       | Patient's Name                    | (0010,0010)                 | Patient's Name   | No       |
| (0010,0020)       | Patient ID                        | (0010,0020)                 | Patient ID   | No       |
| (0010,0021)       | Issuer of Patient ID              | (0010,0021)                 | Issuer of Patient ID   | No       |
| (0010,1000)       | Other Patient IDs                 | (0010,1000)                 | Other Patient IDs  | No       |
| (0010,0030)       | Patient's Birth Date              | (0010,0030)                 | Patient's Birth Date   | No       |
| (0010,0040)       | Patient's Sex                     | (0010,0040)                 | Patient's Sex  | No       |
| (0010,2160)       | Ethnic Group                      | (0010,2160)                 | Ethnic Group   | No       |
| (0010,4000)       | Patient Comments                  | (0010,4000)                 | Patient Comments   | No       |
| (0008,0050)       | Accession Number                  | (0008,0050)                 | Accession Number   | No       |
| (0008,0090)       | Referring Physicians Name         | (0008,0090)                 | Referring Physicians Name  | No       |
| (0040,1001)       | Requested Procedure ID            | (0020,0010)                 | Study ID   | No       |
|                   |                                   | (0040,0275)<br>>(0040,1001) | Request Attributes Sequence<br>> Requested Procedure ID          | No       |
| (0032,1060)       | Requested Procedure Description   | (0008,1030)                 | Study Description  | No       |
|                   |                                   | (0040,0275)<br>>(0032,1060) | Request Attributes Sequence<br>> Requested Procedure Description | No       |
| (0032,1064)       | Requested Procedure Code Sequence | (0008,1032)                 | Procedure Code Sequence  | No       |
| >(0008,0100)      | Code Value                        | >(0008,0100)                | Code Value   | No       |
| >(0008,0102)      | Coding Scheme Designator          | >(0008,0102)                | Coding Scheme Designator   | No       |
| >(0008,0103)      | Coding Scheme Version             | >(0008,0103)                | Coding Scheme Version  | No       |
| >(0008,0104)      | Code Meaning                      | >(0008,0104)                | Code Meaning   | No       |
| (0020,000D)       | Study Instance UID                | (0020,000D)                 | Study Instance UID   | No       |
| (0008,0020)       | Study Date                        | (0008,0020)                 | Study Date   | No       |
| (0008,0030)       | Study Time                        | (0008,0030)                 | Study Time   | No       |
| (0008,1110)       | Referenced Study Sequence         | (0008,1110)                 | Referenced Study Sequence  | No       |
| >(0008,1150)      | Referenced Sop Class UID          | >(0008,1150)                | Referenced Sop Class UID   | No       |

|               |                                      |                             |   |    |
|---------------|--------------------------------------|-----------------------------|---|----|
| >(0008,1155)  | Referenced Sop Instance UID          | >(0008,1155)                | Referenced Sop Instance UID   | No |
| (0040,0100)   | Scheduled Procedure Step Sequence    |                             |   |    |
| >(0040,0007)  | Scheduled Procedure Step Description | (0040,0275)<br>>(0040,0007) | Request Attributes Sequence<br>> Scheduled Procedure Step Description | No |
| >(0040,0008)  | Scheduled Protocol Code Sequence     | (0040,0275)<br>>(0040,0008) | Request Attributes Sequence<br>> Scheduled Protocol Code Sequence     | No |
| >>(0008,0100) | Code Value                           | >(0008,0100)                | Code Value  | No |
| >>(0008,0102) | Coding Scheme Designator             | >(0008,0102)                | Coding Scheme Designator  | No |
| >>(0008,0103) | Coding Scheme Version                | >(0008,0103)                | Coding Scheme Version   | No |
| >>(0008,0104) | Code Meaning                         | >(0008,0104)                | Code Meaning  | No |
| >(0040,0009)  | Scheduled Procedure Step ID          | (0040,0275)<br>>(0040,0009) | Request Attributes Sequence<br>> Scheduled Procedure Step ID          | No |

### 8.1.4 Coerced/Modified Files

Those tags are listed in chapter 4.2.1.3.2 Activity - Query Modality Worklist. Other attributes get lost and are not available in the IOLMaster 700 Application Software.

## 8.2 Data Dictionary of Private Attributes

The Private Attributes added to created SOP Instances are listed in the Tables below. IOLMaster 700 reserves blocks of private attributes in groups 771b, 1201, 1203, 1205 and 2201.

**Table 8-50 Private Dictionary Group (771b,00xx) = “99CZM”**

Occurs in: Encapsulated PDF SOP Instance

| Tag         | Attribute Name      | VR | VM |
|-------------|---------------------|----|----|
| (771b,00xx) | Private Creator     | LO | 1  |
| (771b,xx08) | IOL Laterality      | CS | 1  |
| (771b,xx09) | Formula Denominator | LO | 1  |
| (771b,xx0b) | AL                  | FD | 1  |
| (771b,xx0c) | SNR                 | FD | 1  |
| (771b,xx0d) | Index Tag           | FD | 1  |
| (771b,xx0e) | Mean Value          | FD | 1  |
| (771b,xx0f) | R1                  | FD | 1  |
| (771b,xx10) | R2                  | FD | 1  |
| (771b,xx11) | D1                  | FD | 1  |
| (771b,xx12) | D2                  | FD | 1  |

|             |                                     |    |   |
|-------------|-------------------------------------|----|---|
| (771b,xx13) | A1                                  | FD | 1 |
| (771b,xx14) | A2                                  | FD | 1 |
| (771b,xx15) | Zyl                                 | FD | 1 |
| (771b,xx16) | Refractive Index                    | FD | 1 |
| (771b,xx17) | Quali Tag                           | FD | 1 |
| (771b,xx18) | Num1                                | FD | 1 |
| (771b,xx19) | Num2                                | FD | 1 |
| (771b,xx1a) | Num3                                | FD | 1 |
| (771b,xx1b) | Num4                                | FD | 1 |
| (771b,xx1c) | Num5                                | FD | 1 |
| (771b,xx1d) | WZW                                 | FD | 1 |
| (771b,xx1e) | FPX                                 | FD | 1 |
| (771b,xx1f) | FPY                                 | FD | 1 |
| (771b,xx2c) | Surgeon                             | LO | 1 |
| (771b,xx30) | Axial Length Values Sequence        | SQ | 1 |
| (771b,xx31) | Axial Length Values Triple Sequence | SQ | 1 |
| (771b,xx32) | Keratometer Values Sequence         | SQ | 1 |
| (771b,xx33) | Keratometer Values ntupel Sequence  | SQ | 1 |
| (771b,xx34) | Chamber Depth Values Sequence       | SQ | 1 |
| (771b,xx35) | White-to-white Sequence             | SQ | 1 |
| (771b,xx3b) | White-to-white Values Sequence      | SQ | 1 |
| (771b,xx43) | Mean Value AL                       | FD | 1 |
| (771b,xx44) | Mean Value SNR                      | FD | 1 |
| (771b,xx49) | Mean Value R1                       | FD | 1 |
| (771b,xx4a) | Mean Value D1                       | FD | 1 |
| (771b,xx4b) | Mean Value A1                       | FD | 1 |
| (771b,xx4c) | Mean Value R2                       | FD | 1 |
| (771b,xx4d) | Mean Value D2                       | FD | 1 |
| (771b,xx4e) | Mean Value A2                       | FD | 1 |
| (771b,xx4f) | Mean Value Zyl                      | FD | 1 |
| (771b,xx50) | PUP                                 | FD | 1 |
| (771b,xx51) | PUP FPX                             | FD | 1 |
| (771b,xx52) | PUP FPY                             | FD | 1 |
| (771b,xx60) | Haigis-T Sequence                   | SQ | 1 |
| (771b,xx61) | Haigis-T Formula Sequence           | SQ | 1 |

|             |                              |    |   |
|-------------|------------------------------|----|---|
| (771b,xx62) | Surgical Conditions Sequence | SQ | 1 |
| (771b,xx63) | SIA Cylinder                 | FD | 1 |
| (771b,xx64) | SIA Axis                     | FD | 1 |
| (771b,xx65) | Toric IOL Axis               | FD | 1 |

**Table 8-51 Private Dictionary Group (1201,00xx) =  
“99CZM\_IOLMaster\_ExtendedKeratometryMeasurements”**

Occurs in: Keratometry Measurements SOP Instance

| Tag         | Attribute Name  | VR | VM |
|-------------|---|----|----|
| (1201,00xx) | Private Creator                                       | LO | 1  |
| (1201,xx01) | IOLMaster Keratometry Quality Right Eye Sequence      | SQ | 1  |
| (1201,xx02) | IOLMaster Keratometry Quality Left Eye Sequence       | SQ | 1  |
| (1201,xx03) | Extended Steep Keratometric Axis Sequence             | SQ | 1  |
| (1201,xx04) | Extended Flat Keratometric Axis Sequence              | SQ | 1  |
| (1201,xx05) | Standard Deviation of Keratometry Measurement         | FD | 1  |
| (1201,xx06) | IOLMaster Quality Indicator                           | CS | 1  |
| (1201,xx07) | Standard Deviation of Spherical Equivalent            | FD | 1  |
| (1201,xx08) | IOLMaster Posterior Cornea Surface Right Eye Sequence | SQ | 1  |
| (1201,xx09) | IOLMaster Posterior Cornea Surface Left Eye Sequence  | SQ | 1  |
| (1201,xx0A) | Steep Posterior Cornea Surface Sequence               | SQ | 1  |
| (1201,xx0B) | Flat Posterior Cornea Surface Sequence                | SQ | 1  |
| (1201,xx0C) | Posterior Radius of Curvature                         | FD | 1  |
| (1201,xx0D) | Posterior Keratometric Power                          | FD | 1  |
| (1201,xx0E) | Posterior Keratometric Axis                           | FD | 1  |
| (1201,xx0F) | IOLMaster True Keratometric Power Right Eye Sequence  | SQ | 1  |
| (1201,xx10) | IOLMaster True Keratometric Power Left Eye Sequence   | SQ | 1  |
| (1201,xx11) | Steep True Keratometric Power Sequence                | SQ | 1  |
| (1201,xx12) | Flat True Keratometric Power Sequence                 | SQ | 1  |
| (1201,xx13) | True Radius of Curvature                              | FD | 1  |
| (1201,xx14) | True Keratometric Power                               | FD | 1  |
| (1201,xx15) | True Keratometric Axis                                | FD | 1  |
| (1201,xx16) | Standard Deviation of True Keratometric Power         | FD | 1  |
| (1201,xx17) | Standard Deviation of True Keratometric Power         | FD | 1  |
| (1201,xx1B) | Index of Refraction of the Cornea                     | FD | 1  |
| (1201,xx1C) | Index of Refraction of the Aqueous Humor              | FD | 1  |
| (1201,xx1D) | Referenced Keratometry Measurement QC Image Sequence  | SQ | 1  |
| (1201,xx1E) | Referenced SOP Class UID                              | UI | 1  |



|             |                             |    |   |
|-------------|-----------------------------|----|---|
| (1201,xx1F) | Referenced SOP Instance UID | UI | 1 |
|-------------|-----------------------------|----|---|

**Table 8-52 Private Dictionary Group (1203,00xx) = “99CZM\_IOLMaster\_ClinicalPatientInformation”**

Occurs in: Ophthalmic Axial Measurements and Keratometry Measurements SOP Instance

| Tag         | Attribute Name  | VR | VM |
|-------------|---|----|----|
| (1203,00xx) | Private Creator   | LO | 1  |
| (1203,xx01) | IOLMaster Clinical Patient Information Right Eye Sequence | SQ | 1  |
| (1203,xx02) | IOLMaster Clinical Patient Information Left Eye Sequence  | SQ | 1  |
| (1203,xx03) | Refractive State Sequence                                 | SQ | 1  |
| (1203,xx04) | Sphere Power  | FD | 1  |
| (1203,xx05) | Cylinder Power  | FD | 1  |
| (1203,xx06) | Cylinder Axis   | FD | 1  |
| (1203,xx07) | Vertex Distance   | FD | 1  |
| (1203,xx08) | Visual Acuity Sequence                                    | SQ | 1  |
| (1203,xx09) | Decimal Visual Acuity                                     | FD | 1  |
| (1203,xx0A) | Refractive Surgery State Sequence                         | SQ | 1  |
| (1203,xx0B) | Refractive Procedure Occurred                             | CS | 1  |
| (1203,xx0C) | Refractive Surgery Type Code Sequence                     | SQ | 1  |
| (1203,xx0D) | Code Value  | SH | 1  |
| (1203,xx0E) | Coding Scheme Designator                                  | SH | 1  |
| (1203,xx0F) | Coding Scheme Version                                     | SH | 1  |
| (1203,xx10) | Code Meaning  | LO | 1  |

**Table 8-53 Private Dictionary Group (1205,00xx) = “99CZM\_IOLMaster\_ExtendedOphthalmicAxialMeasurements”**

Occurs in: Ophthalmic Axial Measurements SOP Instance

| Tag         | Attribute Name   | VR | VM |
|-------------|--|----|----|
| (1205,00xx) | Private Creator  | LO | 1  |
| (1205,xx01) | IOLMaster Ophthalmic Axial Measurements Right Eye Sequence | SQ | 1  |
| (1205,xx02) | IOLMaster Ophthalmic Axial Measurements Left Eye Sequence  | SQ | 1  |

**Table 8-54 Private Dictionary Group (2201,00xx) = “99CZM\_NIM\_INTERNAL\_01”**

Occurs in: Multi-frame True Color Secondary Capture Image SOP Instance, Ophthalmic Photography 8 Bit Image SOP Instance, Keratometry Measurements SOP Instance, Ophthalmic Axial Measurements SOP Instance, Intraocular Lens Calculations SOP Instance

Encapsulated PDF Storage

| 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 4202. Ophthalmic Photography Acquisition Device

The application software uses (0022,0015) Acquisition Device Type Code Sequence to specify detailed information on the type of acquisition device used for the OP image.

Occurs in: Ophthalmic Photography 8 Bit Image IOD SOP Instance

**Table 8-2 Coded Values - Ophthalmic Photography Acquisition Device**

| Code Value       | Coding Scheme Designator | Coding Scheme Version | Code Meaning / Comments |
|------------------|--------------------------|-----------------------|-------------------------|
| OPTICAL_BIOMETRY | 99CZM                    | 20160301              | Optical Biometry        |

### 8.3.2 CID 4209. Ophthalmic Anatomic Structure Imaged

The application software uses (0008,2218) Anatomic Region Sequence to specify detailed information on the anatomic region that was examined.

Occurs in: Ophthalmic Photography 8 Bit Image IOD SOP Instance

**Table 8-3 Coded Values - Ophthalmic Anatomic Structure Imaged**

| Code Value | Coding Scheme Designator | Coding Scheme Version | Code Meaning / Comments |
|------------|--------------------------|-----------------------|-------------------------|
| T-AA000    | SRT                      | n/a                   | Eye                     |

### 8.3.3 CID 4231. Lens Status

The application software uses (0022,1024) Lens Status Sequence to specify detailed information on lens status of a patient's eye as defined below.

Occurs in: Ophthalmic Axial Measurements SOP Instance

**Table 8-4 Coded Values - Lens Status**

| Code Value      | Coding Scheme Designator | Coding Scheme Version | Code Meaning / Comments |
|-----------------|--------------------------|-----------------------|-------------------------|
| DA-73410        | SRT                      | n/a                   | Aphakic                 |
| R-2073F         | SRT                      | n/a                   | Phakic                  |
| A-040F7         | SRT                      | n/a                   | Phakic IOL              |
| F-02087         | SRT                      | n/a                   | Piggyback IOL           |
| DA-73460        | SRT                      | n/a                   | Pseudophakia            |
| PGGYBCK_SILICON | 99CZM                    | 20160301              | Piggyback Silicone IOL  |
| PSDPHKC_SILICON | 99CZM                    | 20160301              | Pseudophakic Silicone   |
| PSDPHKC_PMMA    | 99CZM                    | 20160301              | Pseudophakic PMMA       |

### 8.3.4 CID 4232. Vitreous Status

The application software uses (0022,1025) Vitreous Status Code Sequence to specify detailed information on vitreous status of a patient's eye as defined below.

Occurs in: Ophthalmic Axial Measurements SOP Instance

**Table 8-5 Coded Values - Vitreous Status**

| Code Value | Coding Scheme Designator | Coding Scheme Version | Code Meaning / Comments |
|------------|--------------------------|-----------------------|-------------------------|
| DA-7930D   | SRT                      | n/a                   | Post-Vitrectomy         |
| F-035FD    | SRT                      | n/a                   | Silicone Oil            |
| T-AA092    | SRT                      | n/a                   | Vitreous Only           |

### 8.3.5 CID 4233. Ophthalmic Axial Length Measurements Segment Names

The application software uses (0022,1101) Ophthalmic Axial Length Measurements Segment Name Code Sequence to specify detailed information on the axial length segment of a patient's eye which has been measured.

Occurs in: Ophthalmic Axial Measurements SOP Instance

**Table 8-6 Coded Values - Ophthalmic Axial Length Measurements Segment Names**

| Code Value | Coding Scheme Designator | Coding Scheme Version | Code Meaning / Comments |
|------------|--------------------------|-----------------------|-------------------------|
| T-AA200    | SRT                      | n/a                   | Cornea                  |
| T-AA050    | SRT                      | n/a                   | Anterior Chamber        |
| 111778     | DCM                      | n/a                   | Single or Anterior Lens |
| IOLM_AQD   | 99CZM                    | 20160301              | Aqueous Depth           |

### 8.3.6 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: Ophthalmic Axial Measurements SOP Instance, Keratometry Measurements SOP Instance, Intraocular Lens Calculations SOP Instance

**Table 8-7 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                   |

### 8.3.7 CID 4235. Keratometry Descriptors

The application software uses (0022,1096) Keratometry Measurement Type Code Sequence to specify detailed information on the type of keratometry measurement performed on a patient's eye.

Occurs in: Intraocular Lens Calculations SOP Instance

**Table 8-8 Coded Values - Keratometry Descriptors**

| Code Value | Coding Scheme Designator | Coding Scheme Version | Code Meaning / Comments |
|------------|--------------------------|-----------------------|-------------------------|
| 111754     | DCM                      | n/a                   | Auto Keratometry        |

### 8.3.8 CID 4236. IOL Calculation Formula

The application software uses (0022,1028) IOL Formula Code Sequence to specify detailed information on the IOL calculation formula used to calculate IOL power.

Occurs in: Intraocular Lens Calculations SOP Instance

**Table 8-9 Coded Values - IOL Calculation Formula**

| Code Value | Coding Scheme Designator | Coding Scheme Version | Code Meaning / Comments |
|------------|--------------------------|-----------------------|-------------------------|
| 111760     | DCM                      | n/a                   | Haigis                  |
| 111761     | DCM                      | n/a                   | Haigis-L                |
| 111762     | DCM                      | n/a                   | Holladay 1              |
| 111763     | DCM                      | n/a                   | Holladay 2              |
| 111764     | DCM                      | n/a                   | Hoffer Q                |
| 111767     | DCM                      | n/a                   | SRK-T                   |

### 8.3.9 CID 4237. Lens Constant Type

The application software uses Lens Constant Sequence (0022,1092) > Concept Name Code Sequence (0040,A043) to specify detailed information on the IOL calculation constant types used to calculate IOL power.

Occurs in: Intraocular Lens Calculations SOP Instance

**Table 8-10 Coded Values - Lens Constant Type**

| Code Value | Coding Scheme Designator | Coding Scheme Version | Code Meaning / Comments |
|------------|--------------------------|-----------------------|-------------------------|
| F-048FA    | SRT                      | n/a                   | A-Constant              |
| 111768     | DCM                      | n/a                   | ACD Constant            |
| 111769     | DCM                      | n/a                   | Haigis a0               |
| 111770     | DCM                      | n/a                   | Haigis a1               |
| 111771     | DCM                      | n/a                   | Haigis a2               |
| 111772     | DCM                      | n/a                   | Hoffer pACD Constant    |
| 111773     | DCM                      | n/a                   | Surgeon Factor          |

### 8.3.10 CID 4238. Refractive Error Types

The application software uses (0022,1103) Refractive Error Before Refractive Surgery Code Sequence to specify detailed information on the type of refractive error of a patient's eye before refractive surgery was performed.

Occurs in: Intraocular Lens Calculations SOP Instance

**Table 8-11 Coded Values - Refractive Error Types**

| Code Value | Coding Scheme Designator | Coding Scheme Version | Code Meaning / Comments |
|------------|--------------------------|-----------------------|-------------------------|
| DA-74120   | SRT                      | n/a                   | Myopia                  |
| DA-74110   | SRT                      | n/a                   | Hyperopia               |

### 8.3.11 CID 4239. Anterior Chamber Depth Definition

The application software uses (0022,1125) Anterior Chamber Depth Definition Code Sequence to specify detailed information on how to interpret a value for anterior chamber depth.

Occurs in: Ophthalmic Axial Measurements SOP Instance

**Table 8-12 Coded Values - Anterior Chamber Depth Definition**

| Code Value | Coding Scheme Designator | Coding Scheme Version | Code Meaning / Comments          |
|------------|--------------------------|-----------------------|----------------------------------|
| 111776     | DCM                      | n/a                   | Front Of Cornea To Front Of Lens |

### 8.3.12 CID 4240. Ophthalmic Measurement or Calculation Data Source

The application software uses (0022,1150) Ophthalmic Axial Length Data Source Code Sequence to specify detailed information on the source of the measured value.

Occurs in: Ophthalmic Axial Measurements SOP Instance, Intraocular Lens Calculations SOP Instance

**Table 8-13 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                   |
| IOLM_SCAN_000 | 99CZM                    | 20160301              | Measurement at scan angle 0°   |
| IOLM_SCAN_030 | 99CZM                    | 20160301              | Measurement at scan angle 30°  |
| IOLM_SCAN_240 | 99CZM                    | 20160301              | Measurement at scan angle 240° |
| IOLM_SCAN_090 | 99CZM                    | 20160301              | Measurement at scan angle 90°  |
| IOLM_SCAN_300 | 99CZM                    | 20160301              | Measurement at scan angle 300° |
| IOLM_SCAN_330 | 99CZM                    | 20160301              | Measurement at scan angle 330° |

### 8.3.13 CID 4241. Ophthalmic Axial Length Selection Method

The application software uses (0022,1250) Ophthalmic Axial Length Selection Method Code Sequence to specify detailed information on the method used to select the axial length.

Occurs in: Intraocular Lens Calculations SOP Instance

**Table 8-14 Coded Values - Ophthalmic Axial Length Selection Method**

| Code Value | Coding Scheme Designator | Coding Scheme Version | Code Meaning / Comments |
|------------|--------------------------|-----------------------|-------------------------|
| 121412     | DCM                      | n/a                   | Mean value chosen       |
| 121410     | DCM                      | n/a                   | User chosen value       |

### 8.3.14 CID 4243. Ophthalmic Quality Metric Type

The application software uses (0022,1262) Ophthalmic Axial Length Quality Metric Sequence / (0040,A043) Concept Name Code Sequence to specify detailed information on the type of metric used to evaluate the quality of the composite axial length values.

Occurs in: Ophthalmic Axial Measurements SOP Instance

**Table 8-15 Coded Values - Ophthalmic Quality Metric Type**

| Code Value   | Coding Scheme Designator | Coding Scheme Version | Code Meaning / Comments   |
|--------------|--------------------------|-----------------------|---|
| 111786       | DCM                      | n/a                   | Standard Deviation of measurements used   |
| IOLM_QUALITY | 99CZM                    | 20160301              | IOLMaster Quality Metric used<br>Note:<br>3.0 = Successful<br>1.75 = Warning<br>1.0 = Failed<br>0.0 = None of above |

### 8.3.15 CID 7004. Waveform Purposes of Reference

The application software uses (0008,114A) Referenced Instance Sequence to specify references from the OAM quality control image to the related measurements SOP instance and therein the (0040,A170) Purpose of Reference Code Sequence to describe the purpose for which the reference is made.

Occurs in: Multi-frame True Color Secondary Capture Image SOP Instance

**Table 8-16 Coded Values - Waveform Purposes of Reference**

| Code Value   | Coding Scheme Designator | Coding Scheme Version | Code Meaning / Comments                              |
|--------------|--------------------------|-----------------------|--|
| MEASUREMENTS | 99CZM                    | 20160301              | Measurements SOP Instance associated with this image |

### 8.3.16 CID 7005. Contributing Equipment Purposes of Reference

The application software uses (0018,A001) Contributing Equipment Sequence to specify any contributing equipment and therein the (0040,A170) Purpose of Reference Code Sequence to describe the purpose for which the equipment is being referenced.

Occurs in: Multi-frame True Color Secondary Capture Image SOP Instance, Ophthalmic Photography 8 Bit Image SOP Instance, Keratometry Measurements SOP Instance, Ophthalmic Axial Measurements SOP Instance, Intraocular Lens Calculations SOP Instance

**Table 8-17 Coded Values - Contributing Equipment Purposes of Reference**

| Code Value | Coding Scheme Designator | Coding Scheme Version | Code Meaning / Comments |
|------------|--------------------------|-----------------------|-------------------------|
| 109101     | DCM                      | n/a                   | Acquisition Equipment   |

### 8.3.17 CID 7201. Referenced Image Purposes of Reference

The application software uses (0008,1140) Referenced Image Sequence to specify reference images related to a certain measurement and therein (0040,A170) Purpose of Reference Code Sequence to describe the purpose for which the reference is made.

Occurs in: Encapsulated PDF SOP Instance

**Table 8-18 Coded Values - Referenced Image Purposes of Reference**

| Code Value    | Coding Scheme Designator | Coding Scheme Version | Code Meaning / Comments                         |
|---------------|--------------------------|-----------------------|---|
| SCLERAL_IMG_L | 99CZM                    | 20100616              | Image of patient's left eye's scleral vessels.  |
| SCLERAL_IMG_R | 99CZM                    | 20100616              | Image of patient's right eye's scleral vessels. |

### 8.3.18 No CID. Acquisition Context Sequence Codes (no context group defined)

The application software uses (0040,0555) Acquisition Context Sequence to specify more detailed information on biometry measurements made in sclera images as defined below.

Occurs in: Ophthalmic Photography 8 Bit SOP Instance (Image Type "ORIGINAL\PRIMARY\SCLERA")

**Table 8-19 Coded Values - Acquisition Context Sequence – Sclera images**

| Coding Value | Coding Scheme Designator / Version | Coding Type   | Meas. Units Code / Values | Code Meaning / Comments                                       |
|--------------|------------------------------------|---------------|---------------------------|---|
| TORIC_ACQ_Q  | 99CZM_IOLM / 20100616              | Numeric Value | Range 0.0:1.0             | Quality of the image regarding application of markerless IOL. |
| ACQ_EXP_T    | 99CZM_IOLM / 20100616              | Numeric Value | millisecond               | Exposure time during image acquisition                        |

| Coding Value     | Coding Scheme Designator / Version | Coding Type   | Meas. Units Code / Values | Code Meaning / Comments   |
|------------------|------------------------------------|---------------|---------------------------|---|
| ACQ_ILLUMN       | 99CZM_IOLM / 20100616              | Numeric Value | Range 0:255               | Brightness of illuminating LEDs during image acquisition<br>Note: Item is not always present.                                       |
| REFIMG_EVAL_DATA | 99CZM / 20160301                   | Text Value    | n/a                       | Reference image evaluation data   |
| PixelWidth       | 99HIKO                             | Numeric Value | millimeter                | Pixel width in millimeters.   |
| PixelHeight      | 99HIKO                             | Numeric Value | millimeter                | Pixel height in millimeters.  |
| LIMBUSCENTER_X   | 99CZM / 20160301                   | Numeric Value | pixels                    | X-coordinate of the center of the Limbus<br>Note: Defined in an image coordinate system with its origin [0,0] in upper left corner. |
| LIMBUSCENTER_Y   | 99CZM / 20160301                   | Numeric Value | pixels                    | Y-coordinate of the center of the Limbus<br>Note: Defined in an image coordinate system with its origin [0,0] in upper left corner. |
| LIMBUSRADIUS     | 99CZM / 20160301                   | Numeric Value | millimeter                | Radius of the Limbus  |
| LOWERLID_COEFF_A | 99CZM / 20160301                   | Numeric Value | pixels                    | Coefficient A of the polynomial for the lower eyelid<br>Note: The polynomial is defined in pixel.                                   |
| LOWERLID_COEFF_B | 99CZM / 20160301                   | Numeric Value | pixels                    | Coefficient B of the polynomial for the lower eyelid<br>Note: The polynomial is defined in pixel.                                   |
| LOWERLID_COEFF_C | 99CZM / 20160301                   | Numeric Value | pixels                    | Coefficient C of the polynomial for the lower eyelid<br>Note: The polynomial is defined in pixel.                                   |
| UPPERLID_COEFF_A | 99CZM / 20160301                   | Numeric Value | pixels                    | Coefficient A of the polynomial for the upper eyelid<br>Note: The polynomial is defined in pixel.                                   |

| Coding Value     | Coding Scheme Designator / Version | Coding Type   | Meas. Units Code / Values               | Code Meaning / Comments   |
|------------------|------------------------------------|---------------|---|---|
| UPPERLID_COEFF_B | 99CZM / 20160301                   | Numeric Value | pixels                                  | Coefficient B of the polynomial for the upper eyelid<br>Note: The polynomial is defined in pixel. |
| UPPERLID_COEFF_C | 99CZM / 20160301                   | Numeric Value | pixels                                  | Coefficient C of the polynomial for the upper eyelid<br>Note: The polynomial is defined in pixel. |
| SCLERA_QUALITY   | 99CZM / 20160301                   | Text Value    | SUCCESSFUL<br>WARNING<br>FAILED<br>NONE | The IOLMaster quality indicator of sclera measurement   |

The application software uses (0040,0555) Acquisition Context Sequence to specify more detailed information on biometry measurements made in white-to-white images as defined below.

Occurs in: Ophthalmic Photography 8 Bit SOP Instance (Image Type "ORIGINAL\PRIMARY\WHITE\_TO\_WHITE")

**Table 8-20 Coded Values - Acquisition Context Sequence – White-to-white images**

| Coding Value   | Coding Scheme Designator | Coding Type   | Meas. Units Code / Values               | Code Meaning / Comments                                       |
|----------------|--------------------------|---------------|---|---|
| WTW_DIAMETER   | 99CZM                    | Numeric Value | millimeter                              | White-to-white diameter                                       |
| WTW_FP_X       | 99CZM                    | Numeric Value | millimeter                              | Horizontal offset of white-to-white center to fixation point  |
| WTW_FP_Y       | 99CZM                    | Numeric Value | millimeter                              | Vertical offset of white-to-white center to fixation point    |
| PUPIL_DIAMETER | 99CZM                    | Numeric Value | millimeter                              | Pupil diameter  |
| PUPIL_FP_X     | 99CZM                    | Numeric Value | millimeter                              | Horizontal offset of pupil center to fixation point           |
| PUPIL_FP_Y     | 99CZM                    | Numeric Value | millimeter                              | Vertical offset of pupil center to fixation point             |
| POSITION_FP_X  | 99CZM                    | Numeric Value | pixels                                  | X-coordinate of fixation point in the white-to-white image    |
| POSITION_FP_Y  | 99CZM                    | Numeric Value | pixels                                  | Y-coordinate of fixation point in the white-to-white image    |
| WTW_QUALITY    | 99CZM                    | Text Value    | SUCCESSFUL<br>WARNING<br>FAILED<br>NONE | The IOLMaster quality indicator of white-to-white measurement |



## 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 8-11 Encapsulated PDF IOD - Module "CZM Encapsulated Pdf Instance Extension"
- Table 8-12 Encapsulated PDF IOD - Module "CZM IOL Measured Values"
- Table 8-13 Encapsulated PDF IOD - Module "CZM IOL Haigis-T"
- Table 8-34 Multi Frame True Color Sc Image IOD - Module "Czm Multi Frame True Color Sc Image Extension"
- Table 8-38 Ophthalmic Axial Measurements IOD - Module "CZM IOLM Clinical Patient Information"
- Table 8-42 Keratometry Measurements IOD - Module "CZM IOLM Keratometry Quality"
- Table 8-43 Keratometry Measurements IOD - Module "CZM IOLM Posterior Cornea Surface Measurements"
- Table 8-44 Keratometry Measurements IOD - Module "CZM IOLM True Keratometric Power Measurements"
- Table 8-45 Keratometry Measurements IOD - Module "CZM IOLM Clinical Patient Information"

## 8.6 Private Transfer Syntaxes

No Private Transfer Syntax is supported.



Carl Zeiss Meditec AG  
Goeschwitzer Strasse 51-52  
07745 Jena  
Germany  
[www.zeiss.com/iolmaster700](http://www.zeiss.com/iolmaster700)  
[www.zeiss.com/med](http://www.zeiss.com/med)  
[www.zeiss.com/dicom](http://www.zeiss.com/dicom)