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Digital Imaging and Communications in Medicine (DICOM)

Supplement 247: Eyecare Measurement Templates

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Document History

Document Version	Date	Content
01	11-Oct-24	Initial Draft for discussion at WG-9
02	4-Nov-24	First reading at WG-06
03	13-Nov-24	For discussion at WG-9
04	10-Dec-24	For discussion at WG-9
05	10-Jan-25	For discussion at WG-6
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07	16-Jan-25	For discussion at WG-6
PC (08)	21-Jan-25	For public comment
09	23-Mar-25	For Letter Ballot release discussion at WG-6
10	24-Mar-25	Include additional Public Comment resolutions
11	24-Mar-25	Break out Visual Field and add Ratio template
12	26-Mar-25	For Letter Ballot release discussion at WG-6
DLB (13)	27-Mar-25	Draft Letter Ballot

Scope and Field of Application

This Supplement proposes to add templates, context groups, and coded vocabulary for key eyecare measurements to the Standard. These templates may be used in either Structured Reporting documents, or for structured content in an Encapsulated PDF object.

The focus of this Supplement is the set of "key" measurements clinically important for patient care. These are not intended to be a comprehensive set of ophthalmic measurements, although the extensible context groups and templates allow additional measurements beyond the specified key measurements to be included in SOP Instances.

The key measurements of this Supplement are primarily derived from analysis of images, in particular retinal optical coherence tomography (OCT) images. Note that there are several existing IODs that record measurements directly produced by various refractive devices that do not produce images (autorefraction, lensometry, keratometry, etc.), as well as more comprehensive visual field and macular thickness reports, which are not intended to be replaced by these more summary key measurement templates.

The IHE Eyecare domain defined within the Unified Eye Care Workflow Profile (as a draft for trial implementation) an option for Key Measurements in DICOM Encapsulated PDF [https://www.ihe.net/uploadedFiles/Documents/Eye_Care/IHE_EyeCare_Suppl_Key_Measurement_PDF.pdf]. That option specified templates, context groups, and coded vocabulary for various key measurements in ophthalmology to be encoded as structured content within Encapsulated PDF objects. WG-09 has determined that those content specifications should be formalized in the DICOM Standard, and that work informed the draft of this Supplement.

Some vocabulary may be submitted to LOINC for assignment of codes.

SR and Encapsulated PDF

There is tension in clinical documentation between the needs for structured discrete data and human-readable content. In DICOM, discrete data is generally sent using Structured Reporting, and ready for display rendered data may be sent in an Encapsulated PDF. A given set of measurements may be sent in objects in both formats, with cross-reference to the other object using the Referenced Instance Sequence (0008,114A); note that the cross-reference is to an instance as a whole, not to individual measurements. Alternatively, discrete measurements may be included in an Encapsulated PDF object in the SR-like Content Sequence (0040,A730). The Templates defined in this Supplement may be used in either object type.

The DICOM Standard does not recommend the use of any particular approach to meet the clinical documentation needs of the users. Such recommendation may be made by a professional society or a standards profiling effort. For example, the American Academy of Ophthalmology and the IHE Eyecare domain, considering the need to integrate legacy PDF-based systems, have in the past recommended use of Encapsulated PDF with the included SR-like Content Sequence for basic interoperability (see https://www.aaojournal.org/article/S0161-6420(21)00164-0/fulltext), but those recommendations may not meet all use cases in the evolving interoperable healthcare IT environment.

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Closed Issues from Public Comment

1	TIDs 60x2 – 60x9	Should the invocations of the T60x1 measurement group section have VM 1-2 (limited to one each for L and R eye), or 1-n (e.g., to allow different sets of measurements with different grid positioning)? *VM 1-n should be allowed as it is appropriate for trend reports and possibly other uses. [WG-9 consensus 02/2025]*
2	TID 60x1	Are there implementation concerns with the specifications for mandatory Content Items? TID 60x1 makes mandatory a Content Item for each concept specified in the invoking Template, i.e., in the Context Groups invoked for parameters $Measurement and $QualType. This manner of specifying multiple mandatory items has not previously been used in the Standard, and may have implications for software libraries, toolkits, and validators. Additionally, receiving implementations may need to better handle an absent NUM value with an associated reason code. *Current DICOM SOP Instance toolkits and validators, by following the Attribute Type specifications, should properly handle absent NUM values, but may not check for presence of Content Items for all Context Group values. However, this might be considered a real-world conditional constraint, which would need to be checked by manual processes.* *Key measurement Context Groups should be specified as non-extensible because all their items are Mandatory. [WG-9 consensus 03/2025]*
3	TID 60x2	Is the use of Rational Numerator Value (0040,A162) and Rational Denominator Value (0040,A163) in a single NUM item as a supplement to a % value acceptable? A concern is that receiving implementations may ignore those type 3 attributes. Visual Field Fixation ratios in the IHE profile were represented as TEXT ('Text string in the form of "number of <x> responses/number of trials"'). This is bad form for SR. However, encoding the ratio components as separate NUM Content Items does not seem to fit the model of key measurements. *The specific values for number of responses and number of trials are clinically significant, and should be separately encoded. See, e.g., the "Eyes on FHIR" value set concept names (based on the IHE draft profile) that include both percentages and ratios https://build.fhir.org/ig/HL7/fhir-eyecare-ig/branches/master/CodeSystem-visual-field-observations.html. In FHIR, ratios are encoded using the FHIR Ratio data type, which has no simple parallel in DICOM SR Content Item Value Types.* *A new template for a Ratio construct is defined, and the TID 60x2 Visual Field Key Measurements template is revised to use that template. In consequence, the TID 60x2 template will not invoke the TID 60x1 template, and the mandatory measurements are expanded in-line in TID 60x2 rather than being specified in CID 42x1.*

4	TID 60x6, CID 42x5, CID 42x6	Is the approach acceptable to post-coordinate Gangion Cell Layer measurement concepts with a topographical modifier specifying the layers included? The approach specified allows the same measurement concepts, but has the creator specify whether they were made solely on the GCL, on the Gangion Cell Layer + Inner Plexiform Layer (GCL-IPL), or on the entire Ganglion Cell Complex (GCL + IPL + RNFL). *No negative comments received*
5	TID 60x6, CID 42x7, CID 42x8	Is the approach acceptable for allowing application specific definitions of GCL sectors, but using common measurement concepts for sectors with the same name but different spans? *One comment received expressing concern about comparing or aggregating results from devices that use different sector definitions. A cautionary note has been added.*
6	Annex D nnn411-nnn422	Are clockface position definitions clear? Positions go clockwise for the right eye, but counterclockwise for the left eye, when viewed from the anterior position (i.e., looking at the patient face on). *Quadrant positions added to definitions.*
7	CID 42x1, CID 42x2, CID 42x3, CID 42x4, CID 42x6, CID 42x9, CID 42y0, Annex D	Are the identified key measurements necessary and sufficient for the purposes of patient care? Are there additional needed key measurements? Are there some identified measurements that are not useful and may be removed? Are all measurement definitions accurate? Do measurement definitions that include units of measure do so justifiably? *Modified definition for Optic disc area* *Comment on CID 42x2 requested addition of Bruch's Membrane Opening Minimum Rim Width (BMO-MRW) measurements by sector with specified ROI diameter, and a measurement method of axis alignment (horizontal, or aligned to fovea-optic disc axis). These items would be appropriate to a new template, but requires consensus from WG-9. May be addressed with a follow-on CP.* *Removed Corneal Topography Key Measurements – to be addressed in conjunction with revision of Corneal Topography Map and to be consistent with ISO 19980:2021 Ophthalmic instruments — Corneal topographers* *Comment on TID 60x1 and TID 60x4 noted that all key measurements at the top level should contain the size of the measurement grid. (nnn406, DCM, "Retinal ROI width") is included as mandatory in TID 60x4 (through CID 42x3) and TID 60x6 (CID 42x6), measurement grid is defined by ETDRS for the concepts of TID 60x5 (CID 42x4), and grid is not applicable to other templates. No change required.* *Modified definitions for RNFL average thickness, RNFL sector measurements, and RNFL Symmetry* *Changed Retinal ROI radius to Retinal ROI width, with revised definition, to accommodate rectangular ROIs.*

		Changed CID 42x8 GCL Sector Grid Methods to be Retinal Sector Grid Methods, added two methods, and added invocation of Context Group to TID 60x4 RNFL Key Measurement $Method parameter. *A Context Group for optional Ophthalmic Image ROI Measurements added with concept Geographic atrophy area.*
8		Should a new SOP Class be defined that makes SR content mandatory in an Encapsulated PDF SOP Instance? One intended use of these templates is for the SR-like content included in an EPDF. A separate SOP Class might better support conformance claims for systems that are providing such content, and would distinguish PDF display-only instances from those that also have processable discrete data. *A new SOP Class is considered unnecessary and overly complicating for object management systems. It also may interfere with deployment of product upgrades evolving from simple EPDF to EPDF with processable discrete data. [WG-9 consensus 03/2025]*
9		Should a new Ophthalmology SR SOP Class be defined for these SR's? For integration into enterprise EHRs, these SR instances might be transcoded (e.g., into FHIR) under the single document type "Ophthalmology Note" defined in LOINC. Such a SOP Class might facilitate handling such instances as a class for enterprise integration, but would be yet another SOP Class to be added to PACS and other systems. *A new SOP Class is considered unnecessary. [WG-9 consensus 03/2025]*
10		Is the concept of "key measurements" necessary in the current interoperability environment? The IHE profile presumed Encapsulated PDF SOP Instances would be the basic mechanism for interoperability, and that key measurements included in the object would support basic needs for discrete data (e.g., in EHR summaries). As the interoperability environment in general evolves to a more data-rich approach, perhaps standardization should focus on defining comprehensive sets of ophthalmology measurements from which applications can select based on their specific use case. *The templates may be used either in EPDF, as envisioned in the IHE profile, or in DICOM SR as the core specification for a more comprehensive data exchange. This will need to be left for vendor decisions on implementation.*
11		Do all root node templates require a Value Set Constraint specification of "Root Node"? PS3.16 section 6.1.9.2 has no provision for this use, and it is inconsistently used in Annex A root containers, and it is redundant with the root specification above the table. *Templates in this document do not specify Root Node as a Container Value Set Constraint. Editorial consistency throughout Part 16 is left to the DICOM Editor to resolve.*

D1	*Structured as separate root templates to facilitate intra-department (PACS) management and search, rather than as a single master template with subsections for each class of measurements. [WG-9 consensus 12/2024]*
D2	*Measurements should be post-coordinated with laterality, in contrast to current LOINC pre-coordinated RNFL measurements (LOINC Panel 86291-2). [WG-9 consensus 12/2024]*

PS3.6

Add new Context Group UIDs to PS3.6 Annex A

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Table A-3. Context Group UID Values

Context Group UID	Context Group Identifier	Context Group Name	Comment
1.2.840.10008.6.1.x2	**CID 42x2**	**Optic Disc Key Measurements**	
1.2.840.10008.6.1.x3	**CID 42x3**	**RNFL Key Measurements**	
1.2.840.10008.6.1.x4	**CID 42x4**	**Macular Thickness Key Measurements**	
1.2.840.10008.6.1.x5	**CID 42x5**	**GCL Measurement Extent**	
1.2.840.10008.6.1.x6	**CID 42x6**	**GCL Key Measurements**	
1.2.840.10008.6.1.x7	**CID 42x7**	**GCL Sector Measurements**	
1.2.840.10008.6.1.x8	**CID 42x8**	**Retinal Sector Grid Methods**	
1.2.840.10008.6.1.y0	**CID 42y0**	**Endothelial Cell Count Key Measurements**	
1.2.840.10008.6.1.y1	**CID 42y1**	**Ophthalmic Image ROI Measurements**	

PS3.16

105 | *New Template for generic encoding of ratios with explicit numerator and denominator*

TID 30x Ratio

This template allows encoding of numeric ratios with explicit numerator and denominator. The Container concept name (with modifiers) is equivalent to the numeric measurement concept name of TID 300, and uses the same parameter names.

110   Note   Compare to FHIR Ratio DataType https://www.hl7.org/fhir/datatypes.html#Ratio

Type: Extensible
Order: Significant
Root: No

115   **Table TID 50x.a. Parameters**

Parameter Name	Parameter Usage
$Measurement	Coded term or Context Group for Concept Name of ratio
$ModType	Modifier Name for Concept Name of ratio
$ModValue	Modifier Value for Concept Name of ratio
$NumUnits	Numerator units of measurement
$DenomUnits	Denominator units of measurement
$RefAuthority	Bibliographic reference or authority for statistical properties of a reference population
$RangeAuthority	Bibliographic reference or authority for the normal range of the measurement

Table TID 30x. Ratio

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	$Measurement	1	M		
2	>	HAS CONCEPT MOD	CODE	$ModType	1-n	U		$ModValue
3	>	CONTAINS	NUM	(1000x0, DCM, "Numerator")	1	M		UNITS = $NumUnits
4	>	CONTAINS	NUM	(1000x1, DCM, "Denominator")	1	M		UNITS = $DenomUnits
5	>	HAS PROPERTIES	INCLUDE	DTID 310 "Measurement Properties"	1	U		$RefAuthority = $RefAuthority $RangeAuthority = $RangeAuthority
6	>	HAS OBS CONTEXT	INCLUDE	DTID 4108 "Tracking Identifier"	1	U		

Update TID 4019 PS3.16 Annex A with Item from TID 2102

TID 4019 Algorithm Identification

This Template details the algorithm unambiguously. Re-state the software identification from the General Equipment Module of the SR IOD if all algorithms are unambiguously defined by that Module.

Type: Non-Extensible
Order: Significant
Root: No

Table TID 4019. Algorithm Identification

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			TEXT	EV (111001, DCM, "Algorithm Name")	1	M		
1b			CODE	EV (111001, DCM, "Algorithm Name")	1	U		
2			TEXT	EV (111003, DCM, "Algorithm Version")	1	M		
2b			**TEXT**	**EV (122405, DCM, "Algorithm Manufacturer")**	**1**	**U**		
3			TEXT	EV (111002, DCM, "Algorithm Parameters")	1-n	U		
4			CODE	EV (111000, DCM, "Algorithm Family")	1	U		

Content Item Descriptions

Row 1	May be the same as the Manufacturer's Model Name (0008,1090) of the General Equipment Module, if the Algorithm is not distinguishable from the body of software that makes up the Equipment.
Row 2	May be the same as Software Versions (0018,1020) of the General Equipment Module, if the latter is a single Value, or its multiple Values are combined into a single TEXT Content Item Value.
Row 2b	**May be the same as the Manufacturer (0008,0070) of the General Equipment Module.**

New templates for PS3.16 Annex A

TID 60x1 Ophthalmology Measurements Group

135   This Template is a proper subset of <u>TID 1501</u>, with some optional extensions, and may be processed by a
receiving application in the same way. The parameters used in this Template are identical to those parameters
as used in TID 1501. However, this Template is specialized for ophthalmology (finding site "Eye"), and makes
mandatory a Content Item for each measuement or finding concept specified in the invoking Template in the
Context Groups invoked for the $Measurement parameter. (TID 1501 has no mandatory content.)

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     Type: Extensible
     Order: Non-Significant
     Root: No

145   **Table TID 60x1.a. Parameters**

Parameter Name	Parameter Usage
$TargetSiteMod	Value for Anatomic Location of measurement
$Method	Value for Measurement Method
$Measurement	Coded term or Context Group for Concept Name of mandatory measurements
$OptMeasure	Coded term or Context Group for Concept Name of optional measurements

Table TID 60x1. Ophthalmology Measurements Group

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1		CONTAINS	CONTAINER	EV <u>(125007, DCM, "Measurement Group")</u>	1	M		
2	>	HAS CONCEPT MOD	CODE	<u>EV (363698007, SCT, "Finding Site")</u>	1	M		EV <u>(81745001, SCT, "Eye")</u>
3	>>	HAS CONCEPT MOD	CODE	EV <u>(272741003, SCT, "Laterality")</u>	1	M		D<u>CID 247 "Laterality Left-Right Only"</u>
4	>>	HAS CONCEPT MOD	CODE	EV <u>(106233006, SCT, "Topographical modifier")</u>	1	MC	IFF Template is invoked with a non-empty $TargetSiteMod parameter	$TargetSiteMod
5	>	HAS CONCEPT MOD	CODE	EV <u>(370129005, SCT, "Measurement Method")</u>	1	MC	IFF Template is invoked with a non-empty $Method parameter	$Method
6	>	HAS OBS CONTEXT	CODE	EV <u>(418775008 , SCT, "Finding Method")</u>	1	MC	IFF measurements made with ROI or sector grid positioned	EV (nnn110, DCM, "Repositioned ROI or grid")

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
							differently from prior analyses	
7	>	HAS OBS CONTEXT	INCLUDE	DTID 4108 "Tracking Identifier"	1	U		
8	>	CONTAINS	INCLUDE	DTID 300 "Measurement"	1-n	MC	IFF Template is invoked with a non-empty $Measurement parameter (see Content Item Description)	$Measurement = $Measurement
9	>	CONTAINS	INCLUDE	DTID 300 "Measurement"	1-n	U		$Measurement = $OptMeasure
10	>	CONTAINS	IMAGE	EV (121112, DCM, "Source of Measurement")	1-n	U		
11	>	CONTAINS	NUM	EV (111694, DCM, "Image Set Quality Rating")	1	UC	XOR Row 12	UNITS = EV ({0:100}, UCUM, "range:0:100") Value = 0 - 100
12	>	CONTAINS	CODE	EV (111101, DCM, "Image Quality")	1	UC	XOR Row 11	BCID 3114 Study Quality
13	>	CONTAINS	IMAGE	EV (130401, DCM, "Visual explanation")	1	U		
14	>	CONTAINS	COMPOSITE	EV (130401, DCM, "Visual explanation")	1	U		
15	>	CONTAINS	TEXT	EV (121106, DCM, "Comment")	1	U		

150 **Content Item Descriptions**

Row 8	Mandatory numeric findings of the measurement group.
	Each Concept specified in the Value Set Constraints (i.e., as specified in the invoking Template $Measurement parameter) shall be encoded in a NUM Content Item, thus if there are eight concepts in the specified Context Group, eight NUM Content Items in accordance with TID 300 shall be present. Note that the NUM Content Item allows an absent value with an associated reason code per CID 42, e.g., (114007, DCM, "Measurement not attempted").
	TID 300 Measurement defines an optional capability to specify properties of a measurement via TID 310 Measurement Properties. TID 310 supports properties such as normality, statistical properties (through subsidiary TID 311), normal ranges (subsidiary TID 312), level of significance and more. Normality flags are highly useful and commonly provided by implementations.
Row 9	Optional numeric measurements of the measurement group.

Row 10	Reference to the original image(s), e.g., Ophthalmic Tomography, that provided the data analyzed to produce the measurements in this group.
Rows 11, 12	A numeric (row 12) or categorical (row 13) rating of the quality of the source images for the purpose of producing the measurements in this group.
Rows 13, 14	May be a reference to a Secondary Capture Image (row 14) or Encapsulated PDF (row 15) rendering of the set of measurements and findings encoded in this Measurement Group, and possibly additional data.

TID 60x2 Visual Field Key Measurements

Type: Extensible
Order: Non-Significant
Root: Yes

Table TID 60x2 Visual Field Key Measurements

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (nnn100, DCM, "Visual Field Key Measurements")	1	M		
2	>	HAS CONCEPT MOD	INCLUDE	DTID 1204 "Language of Content Item and Descendants"	1	U		
3	>	HAS OBS CONTEXT	INCLUDE	DTID 1002 "Observer Context"	1-n	U		
4	>	HAS OBS CONTEXT	INCLUDE	DTID 4019 Algorithm Identification	1	U		
5	>	CONTAINS	CONTAINER	EV (125007, DCM, "Measurement Group")	1-n	M		
6	>>	HAS CONCEPT MOD	CODE	EV (363698007, SCT, "Finding Site")	1	M		EV (81745001, SCT, "Eye")
7	>>>	HAS CONCEPT MOD	CODE	EV (272741003, SCT, "Laterality")	1	M		DCID 247 "Laterality Left-Right Only"
8	>>	HAS CONCEPT MOD	CODE	EV (370129005, SCT, "Measurement Method")	1	M		DCID 4250 Visual Field Static Perimetry Test Pattern
9	>>	HAS ACQ CONTEXT	CODE	EV (246501002, SCT, "Technique")	1	M		DCID 4251 Visual Field Static Perimetry Test Strategy

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
10	>>	HAS OBS CONTEXT	INCLUDE	DTID 4108 "Tracking Identifier"	1	U		
11	>>	CONTAINS	INCLUDE	DTID 300 "Measurement"	1	M		$Measurement = EV (nnn200, DCM, "Visual Field Global Deviation from Normal") $Units=EV(dB, UCUM, "dB")
12	>>	CONTAINS	INCLUDE	DTID 300 "Measurement"	1	M		$Measurement = EV (nnn201, DCM, "Visual Field Localized Deviation From Normal") $Units=EV(dB, UCUM, "dB")
13	>>	CONTAINS	INCLUDE	DTID 300 "Measurement"	1	M		$Measurement = EV (111852, DCM, "Visual Field Index") $Units=EV(%, UCUM, "%")
14	>>	CONTAINS	INCLUDE	DTID 30x "Ratio"	1	MC	IF Row 16 not present	$Measurement = (nnn202, DCM, "Fixation false positive ratio") $NumUnits = EV ({false positives}, UCUM, "false positives") $DenomUnits = EV ({trials}, UCUM, "trials")
15	>>	CONTAINS	INCLUDE	DTID 300 "Measurement"	1	MC	IF Row 15 not present	$Measurement = (nn202a, DCM, "Fixation false positive percent") $Units=EV(%, UCUM, "%")
16	>>	CONTAINS	INCLUDE	DTID 30x "Ratio"	1	MC	IF Row 18 not present	$Measurement = (nnn203, DCM, "Fixation false negative ratio") $NumUnits = EV ({false negatives}, UCUM, "false negatives") $DenomUnits = EV ({trials}, UCUM, "trials")
17	>>	CONTAINS	INCLUDE	DTID 300 "Measurement"	1	MC	IF Row 17 not present	$Measurement = (nn203a, DCM, "Fixation false negative percent") $Units=EV(%, UCUM, "%")
18	>>	CONTAINS	INCLUDE	DTID 30x "Ratio"	1	M		$Measurement = (nnn204, DCM, "Fixation losses ratio") $NumUnits = EV ({fixation losses}, UCUM, "fixation losses")

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
								$DenomUnits = EV ({trials}, UCUM, "trials")
19	>>	CONTAINS	CODE	EV (111855, DCM, "Glaucoma Hemifield Test Analysis")	1	M		DCID 4254. Visual Field Static Perimetry Test Analysis Result
20	>>	CONTAINS	COMPOSITE	EV (121112, DCM, "Source of Measurement")	1	U		
21	>>	CONTAINS	IMAGE	EV (130401, DCM, "Visual explanation")	1	U		
22	>>	CONTAINS	COMPOSITE	EV (130401, DCM, "Visual explanation")	1	U		
23	>>	CONTAINS	TEXT	EV (121106, DCM, "Comment")	1	U		

160 **Content Item Descriptions**

Row 5	For example, the Measurement Group CONTAINER may be instantiated once for each eye, or multiple times for a trend series for a single eye.
Row 20	May be a reference to an Ophthalmic Visual Field Static Perimetry Measurements SOP Instance.
Rows 21, 22	May be a reference to a Secondary Capture Image (row 21) or Encapsulated PDF (row 22) rendering of the set of measurements and findings encoded in this Measurement Group, and possibly additional data.

TID 60x3 Optic Disc Key Measurements

Type: Extensible
165 Order: Non-Significant
Root: Yes

Table TID 60x3 Optic Disc Key Measurements

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (nnn101, DCM, "Optic Disc Key Measurements")	1	M		
2	>	HAS CONCEPT MOD	INCLUDE	DTID 1204 "Language of Content Item and Descendants"	1	U		

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
3	**>**	HAS OBS CONTEXT	INCLUDE	DTID 1002 "Observer Context"	1-n	U		
4	>	HAS OBS CONTEXT	INCLUDE	DTID 4019 Algorithm Identification	1	M		
5	>	CONTAINS	INCLUDE	DTID 60x1 "Ophthalmology Measurements Group"	1-n	M		$Measurement = DCID 42x2 Optic Disc Key Measurements

170 **Content Item Descriptions**

Row 5	For example, TID 60x1 may be invoked once for each eye, or multiple times for a trend series for a single eye.

TID 60x4 Retinal Nerve Fiber Layer Key Measurements

Type: Extensible
175 Order: Non-Significant
Root: Yes

Table TID 60x4 Retinal Nerve Fiber Layer Key Measurements

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (nnn102, DCM, "Retinal Nerve Fiber Layer Key Measurements")	1	M		
2	>	HAS CONCEPT MOD	INCLUDE	DTID 1204 "Language of Content Item and Descendants"	1	U		
3	>	HAS OBS CONTEXT	INCLUDE	DTID 1002 "Observer Context"	1-n	U		
4	>	HAS OBS CONTEXT	INCLUDE	DTID 4019 Algorithm Identification	1	M		
5	>	CONTAINS	INCLUDE	DTID 60x1 "Ophthalmology Measurements Group"	1-n	M		$Method = DCID 42x8 Retinal Sector Grid Methods $Measurement = DCID 42x3 RNFL Key Measurements
6	>	CONTAINS	INCLUDE	DTID 300 "Measurement"	1	MC	IFF RNFL measurements made on both eyes	$Measurement = (nnn405, DCM, "Retinal nerve fiber layer symmetry") $Units = (%, UCUM, "%")

180 **Content Item Descriptions**

Row 5	For example, TID 60x1 may be invoked once for each eye, or multiple times for a trend series for a single eye.
	Receiving applications are cautioned about comparing or aggregating measurements from measurement groups with different ROI areas or sector grid methods.

TID 60x5 Macular Thickness Key Measurements

The macular grid used for the measurements of this template is based upon the grid employed by the Early
185 Treatment of Diabetic Retinopathy Study (ETDRS) to measure area and proximity of macular edema to the anatomic center (fovea) of the macula. See *ETDRS Report Number 10*.

Type: Extensible
Order: Non-Significant
Root: Yes
190

Table TID 60x5 Macular Thickness Key Measurements

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (nnn103, DCM, "Macular Thickness Key Measurements")	1	M		
2	>	HAS CONCEPT MOD	INCLUDE	DTID 1204 "Language of Content Item and Descendants"	1	U		
3	>	HAS OBS CONTEXT	INCLUDE	DTID 1002 "Observer Context"	1-n	U		
4	>	HAS OBS CONTEXT	INCLUDE	DTID 4019 Algorithm Identification	1	M		
5	>	CONTAINS	INCLUDE	DTID 60x1 "Ophthalmology Measurements Group"	1-n	M		$Measurement = DCID 42x4 Macular Thickness Key Measurements

Content Item Descriptions

Row 5	For example, TID 60x1 may be invoked once for each eye, or multiple times for a trend series for a single eye.

195

TID 60x6 Ganglion Cell Layer Key Measurements

Type: Extensible
Order: Non-Significant
Root: Yes
200

Table TID 60x6 Ganglion Cell Layer Key Measurements

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (nnn104, DCM, "Ganglion Cell Layer Key Measurements")	1	M		
2	>	HAS CONCEPT MOD	INCLUDE	DTID 1204 "Language of Content Item and Descendants"	1	U		
3	>	HAS OBS CONTEXT	INCLUDE	DTID 1002 "Observer Context"	1-n	U		
4	>	HAS OBS CONTEXT	INCLUDE	DTID 4019 Algorithm Identification	1	M		
5	>	CONTAINS	INCLUDE	DTID 60x1 "Ophthalmology Measurements Group"	1-n	M		$TargetSiteMod = DCID 42x5 GCL Measurement Extent $Method = DCID 42x8 Retinal Sector Grid Methods $Measurement = DCID 42x6 GCL Key Measurements $OptMeasure = DCID 42x7 GCL Sector Measurements

Content Item Descriptions

Row 5	For example, TID 60x1 may be invoked once for each eye, or multiple times for a trend series for a single eye.
	Approaches to measure the Ganglion Cell Layer thickness vary widely. This template requires the SOP Instance creator application to specify which other cell layers, if any, are measured with the GCL proper (using a concept from CID 42x5 GCL Measurement Extent).
	Applications also use various approaches to identifying different sectors of the retina when measuring the GCL thickness. The sector definition used is specified by a concept from CID 42x8 GCL Sector Grid Methods. Measurements that match the sector names defined by the method may be selected from CID 42x7 GCL Sector Measurements to be included in the key measurements.
	Receiving applications are cautioned about comparing or aggregating measurements from measurement groups with different measurement extents or sector grid methods.

205

TID 60x8 Endothelial Cell Count Key Measurements

Type: Extensible
Order: Non-Significant
210 Root: Yes

Table TID 60x8 Endothelial Cell Count Key Measurements

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (nnn106, DCM, "Endothelial Cell Count Key Measurements")	1	M		
2	>	HAS CONCEPT MOD	INCLUDE	DTID 1204 "Language of Content Item and Descendants"	1	U		
3	>	HAS OBS CONTEXT	INCLUDE	DTID 1002 "Observer Context"	1-n	U		
4	>	HAS OBS CONTEXT	INCLUDE	DTID 4019 Algorithm Identification	1	M		
5	>	CONTAINS	INCLUDE	DTID 60x1 "Ophthalmology Measurements Group"	1-n	M		$Measurement = DCID 42y0 Endothelial Cell Count Measurements

Content Item Descriptions

Row 5	For example, TID 60x1 may be invoked once for each eye, or multiple times for a trend series for a single eye.

215

TID 60x9 Ophthalmic Image ROI Measurements

Type: Extensible
220 Order: Non-Significant
Root: Yes

Table TID 60x9 Ophthalmic Image ROI Measurements

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (nnn107, DCM, "Ophthalmic Image ROI Measurements")	1	M		
2	>	HAS CONCEPT MOD	INCLUDE	DTID 1204 "Language of Content Item and Descendants"	1	U		
3	>	HAS OBS CONTEXT	INCLUDE	DTID 1002 "Observer Context"	1-n	U		
4	>	HAS OBS CONTEXT	INCLUDE	DTID 4019 Algorithm Identification	1	U		

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
5	>	CONTAINS	INCLUDE	DTID 60x1 "Ophthalmology Measurements Group"	1-n	M		$OptMeasure = DCID 42y1 Ophthalmic Image ROI Measurements

225 **Content Item Descriptions**

Row 5	For example, TID 60x1 may be invoked once for each eye, or multiple times for a trend series for a single eye, or multiple times for different classes of measurements.
	No mandatory key measurements are specified. Creating applications may include any measurements or findings.

Update CID 222 with additonal SNOMED normality codes

230 **CID 222 Normality**

Keyword: Normality
FHIR Keyword: dicom-cid-222-Normality
Type: Extensible
Version: ~~20170914~~ 2025mmdd
235 UID: 1.2.840.10008.6.1.27

Table CID 222. Normality

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-RT ID	UMLS Concept Unique ID
SCT	17621005	Normal	G-A460	C0205307
SCT	263654008	Abnormal	R-42037	C0205161
SCT	371879000	Abnormally High	R-002C4	C1299351
SCT	371880002	Abnormally Low	R-002C5	C1299352
SCT	371934000	Normality Undetermined	R-0039B	C1299401
SCT	**442777001**	**Borderline high**		
SCT	**442779003**	**Borderline low**		
SCT	**394844007**	**Outside reference range**		
SCT	**281302008**	**Above reference range**		
SCT	**281300000**	**Below reference range**		
SCT	**281301001**	**Within reference range**		

New context groups for PS3.16 Annex B

240

CID 42x2 Optic Disc Key Measurements

Keyword: OpticDiscKeyMeasurements
245 FHIR Keyword: dicom-cid-42x2-OpticDiscKeyMeasurements
Type: Non-Extensible
Version: 2025mmdd
UID: 1.2.840.10008.6.1.x2

250 **Table CID 42x2 Optic Disc Key Measurements**

Coding Scheme Designator	Code Value	Code Meaning	Units of Measure
DCM	nnn300	Cup to disc area ratio	({ratio}, UCUM, "ratio")
DCM	nnn301	Cup to disc ratio vertical	({ratio}, UCUM, "ratio")
DCM	nnn302	Cup to disc ratio horizontal	({ratio}, UCUM, "ratio")
DCM	nnn303	Neuroretinal rim area	(mm2, UCUM, "mm2")
DCM	nnn304	Optic cup area	(mm2, UCUM, "mm2")
DCM	nnn305	Optic disc area	(mm2, UCUM, "mm2")
DCM	nnn306	Optic cup volume	(mm3, UCUM, "mm3")

CID 42x3 RNFL Key Measurements

255 In encoding of clockface position measurements, positions in the right eye proceed in the natural clockwise direction as viewed from the anterior position, while positions in the left eye proceed in the counter-clockwise direction.

Keyword: RNFLKeyMeasurements
260 FHIR Keyword: dicom-cid-42x3-RNFLKeyMeasurements
Type: Non-Extensible
Version: 2025mmdd
UID: 1.2.840.10008.6.1.x3

265
Table CID 42x3 RNFL Key Measurements

Coding Scheme Designator	Code Value	Code Meaning	Units of Measure
DCM	nnn400	Retinal nerve fiber layer average thickness	(um, UCUM, "um")
DCM	nnn401	Retinal nerve fiber layer inferior thickness	(um, UCUM, "um")
DCM	nnn402	Retinal nerve fiber layer superior thickness	(um, UCUM, "um")
DCM	nnn403	Retinal nerve fiber layer temporal thickness	(um, UCUM, "um")
DCM	nnn404	Retinal nerve fiber layer nasal thickness	(um, UCUM, "um")
DCM	nnn411	RNFL clockface position 1 thickness	(um, UCUM, "um")
DCM	nnn412	RNFL clockface position 2 thickness	(um, UCUM, "um")
DCM	nnn413	RNFL clockface position 3 thickness	(um, UCUM, "um")
DCM	nnn414	RNFL clockface position 4 thickness	(um, UCUM, "um")
DCM	nnn415	RNFL clockface position 5 thickness	(um, UCUM, "um")
DCM	nnn416	RNFL clockface position 6 thickness	(um, UCUM, "um")
DCM	nnn417	RNFL clockface position 7 thickness	(um, UCUM, "um")
DCM	nnn418	RNFL clockface position 8 thickness	(um, UCUM, "um")
DCM	nnn419	RNFL clockface position 8 thickness	(um, UCUM, "um")
DCM	nnn420	RNFL clockface position 10 thickness	(um, UCUM, "um")
DCM	nnn421	RNFL clockface position 11 thickness	(um, UCUM, "um")
DCM	nnn422	RNFL clockface position 12 thickness	(um, UCUM, "um")
DCM	nnn406	Retinal ROI width	(mm, UCUM, "mm")

CID 42x4 Macular Thickness Key Measurements

270

Keyword: MacularThicknessKeyMeasurements
FHIR Keyword: dicom-cid-42x4-MacularThicknessKeyMeasurements
Type: Non-Extensible
Version: 2025mmdd
275 UID: 1.2.840.10008.6.1.x4

Table CID 42x4 Macular Thickness Key Measurements

Coding Scheme Designator	Code Value	Code Meaning	Units of Measure
LN	57108-3	Macular grid.center point thickness by OCT	(um, UCUM, "um")
LN	57109-1	Macular grid.center subfield thickness by OCT	(um, UCUM, "um")
LN	57110-9	Macular grid.inner superior subfield thickness by OCT	(um, UCUM, "um")
LN	57111-7	Macular grid.inner nasal subfield thickness by OCT	(um, UCUM, "um")
LN	57112-5	Macular grid.inner inferior subfield thickness by OCT	(um, UCUM, "um")
LN	57113-3	Macular grid.inner temporal subfield thickness by OCT	(um, UCUM, "um")
LN	57114-1	Macular grid.outer superior subfield thickness by OCT	(um, UCUM, "um")
LN	57115-8	Macular grid.outer nasal subfield thickness by OCT	(um, UCUM, "um")
LN	57116-6	Macular grid.outer inferior subfield thickness by OCT	(um, UCUM, "um")
LN	57117-4	Macular grid.outer temporal subfield thickness by OCT	(um, UCUM, "um")
LN	57118-2	Macular grid.total volume by OCT	(uL, UCUM, "uL")
DCM	nnn250	Average macular thickness	(um, UCUM, "um")

Note : The Macular grid measurement concepts, based on the ETDRS grid, are included in LOINC panel
280   57119-0 Optical coherence tomography panel. The ETDRS grid defines the center subfield diameter of
1 mm, inner subfields diameter of 3 mm, and the outer subfields diameter of 6 mm; see PS3.17
Section UU.5.

285 ## CID 42x5 GCL Measurement Extent

This Context Group specifies the retinal layers included in the ganglion cell layer (GCL) measurements.

Keyword: GCLMeasurementExtent
290 FHIR Keyword: dicom-cid-42x5-GCLMeasurementExtent
Type: Non-Extensible
Version: 2025mmdd
UID: 1.2.840.10008.6.1.x5

295   **Table CID 42x5 GCL Measurement Extent**

Coding Scheme Designator	Code Value	Code Meaning
SCT	39197003	Ganglion cell layer
DCM	nnn550	Ganglion cell and inner plexiform layers
DCM	nnn551	Ganglion cell complex

CID 42x6 GCL Key Measurements

This Context Group includes key measurements of the ganglion cell layer (GCL) thickness, with or without
300 adjacent layers as specified by the context of usage.

Keyword: GCLKeyMeasurements
FHIR Keyword: dicom-cid-42x6-GCLKeyMeasurements
Type: Non-Extensible
305 Version: 2025mmdd
UID: 1.2.840.10008.6.1.x6

Table CID 42x6 GCL Key Measurements

Coding Scheme Designator	Code Value	Code Meaning	Units of Measure
DCM	nnn406	Retinal ROI width	(mm, UCUM, "mm")
DCM	nnn500	Average GCL thickness	(um, UCUM, "um")
DCM	nnn502	Minimum GCL thickness	(um, UCUM, "um")

310

CID 42x7 GCL Sector Measurements

This Context Group includes measurements of the ganglion cell layer (GCL) thickness in each retinal sector,
with or without adjacent layers as specified by the context of usage, and with the span of each sector also
315 defined by the context of usage.

Keyword: GCLSectorMeasurements
FHIR Keyword: dicom-cid-42x7-GCLSectorMeasurements
Type: Non-Extensible
320 Version: 2025mmdd
UID: 1.2.840.10008.6.1.x7

Table CID 42x7 GCL Sector Measurements

Coding Scheme Designator	Code Value	Code Meaning	Units of Measure
DCM	nnn511	Average GCL thickness superior sector	(um, UCUM, "um")
DCM	nnn512	Average GCL thickness nasal-superior sector	(um, UCUM, "um")
DCM	nnn513	Average GCL thickness nasal sector	(um, UCUM, "um")
DCM	nnn514	Average GCL thickness nasal-inferior sector	(um, UCUM, "um")
DCM	nnn515	Average GCL thickness inferior sector	(um, UCUM, "um")
DCM	nnn516	Average GCL thickness temporal-inferior sector	(um, UCUM, "um")
DCM	nnn517	Average GCL thickness temporal sector	(um, UCUM, "um")
DCM	nnn518	Average GCL thickness temporal-superior sector	(um, UCUM, "um")

325

CID 42x8 Retinal Sector Grid Methods

Keyword: RetinalSectorGridMethods
FHIR Keyword: dicom-cid-42x8-RetinalSectorGridMethods
330 Type: Extensible
Version: 2025mmdd
UID: 1.2.840.10008.6.1.x8

Table CID 42x8 RetinalSector Grid Methods

Coding Scheme Designator	Code Value	Code Meaning
DCM	nnn560	Hemifield circular sector grid
DCM	nnn56b	Hemifield rectangular sector grid
DCM	nnn561	Elliptical annulus sector grid
DCM	nnn562	Garway-Heath sector grid
DCM	nnn563	Quadrant-octant sector grid
DCM	nnn564	Posterior pole 8x8 grid

335

CID 42y0 Endothelial Cell Count Measurements

Keyword: EndothelialCellCountMeasurements
340 FHIR Keyword: dicom-cid-42y0-EndothelialCellCountMeasurements
Type: Non-Extensible
Version: 2025mmdd
UID: 1.2.840.10008.6.1.y0

345 **Table CID 42y0 Endothelial Cell Count Measurements**

Coding Scheme Designator	Code Value	Code Meaning	Units of Measure
DCM	nnn700	Endothelial cell density	({cells}/mm2, UCUM, "cells/mm2")

CID 42y1 Ophthalmic Image ROI Measurements

350 Keyword: OphthalmicImageROIMeasurements
FHIR Keyword: dicom-cid-42y1-OphthalmicImageROIMeasurements
Type: Extensible
Version: 2025mmdd
UID: 1.2.840.10008.6.1.y1
355

Table CID 42y1 Ophthalmic Image ROI Measurements

Coding Scheme Designator	Code Value	Code Meaning	Units of Measure
DCM	nnn800	Geographic atrophy area	(mm2, UCUM, "mm2")

New codes and definitions for PS3.16 Annex D

ANNEX D

Code Value	Code Meaning	Definition	Notes
1000x0	Numerator	Numerator of a value expressed as a ratio	
1000x1	Denominator	Denominator of a value expressed as a ratio	
nnn100	Visual Field Key Measurements	Clinically relevant measurements of patient Visual Field	
nnn101	Optic Disc Key Measurements	Clinically relevant measurements of Optic Disc	
nnn102	Retinal Nerve Fiber Layer Key Measurements	Clinically relevant measurements of Retinal Nerve Fiber Layer	
nnn103	Macular Thickness Key Measurements	Clinically relevant measurements of Macular Thickness	
nnn104	Ganglion Cell Layer Key Measurements	Clinically relevant measurements of Gangion Cell Layer	
nnn106	Endothelial Cell Count Key Measurements	Clinically relevant measurements of Endothelial Cell Count	
nnn107	Ophthalmic Image ROI Measurements	Measurements of Ophthalmic Images based on a Region of Interest	
nnn110	Repositioned ROI or grid	Indicator that measurements were made with ROI or grid positioned differently than used for a prior measurement set	
nnn200	Visual Field Global Deviation from Normal	Weighted average deviation from the age corrected normal visual field, as decibel. Corresponds to Global Deviation from Normal (0024,0066) in the Results Normals Sequence (0024,0064)	
nnn201	Visual Field Localized Deviation From Normal	Weighted square root of loss variance in visual field, as decibel. Corresponds to Localized Deviation From Normal (0024,0068) in the Results Normals Sequence (0024,0064)	
nnn202	Fixation false positive ratio	The ratio between the number of times patient responses occurred when no visual stimulus was present (false positive responses) and the number of trials presented. Corresponds to ratio of False Positives Quantity (0024,0060) to Positive Catch Trials Quantity (0024,0056) in the Visual Field Catch Trial Sequence (0024,0034)	
nn202a	Fixation false positive percent	Estimated percentage of all patient responses that occurred at a time when no visual stimulus was present (false positive responses), as percent. Corresponds to False Positives Estimate (0024,0054) in the Visual Field Catch Trial Sequence (0024,0034)	

Code Value	Code Meaning	Definition	Notes
nnn203	Fixation false negative ratio	The ratio between the number of times stimuli were not seen by the patient but were previously seen at a lower luminance earlier in the visual field test (false negative responses) and the number of trials presented. Corresponds to ratio of False Negatives Quantity (0024,0050) to Negative Catch Trials Quantity (0024,0048) in the Visual Field Catch Trial Sequence (0024,0034)	
nn203a	Fixation false negative percent	Estimated percentage of all stimuli that were not seen by the patient but were previously seen at a lower luminance earlier in the visual field test (false negative responses), as percent. Corresponds to False Negatives Estimate (0024,0046) in the Visual Field Catch Trial Sequence (0024,0034)	
nnn204	Fixation losses ratio	The ratio between the number of times a patient loses visual fixation while maintaining a visual gaze on a single location and the number of trials presented. Corresponds to ratio of Patient Not Properly Fixated Quantity (0024,0036) to Fixation Checked Quantity (0024,0035) in Fixation Sequence (0024,0032)	
nnn250	Average macular thickness	Average macular thickness across all ETDRS subfields	
nnn300	Cup to disc area ratio	Ratio of the optic cup area to the optic disc area	
nnn301	Cup to disc ratio vertical	Ratio of the vertical diameter of the optic cup to that of the vertical diameter of the optic disc	
nnn302	Cup to disc ratio horizontal	Ratio of the horizontal diameter of the optic cup to that of the horizontal diameter of the optic disc	
nnn303	Neuroretinal rim area	Area of the neuroretinal rim portion of the optic nerve head	
nnn304	Optic cup area	Area of the cup portion of the optic nerve head	
nnn305	Optic disc area	Area of the optic disc or Bruch's Membrane Opening (BMO)	
nnn306	Optic cup volume	Volume of the cup portion of the optic nerve head	
nnn400	Retinal nerve fiber layer average thickness	Average measured thickness of the retinal nerve fiber layer (RNFL), i.e., the distance between the internal limiting membrane (ILM) and the Gangion Cell Layer (GCL), across the entire ROI (also denoted as the global RNFL thickness)	
nnn401	Retinal nerve fiber layer inferior thickness	Average measured thickness of the retinal nerve fiber layer (RNFL), i.e., the distance between the internal limiting membrane (ILM) and the Gangion Cell Layer (GCL), in the inferior quadrant as defined by the measurement method.	
nnn402	Retinal nerve fiber layer superior thickness	Average measured thickness of the retinal nerve fiber layer (RNFL), i.e., the distance between the internal limiting membrane (ILM) and the Gangion Cell Layer (GCL), in the superior quadrant as defined by the measurement method.	
nnn403	Retinal nerve fiber layer temporal thickness	Average measured thickness of the retinal nerve fiber layer (RNFL), i.e., the distance between the internal limiting membrane (ILM) and the Gangion Cell Layer (GCL), in the temporal quadrant as defined by the measurement method.	

Code Value	Code Meaning	Definition	Notes
nnn404	Retinal nerve fiber layer nasal thickness	Average measured thickness of the retinal nerve fiber layer (RNFL), i.e., the distance between the internal limiting membrane (ILM) and the Gangion Cell Layer (GCL), in the nasal quadrant as defined by the measurement method.	
nnn405	Retinal nerve fiber layer symmetry	Symmetry between the two eyes of the retinal nerve fiber layer (RNFL) thickness, represented as percent.	
nnn406	Retinal ROI width	Diameter of circular area, minor axis of eliptical area, or minor dimension of a rectangular area, used for measurement of retinal layer thicknesses	
nnn411	RNFL clockface position 1 thickness	Average measured retinal nerve fiber layer thickness at clockface position 1, in the clockwise direction for the right eye and the counter-clockwise direction for the left eye, as viewed from an anterior position. This is in the nasal superior quadrant.	
nnn412	RNFL clockface position 2 thickness	Average measured retinal nerve fiber layer thickness at clockface position 2, in the clockwise direction for the right eye and the counter-clockwise direction for the left eye, as viewed from an anterior position. This is in the nasal superior quadrant.	
nnn413	RNFL clockface position 3 thickness	Average measured retinal nerve fiber layer thickness at clockface position 3, in the clockwise direction for the right eye and the counter-clockwise direction for the left eye, as viewed from an anterior position. This is the nasal position.	
nnn414	RNFL clockface position 4 thickness	Average measured retinal nerve fiber layer thickness at clockface position 4, in the clockwise direction for the right eye and the counter-clockwise direction for the left eye, as viewed from an anterior position. This is in the nasal inferior quadrant.	
nnn415	RNFL clockface position 5 thickness	Average measured retinal nerve fiber layer thickness at clockface position 5, in the clockwise direction for the right eye and the counter-clockwise direction for the left eye, as viewed from an anterior position. This is in the nasal inferior quadrant.	
nnn416	RNFL clockface position 6 thickness	Average measured retinal nerve fiber layer thickness at clockface position 6. This is the inferior position.	
nnn417	RNFL clockface position 7 thickness	Average measured retinal nerve fiber layer thickness at clockface position 7, in the clockwise direction for the right eye and the counter-clockwise direction for the left eye, as viewed from an anterior position. This is in the temporal inferior quadrant.	
nnn418	RNFL clockface position 8 thickness	Average measured retinal nerve fiber layer thickness at clockface position 8, in the clockwise direction for the right eye and the counter-clockwise direction for the left eye, as viewed from an anterior position. This is in the temporal inferior quadrant.	
nnn419	RNFL clockface position 9 thickness	Average measured retinal nerve fiber layer thickness at clockface position 9, in the clockwise direction for the right eye and the counter-clockwise direction for the left eye, as viewed from an anterior position. This is the temporal position.	

Code Value	Code Meaning	Definition	Notes
nnn420	RNFL clockface position 10 thickness	Average measured retinal nerve fiber layer thickness at clockface position 10, in the clockwise direction for the right eye and the counter-clockwise direction for the left eye, as viewed from an anterior position. This is in the temporal superior quadrant.	
nnn421	RNFL clockface position 11 thickness	Average measured retinal nerve fiber layer thickness at clockface position 11, in the clockwise direction for the right eye and the counter-clockwise direction for the left eye, as viewed from an anterior position. This is in the temporal superior quadrant.	
nnn422	RNFL clockface position 12 thickness	Average measured retinal nerve fiber layer thickness at clockface position 12. This is the superior position.	
nnn500	Average GCL thickness	Average thickness of the ganglion cell layer across the entire ROI (also denoted as the global GCL thickness)	
nnn502	Minimum GCL thickness	Minimum thickness of the ganglion cell layer over a single meridian crossing the annulus	
nnn511	Average GCL thickness superior sector	Average ganglion cell layer thickness in the superior sector as defined by the measurement method	
nnn512	Average GCL thickness nasal-superior sector	Average ganglion cell layer thickness in the nasal-superior sector as defined by the measurement method	
nnn513	Average GCL thickness nasal sector	Average ganglion cell layer thickness in the nasal sector as defined by the measurement method	
nnn514	Average GCL thickness nasal-inferior sector	Average ganglion cell layer thickness in the nasal-inferior sector as defined by the measurement method	
nnn515	Average GCL thickness inferior sector	Average ganglion cell layer thickness in the inferior sector as defined by the measurement method	
nnn516	Average GCL thickness temporal-inferior sector	Average ganglion cell layer thickness in the temporal-inferior as defined by the measurement method sector	
nnn517	Average GCL thickness temporal sector	Average ganglion cell layer thickness in the temporal sector as defined by the measurement method	
nnn518	Average GCL thickness temporal-superior sector	Average ganglion cell layer thickness in the temporal-superior sector as defined by the measurement method	
nnn550	Ganglion cell and inner plexiform layers	Anatomic region including the ganglion cell layer (GCL) and the inner plexiform layer (IPL)	
nnn551	Ganglion cell complex	Anatomic region including the Ganglion cell layer (GCL), the inner plexiform layer (IPL), and the retinal nerve fiber layer (RNFL)	
nnn560	Hemifield circular sector grid	Circular measurement area with measurements on 180° hemifield sectors centered on vertical and horizontal axes (superior, inferior, nasal, temporal).	

Code Value	Code Meaning	Definition	Notes
nnn56b	Hemifield rectangular sector grid	Rectangular measurement area with measurements in hemifield sectors (superior, inferior, nasal, temporal).	
nnn561	Elliptical annulus sector grid	Measurement area of an elliptical annulus, with an inner minor axis radius of 0.5 mm, an outer minor axis of 2.0 mm aligned vertically, an inner major axis radius of 0.6 mm, and an outer major axis of 2.4 mm aligned horizontally, divided into six 60° sectors with boundaries beginning at 30° from vertical (superior, nasal-superior, nasal-inferior, inferior, temporal-inferior, temporal-superior).	
nnn562	Garway-Heath sector grid	Circular measurement area, divided into six sectors – a 110° nasal sector and a 90° temporal sector centered on the fovea-Bruch's membrane opening (BMO) axis, and four 40° sectors (temporal-superior, nasal-superior, nasal-inferior, temporal-inferior)	
nnn563	Quadrant-octant sector grid	Circular measurement area, divided into six sectors – 90° nasal and temporal quadrants centered on the horizontal axis, and four 45° octants (temporal-superior, nasal-superior, nasal-inferior, temporal-inferior)	
nnn564	Posterior pole 8x8 grid	Rectangular measurement area divided into an 8x8 grid positioned symmetrically to the fovea-optic disc axis and centered on the optic disc.	
nnn700	Endothelial cell density	The density of endothelial cells present on the innermost surface of the cornea, as cells/mm2	
nnn800	Geographic atrophy area	The sum of the areas of all macular atrophy lesions	